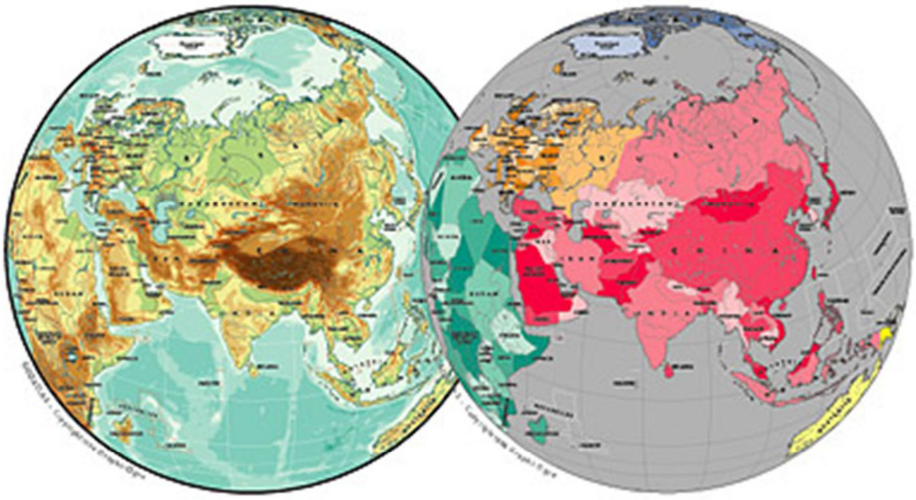
Stockholm Convention on persistent organic pollutants (POPs)

UNEP

GLOBAL MONITORING PLAN
FOR PERSISTENT ORGANIC POLLUTANTS

UNDER THE STOCKHOLM CONVENTION ARTICLE 16
ON EFFECTIVENESS EVALUATION

FIRST REGIONAL MONITORING REPORT
ASIA-PACIFIC REGION



Members of Regional Organization Group

Mr. Minghui Zheng (China), Mr. Waisea Votadroka (Fiji), Mr. G.K. Pandey (India),
Mr. Yasuyuki Shibata (Japan), Ms. Hala Sultan Saif Al-Easa (Qatar), Mr. Fouad Elok (Syria).

Consultants

Ms. Hiroko Arataki and Mr. Noriyasu Nagai, Japan NUS Co. Ltd., Japan (Initial Author)
Mr. Zongwei Cai, Hong Kong Baptist University, Hong Kong SAR, China (Principal Author)

GLOBAL MONITORING PLAN

FOR PERSISTENT ORGANIC POLLUTANTS

UNDER THE STOCKHOLM CONVENTION ARTICLE 16 ON EFFECTIVENESS EVALUATION

FIRST REGIONAL MONITORING REPORT

ASIA-PACIFIC REGION

Members of Regional Organization Group
Mr. Minghui Zheng (China), Mr. Waisea Votadroka (Fiji), Mr. G.K. Pandey (India),
Mr. Yasuyuki Shibata (Japan), Ms. Hala Sultan Saif Al-Easa (Qatar), Mr. Fouad Elok (Syria)

Consultants
Ms. Hiroko Arataki and Mr. Noriyasu Nagai, Japan NUS Co. Ltd., Japan (Initial Author)
Mr. Zongwei Cai, Hong Kong Baptist University, Hong Kong SAR, China (Principal Author)

DECEMBER 2008

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

National Focal Point of each country in the Asia-Pacific region

ROG members of the region

- China: Mr. Minghui Zheng
- Fiji: Mr. Waisea Votadroka
- India: Mr. G. K. Pandey
- Japan: Mr. Yasuyuki Shibata
- Qatar: Ms. Hala Sultan Saif Al-Easa
- Syria: Mr. Fouad Elok

Initial report drafters

Ms. Hiroko Arataki, Japan NUS Co. Ltd., Japan

Mr. Noriyasu Nagai, Japan NUS Co. Ltd., Japan

Final report drafter

Mr. Zongwei Cai, Hong Kong Baptist University, Hong Kong SAR, China

PREFACE

Persistent organic pollutants (POPs) are a group of chemicals including those had/have been widely used in agricultural and industrial practices, and those unintentionally produced and released from many anthropogenic activities around the globe. POPs are characterized by persistence – the ability to resist degradation in various media such as air, water, sediments and organisms for months and even decades; *bio-accumulation* - the ability to accumulate in living tissues at levels higher than those in the surrounding environment; *harmfulnes*s – the toxicity to human and/or wildlife to give adverse effects to human health and the environment, and *potential for long range transport* – the potential to travel long distances from the source of release through various media such as air, water and migratory species. Specific health effects of POPs include cancer, allergies and hypersensitivity, damage to the central and peripheral nervous systems, reproductive disorders, and disruption of the immune system. Some POPs are also considered to be endocrine disrupters which can damage reproductive and immune systems of the exposed individuals as well as their offspring by altering the hormonal system. The ability of these toxic compounds to transport to remote areas of the globe, such as the Arctic, and to bioaccumulate through food webs has raised concerns for the health of humans and the environment, particularly for indigenous people that rely on traditional diets of marine mammals and fish. Because of the international scope of manufacture, use and unintentional releases, and the long distance movement, Stockholm Convention on Persistent Organic Pollutants was established in May 2001 to "*protect human health and the environment from persistent organic pollutants by reducing or eliminating releases to the environment*". The substances presently being addressed under the Convention are aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, PCB PCDD/PCDF and toxaphene. The Convention includes a procedure to add further substances to it.

The Convention calls for the reduction or elimination of releases of persistent organic pollutants, which should translate into reduced environment levels over time. Article 16 of the Stockholm Convention stipulates that the Conference of the Parties shall evaluate the effectiveness of the Convention four years after its date of entry into force. The effectiveness of the Convention shall be evaluated on the basis of available scientific, environmental, technical and economic information, including:

- Reports on monitoring of environmental levels
- National reports submitted pursuant to Article 15
- Non-compliance information provided pursuant to Article 17

An important component of effectiveness evaluation is the development of a global monitoring plan providing a harmonized organizational framework for the collection of comparable monitoring data or information on the presence of the persistent organic pollutants from all regions, in order to identify changes in levels over time, as well as to provide information on their regional and global environmental transport. The first report for the effectiveness evaluation will be presented at the fourth meeting of the Conference of the Parties in May 2009 and will serve as baseline for further evaluations.

The global monitoring plan is being implemented in all five United Nations Regions. This regional monitoring report aims to describe and discuss the baseline levels in the Asia-Pacific Region.

ABBREVIATIONS AND ACRONYMS

ACF	Active Carbon Fiber Felt
ALRT	Atmospheric Long Range Transport
AMAP	Arctic Monitoring and Assessment Programme
ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
BCF	Bioconcentration Factor
CRM	Certified Reference Material
CIS	Commonwealth of Independent States
COP	Conference of the Parties
CTD	Characteristic Travel Distance
CV	Coefficient of Variation
DDD	Dichlorodiphenyldichloroethane; Metabolites of DDT
DDE	Dichlorodiphenyldichloroethylene; Metabolites of DDT
DDT	Dichlorodiphenyltrichloroethane
dl-PCB	Dioxin-like PCB
EMEP	Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmission of Air Pollutants in Europe
EPER	European Pollutant Emission Register
EUSES	European Union System for the Evaluation of Substances
FAO	Food and Agriculture Organisation of the United Nations
GAPS	Global Atmospheric Passive Sampling Survey
GEF	Global Environment Facility
GEMS	Global Environment Monitoring System
GMP	Global Monitoring Plan
HCB	Hexachlorobenzene
HELCOM	Helsinki Commission/The Baltic Marine Environment Protection Commission
HCH	Hexachlorocyclohexanes
HPLC	High Performance Liquid Chromatography
HRGC	High Resolution Gas Chromatography (capillary column)
HRMS	High Resolution Mass Spectrometer
IADN	Integrated Atmospheric Deposition Network
IARC	International Agency for Research on Cancer
ICES	International Council for the Exploration of the Sea
IFCS	Intergovernmental Forum on Chemical Safety
IMO	International Maritime Organisation
INFOCAP	Information Exchange Network on Capacity Building for the Sound Management of Chemicals
IPPC	Integrated Pollution Prevention and Control
I-TEQ	International Toxicity Equivalence
K_{AW}	Air/Water Partition Coefficient
K_{OA}	Octanol/Air Partition Coefficient
K_{OW}	Octanol/Water Partition Coefficient
LOD	Limit of Detection
LOQ	Limit of Quantification
LRT	Long Range Transport
LRTAP	Long Range Transport Air Pollutants
LRTP	Long Range Transport Potential
MDL	Method Detection Limit

MRL	Maximum Residue Limit
MSCE-East	Meteorological Synthesizing Centre-East
Na-PCP	Sodium-pentachlorophenate
NARAPs	North American Regional Action Plans
ND	Not detected
NGO	Non-Governmental Organisation
NIS	Newly Independent States
NOAA	National Oceanic and Atmospheric Administration
OC	Organochlorines
OCP	Organochlorine Pesticides
OECD	Organisation for Economic Co-operation and Development
OSPAR	Commission for the Protection of the Marine Environment of the North-East Atlantic
PCB	Polychlorinated biphenyls
PCDD	Polychlorinated dibenzo-*p*-dioxins
PCDF	Polychlorinated dibenzofurans
PIC	Prior Informed Consent
POPs	Persistent Organic Pollutants (group of twelve as defined in the Stockholm Convention 2001)
PRTR	Pollutant Release and Transfer Register
PTS	Persistent Toxic Substances
PUF	Polyurethane Foam
PVC	Polyvinylchloride
QA/QC	Quality Assurance and Quality Control Regimes
RECETOX	Research Centre for Environmental Chemistry and Ecotoxicology
RENPAP	Regional Network on Pesticide Production in Asia and Pacific
ROG	Regional Organization Group for the Global Monitoring Plan
ROPME	Regional Organisation for the Protection of the Marine Environment
ROWA	Regional Organisation of West Asia
SAICM	Strategic Approach to International Chemicals Management
SOP	Standard Operating Procedure
SPM	Suspended particulate matter
SPREP	South Pacific Regional Environment Programme
t	Metric Tonnes
TCDD	Tetrachlorodibenzo-*p*-dioxin
TEF	Toxicity Equivalent Factor
TEQ	Toxicity Equivalents
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organisation
WHO	World Heath Organisation
WMO	World Meteorological Organization
XAD	Styrene/divinylbenzene-co-polymer Resin

GLOSSARY OF TERMS

Activity	Any programme or other activity or project that generates data or information on the levels of POPs in the environment or in humans that can contribute to the effectiveness evaluation under Article 16 of the Stockholm Convention
Core media	These are the environmental media identified by the Conference of the Parties to the Stockholm Convention at its second meeting as core for the first evaluation: ambient air; human milk and / or human blood.
CTD	The characteristic travel distance– defined as the “half-distance” for a substance present in a mobile phase
I L-1	Instrumentation level 1 capable to analyze PCDD/PCDF and dioxin-like PCB at ultra-trace concentrations: must be a high-resolution mass spectrometer in combination with a capillary column
I L-2	Instrumentation level capable to analyze all POPs: (capillary column and a mass-selective detector)
I L-3	Instrumentation level capable to analyze all POPs without PCDD/PCDF and dioxin like PCB (capillary column and an electron capture detector)
I L-4	Instrumentation level not capable to do congener-specific PCB analysis (no capillary column, no electron capture detector or mass selective detector)
Inter-	
comparisons	Participation in national and international intercalibration activities such as ring-tests, laboratory performance testing schemes, etc LOD Limit of detection. Definition: The lowest concentration at which a compound can be detected; it is defined as that corresponding to a signal three times the noise.
<LOD	Result below the limit of detection
<LOQ	Result below the limit of quantification.
MDL	Method detection limit. The MDL considers the whole method including sampling, sample treatment and instrumental analysis.

EXECUTIVE SUMMARY

Overview of the region

Asia-Pacific Region is located in tropical, sub-tropical temperate and sub-arctic climate area, with many countries under the strong influence of the monsoon climate. The region is characterized by huge agricultural and industrial activities to support large number of people, about 59% of the world population. Many countries in the Region have historically used POPs, *e.g.* DDT for vector control and PCB for industrial use. Some POPs substances are still used as a specific exemption in agricultures, fisheries and industries. In this Region, there are 62 countries/states, out of which 43 countries are either of ratification, acceptance, approval or accession to the Stockholm Convention on POPs. Most countries in the Region are developing countries or countries with their economies in transition.

Description of contributing programs

a. Type of information used

In the Asia-Pacific Region, several international and national POPs monitoring programmes on air and human milk are available. For the air, passive sampling was conducted in Fiji in collaboration with RECETOX. In POPs Monitoring Project in East Asian Countries which is initiated by Japan, sampling was operated in ten countries (Cambodia, Indonesia, Japan, Republic of Korea, Lao PDR, Malaysia, Mongolia, Philippines, Thailand and Vietnam). In China and Japan, some ambient POPs air monitoring programmes are performed. For human milk, China (including Hong Kong SAR of China), Fiji, Kiribati, Philippines and Tonga have been involved in 3rd or 4th round WHO human milk survey. China, India and Japan also have some national POPs monitoring programmes on human milk and/or blood.

It should be noted that only a few countries in the Region reported the POPs data. Some countries have been collecting POPs data for longer and more intensively than others, but most countries have not.

b. Criteria to select the information

The data was mainly collected over the period between 1998 and 2008. However, some earlier data related to the historical importance were presented and briefly described. The data was submitted through focal point of each Party and evaluated by the ROG members based on the information on analytical procedure, QA/QC protocol, etc. In addition to data on core media, the monitoring data on non-core media, such as water, soil and biota, were also collected as supplementary data and briefly discussed.

In the newly established monitoring programs, the methods for sampling and analysis of POPs in the air and human samples were conducted in principle in accordance with "Guidance on the Global Monitoring Plan for Persistent Organic Pollutants". However, for the data reported and published earlier, various methods for sampling and analysis of POPs have been applied. Most POPs analyses described in the report involved series of QA/QC programs. Due to the difference of analytical procedures, however, the criteria of QA/QC and data validation from various countries were quite different.

Main findings

This Regional report provides baseline information of POPs in ambient air and human milk from some part of the region. Comprehensive spatial and temporal data on POPs monitoring are only available in a small number of countries in the Region, *e.g.* Japan. Some countries are currently developing their programs on the monitoring and inventories, while others still lack of capacity for POPs monitoring. Because monitoring data do not exist in most countries to enable the assessment of long-range transport of POPs in the Region, substantial effort will be needed to fill the data and technical gaps in the Region.

Baseline levels of POPs in air

In the Pacific and East Asian subregions, there are some baseline data on ambient air for the first effectiveness evaluation. On the other hand, such data sets are lacking in South and West Asian subregions.

In China, eleven background sampling sites were selected and PM_{10} high volume sampling was carried out to analyze dioxins and other POPs. In Hong Kong SAR of China, monitoring of some POPs (dioxins and total PCBs) in ambient air has been conducted since mid-1997 as part of the regular toxic air pollutants monitoring programme.

Fiji has conducted a pilot study on the application of passive samplers for the determination of POPs in ambient air from June 2006 to May 2007 at three sampling sites in Fiji Islands through collaborations with RECETOX.

In India, there have been a few historical studies of POPs in air, which, however, are not conclusively reflective of POPs levels in ambient air.

Japan has been monitoring POPs in the air by high volume sampler throughout the nation since 1997 for dioxins, and since 2002 for other POPs. In addition, background air monitoring has been conducted every month by using high volume sampler at Hateruma Island since 2004.

In Oman, air samples were analyzed for DDT in 2005.

The POPs Monitoring Project in East Asian Countries has also monitored POPs (9 pesticides) in the air by high volume sampler in Cambodia, Indonesia, Republic of Korea, Lao PDR, Malaysia, Mongolia, Philippines, Thailand and Vietnam since 2005.

Generally, the reported levels of POPs in the air were on the averaged high side when compared with concentrations in other parts of the world. The reported data provide baseline information of POPs in some countries. However, some POPs were not-detected either because of the levels were really low or the detection limits of analytical method were not low enough, which may provide difficulty for future comparison. Also, some data were collected in particular period of the year as a snap shot, and more data will be necessary for the discussion of the long-range transport.

Baseline levels of POPs in human milk/blood

For many countries in the Region, there is generally even less information available on the levels of POPs in the human tissues than those of air.

In China, human milk survey has been performed in 2007-2008, covering twelve provinces and six metropolises. Hong Kong SAR of China, Fiji and Tonga participated in the 3rd round WHO human milk survey.

Fiji and Kiribati have monitored POPs in human milk within the framework of the 4th round WHO human milk survey.

Reports are available on the levels of pesticides residues in human blood samples from India in 2005. India also reported data of DDT and HCH in human milk samples from 1979 to 1986. In addition, India also has limited data on some POPs (*e.g.* Chlordane, DDT, HCB, PCB and dioxins) from human milk monitoring programs.

In Japan,The Ministry of the Environment reported the results of monitoring POPs in human milk and blood in 2004 and 2005. There is also human milk monitoring data for PCBs and some pesticides

since 1972, and for dioxins since 1973. The POPs monitoring on human blood for several sites in Japan were operated for several years between 1980 and 2005.

For human samples, the data are lacking over the region. More data are needed to provide baseline for future evaluation. Trend data in Japan, however, showed clear decline of dioxins, PCBs and other POPs levels in recent decades.

Levels of POPs in other media

Three countries (India, Japan and Syria) reported POPs levels in other media such as water, sediment and biota.

Long-range transport of POPs

The absence of sufficiently long-term regional monitoring programs on POPs did not allow the investigation and evaluation of long-range transport. However, some preliminary investigation were been conducted, including back trajectory analysis of air monitoring data in East Asian Monitoring Program and development of the long-range transport models.

Data gaps

While Japan has been continuously monitoring POPs throughout the nation with well-established programs and facilities, China has recently started the POPs inventory on ambient air and human milk. Facility for POPs monitoring and inventory is limited in most countries in the region, especially for dioxins analysis. In addition, the knowledge base and techniques of specialists in parts of the Region cannot meet the requirements of up-to-date administration. In some cases, there is also insufficient quality control and data validation.

Capacity building needs

The capacity building for POPs monitoring programs for most countries in the region remains to be top priority and recommendation. More qualified data on POPs concentration are needed in order to obtain the baseline of POPs levels in the region. In particularly, resources are required to improve analytical facilities and methods for the determination of POPs. This entails more trained personnel and the acquisition of appropriate analytical facilities and the funds to maintain and operate the instruments. A major effort associated with improving analytical capability for POPs needs to ensure good quality assurance and quality control among laboratories, which may include the regular use of reference standards and/or certified reference materials, regional training programs and inter-laboratory comparison exercises, and the identification of reference laboratories in the region for specific POPs.

Future programmes

There are some national programs such as those in China and Japan which will continue to provide POPs monitoring data for the future evaluation. East Asian POPs Monitoring Program will also continue. Many of the data in this report, however, were obtained from one time project. Further mechanism is needed to collect comparable data for the future evaluation.

Conclusions and recommendations

For ambient air, there are some baseline data on ambient air for the first effectiveness evaluation in the Pacific and East Asian subregions. On the other hand, such data sets are lacking in South and West Asian subregions. For human tissues, the data are lacking over the region. More data are needed to provide baseline for future evaluation.

For the future evaluation, establishment of regional/subregional long-term POPs monitoring program such as East Asian POPs Monitoring Program is needed.

The following were identified as capacity building/enhancement needs: human capacity, inter-calibration tests, strengthening skills for sampling and analysis infrastructure strengthening of existing laboratories for analyzing the core media, QA/QC, and financial assistance to establish long-term, self-sufficient laboratories.

In order to support the implementation of the Stockholm Convention in countries and to improve the scientific knowledge on how to accurately analyze POPs in relevant matrices (at least core media), POPs laboratories within the region have to implement modern and robust methods according to international scientific standard, adopt them to their circumstances and prove their capabilities with the successful participation in international intercomparison studies. Capacity building for POPs laboratories is considered one of priorities in this Region.

Countries were also encouraged to seek opportunities for sharing regional monitoring data and for developing multi-country approaches and joint programmes to secure international funding. Additionally, countries were encouraged to work with neighbouring countries to produce sub-regional data.

It is suggested that in order to fill gaps and cover needs, further financial and technical supports on POPs monitoring should be provided according to articles 12 and 13 of the Convention.

1. INTRODUCTION

At its third meeting in May 2007, the Conference of the Parties, by decision SC-3/19 on effectiveness evaluation, adopted the amended global monitoring plan for persistent organic pollutants (UNEP/POPS/COP.3/22/Rev.1, annex II) and adopted the amended implementation plan for the global monitoring plan (UNEP/POPS/COP.3/23/Rev.1). It also adopted the Guidance on the Global Monitoring Plan for Persistent organic Pollutants[1], which was prepared by the technical working group mandated by the Conference of the Parties in its decision SC-2/13. This guidance document provides the overall technical guidance for the implementation of the global monitoring plan in all United Nations Regions.

These decisions outlined a program to begin the evaluation of the effectiveness of the Convention with regional monitoring reports that use existing national and international programs, in combination with strategic capacity building in regions where major data gaps have been identified, to provide information on the concentrations of the priority POPs.

Decision SC-3/19 established a regional organization group, composed of six members for each of the five United Nations Regions to facilitate implementation of the global monitoring plan, and invited Parties to nominate members to those groups with expertise in monitoring and data evaluation The main objectives of the regional organization groups were to define and implement the regional strategy for information gathering, including capacity building and establishment of strategic partnerships in order to fill the identified data gaps, and to prepare the regional monitoring report as contribution to the first effectiveness evaluation report that will be presented to the Conference of the Parties at its fourth meeting in May 2009.

The regional monitoring report that summarizes the results of monitoring programs within their region to record baseline concentrations of POPs in the environment and human milk or blood, against which temporal trends can be established, is major output to be produced by the regional organization group. The role of the report is also to facilitate communication on contaminant issues between regions and assist in addressing gaps in the global program. The regional reports comprise an element of reporting to the Conference of the Parties and they provide an important link between the field sampling programs and the evaluation of the effectiveness of the Stockholm Convention.

The POPs listed in Annexes A, B, and C of the Stockholm Convention share a number of physical and chemical properties that result in concerns for human health and environment. Of particular importance is the toxicity of the compounds, and their ability to accumulate in the fat of humans and wildlife, as well as in soils and the sediments of lakes from where they may be re-emitted again. Their accumulation in fat makes them resistant to clearance from the human body, except in the formation of milk, and are subsequently passed on to a nursing child. Among their physical properties is their ability to transport over long distances through air, followed by condensation out of the air in the cold temperatures of the high latitudes and altitudes.

Determining the effectiveness of controls on POPs mandated by the Convention requires detailed information on the background environmental concentrations of priority POPs from programs that are statistically robust and can detect changes in contaminants over time. Hence, the global monitoring plan must be able to provide a harmonized organizational framework to collect comparable information between the regions to help determine changes over time, but also spatial trends of transport of chemical compounds.

A number of environmental media have been used to monitor environmental trends through time and the Parties have recognized the role that many of these could play in a global monitoring program. National programs reporting the concentration of priority chemicals in mussels, fish tissue, bird eggs and sediments have all been used to establish trends through time, but these programs are often regional in nature and may not be widely applicable across the globe. Each of these media has specific advantages and disadvantages for trend detection and difficulties in terms of sample collection, storage and analysis. For a number of reasons, the Conference of the Parties has chosen three core matrices - air, human milk and / or human blood- for global monitoring in that they provide information on the sources and transport of priority POPs and the levels of exposure in the human population. Data from regional programs using other media can be used to complement the data from the core matrices in helping to establish trends using a weight of evidence approach. The first monitoring report, using data collected over the period 1998-2008, provides a critical baseline upon which concentrations in the core matrices will be studied over the long-term.

2. DESCRIPTION OF THE REGION

2.1 Overall composition of the region

2.1.1 General features

Asia-Pacific Region is one of the five United Nation regions (Figure 2.1–1). The region is constituted by the countries listed below (reference). As sub-regional arrangements, Table 2.1-1 shows the sub-region and the countries contained.

Table 2.1-1 Countries in the Asia-Pacific Region

Afghanistan	Kuwait	Pitcairn Islands
Bahrain	Kyrgyzstan	Qatar
Bangladesh	Lao People's Republic	Samoa
Bhutan	Lebanon	Saudi Arabia
Brunei Darussalam	Malaysia	Singapore
Cambodia	Maldives	Solomon Islands
China	Marshall Islands	Sri Lanka
Cook Islands	Micronesia (Federal States of)	Syrian Arab Republic
Fiji	Mongolia	Tajikistan
French Polynesia	Myanmar	Thailand
Guam	N. Mariana Islands	Tokelau
India	Nauru	Tonga
Indonesia	Nepal	Turkmenistan
Iran (Islamic Republic of)	New Caledonia	Tuvalu
Iraq	Niue	United Arab Emirates
Japan	Oman	Uzbekistan
Jordan	Pakistan	Vanuatu
Kazakhstan	Palau (Republic of)	Viet Nam
Kiribati	Palestine	Wallis and Futuna
Korea (DPRK)	Papua New Guinea	Yemen
Korea (Republic of)	Philippines	

Note: Underline shows countries are of either ratification, acceptance, approval or accession to the Convention, but signature or succession to signature only.

The feature of Asia-Pacific Region is as described below.

■ The region is located between 55 deg N to 30 deg S, and 35 deg E to 155 deg W.

■ The region covers 23% of the world land area[2], and is inhabited by 59 % (approx. 3,929 million[3]) of the world population. The region includes the two "billion" countries, China and India, either of which alone has the population size of other regions.

■ The region makes up about 39% of world total GDP (PPP).

■ In Asia-Pacific Region, there are 62 countries/states, out of which 41 has either ratified, accepted, approved or accessed to the Convention.

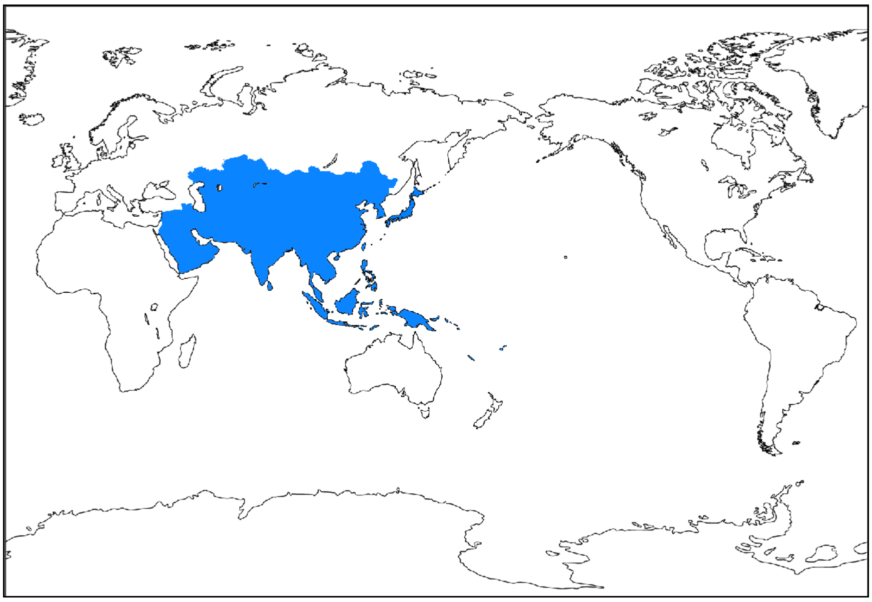


Figure 2.1–1 Map showing the Asia-Pacific Region[4]

2.1.2 Natural environment

(1) Climate of the region

■ Air circulation in the region is governed by Hadley cell (equatorial to 30 degrees north or south), or Ferrel cell (30 to 60 degrees in both hemisphere).

■ Near the equator, the wind is easterlies (Trade wind), converging to the equator where ascending air gives much rain to support tropical rain forest (Intertropical Convergence Zone; ITCZ).

■ Around 30 deg N and S, there are dry downward flow, making arid in the area (Figure 2.1–2).

■ Areas higher than 30 deg is controlled by Ferrel cell with strong westerly wind at around 30 to 40 degrees especially in winter season.

This general pattern is modulated by the geographical characteristics of the region, especially by the presence of Tibetan Plateau and Western Pacific Warm Pool (WPWP), which cause "Monsoon" climatic pattern in Southern and South Eastern Asia, and huge precipitation in South Eastern Asia.

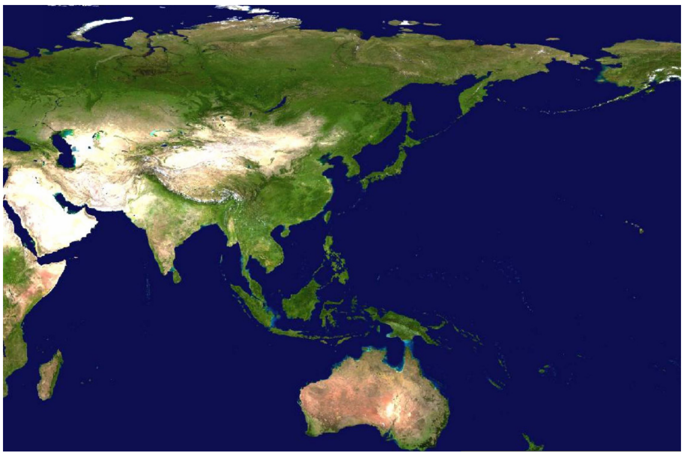
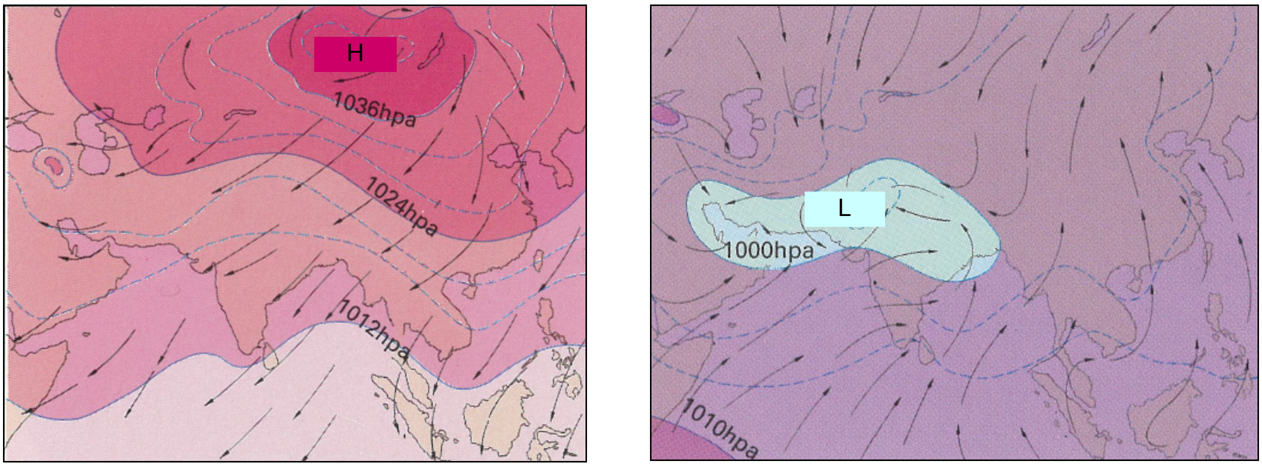


Figure 2.1–2 Satellite map of Asia-Pacific Region[4]

(a) Seasonal change of the wind direction

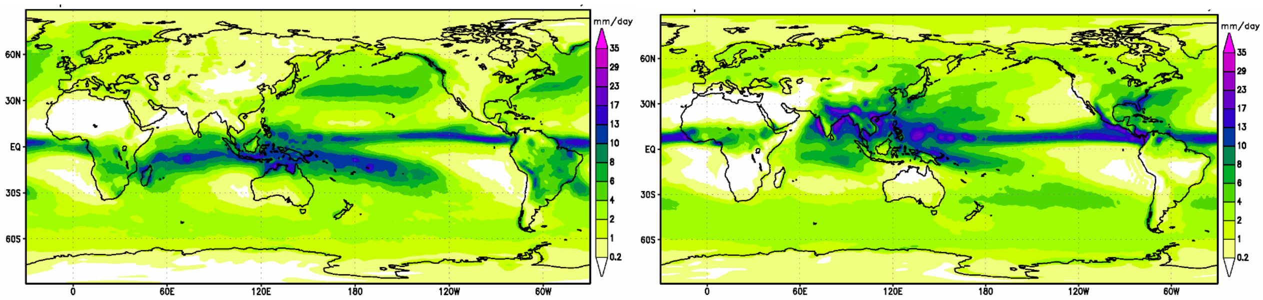


(A) Wind from high pressure in north Asia causes northeast monsoon in the winter

(B) Wind to low pressure caused by heating of the air above land occurs southeast monsoon in the summer

Figure 2.1–3 Summer and winter monsoon circulation.

(b) Seasonal change of the regional precipitation caused by monsoon



(A) January

(B) July

Figure 2.1–4 World precipitation of the summer and winter[5]

2.1.3 POPs related activities including agriculture and Industry

<u>Primary Industry (Agriculture, Forestry, Fishery)</u>: agricultural production and POPs pesticide use
<u>Secondary Industry (mining and manufacturing)</u>: use of PCB
<u>Daily life</u>: control of malaria and termite, and POPs use; incineration of waste and dioxins

- POPs are still used as special exemption of the Stockholm Convention, such as pesticide for agricultural production, and termite control for wooden house.
- Asia-Pacific Region has many POPs related problems, such as hazardous/municipal solid waste disposal, sustainable agricultural production, water/air pollution, recycling and e-waste, etc.
- Some of the countries in the region lacks suitable legislative framework, and infrastructure for the sound management of the chemicals.
- Some of the countries do not allow the use of POPs. For example, all POPs pesticides are banned in Syria and Qatar.

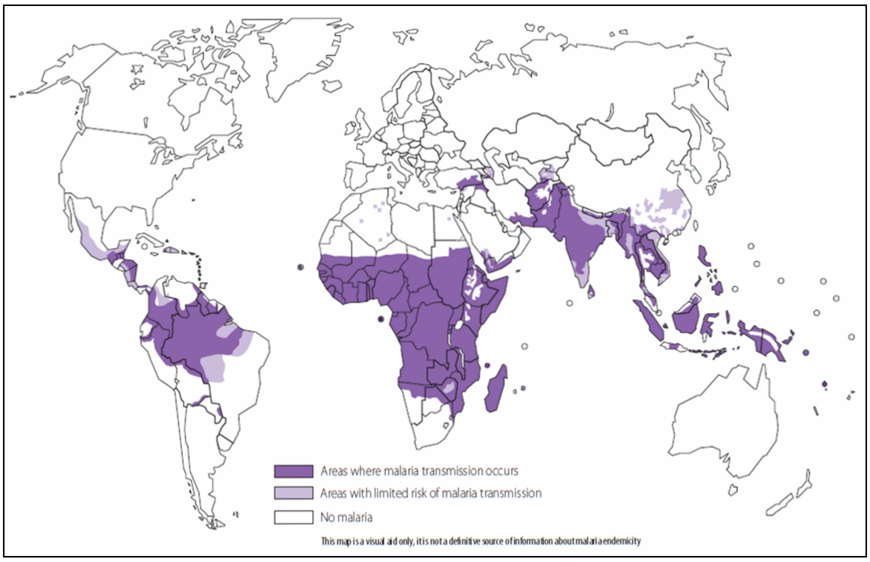


Figure 2.1–5 Distribution of malaria risk areas in the world[6]

2.2 Historical and current sources

For each of the 12 POPs, information on regulation and purpose of use, production and importation for the countries in this region was organized based on the NIP, Regionally Based Assessment of Persistent Toxic Substances (published by UNEP, 2002), FAO production yearbook, etc.

2.2.1 Exemption of the Convention

Parties of the Convention reported their specific exemption to the Convention. Following information is based on the registered information on special exemption from the Stockholm Convention according to its website[7].

Table 2.2–1 Register of specific exemptions for the Stockholm Convention in the countries within Asia-Pacific region.

Chemical	Activity	Specific exemption	Party/ Expiry date	Estimated quantity of production/use	Purpose(s) of production/use	Reason(s) for exemption	Remarks[1]
Chlordane CAS No: 57-74-9	Production	As allowed for Parties listed in the Register	China/ May 2009	The annual output of chlordane oil is about 500 tons.	For termiticide use		There are nine enterprises having the capability to produce chlordane, among which six enterprises produce it at present.
	Use	Termiticide	China/ May 2009	The annual consumption of chlordane oil is in the range of 400-500 tons.	95% of chlordane is used in structures of houses, 4% of chlordane is used in dams, and the rest 1% of chlordane is used in underground cable boxes to control termites.		
DDT[2] CAS No: 50-29-3	Production	Intermediate in production of dicofol	China/ May 2009	About 73% of DDT is used as the intermediate in the production of dicofol. There are 3-5 enterprises having the capability to produce dicofol.	DDT is used as the intermediate in the production of dicofol, an organochlorine is used as miticide for a wide variety of fruits, vegetables, and crops.	DDT used as the intermediate in the production of dicofol is in non- closed- systems and needs to be applied for the specific exemption.	
			India/ April 2011	150,000 kg of DDT	Manufacture of Dicofol	Dicofol is a cost effective and most useful acaricide in tropical and sub tropical agriculture in India .dicofol does not posses any characteristic of parent POP	Only one public sector unit manufactures Dicofol.
	Use	Intermediate	India/ April 2011	150,000 kg of DDT	Manufacture of Dicofol	Dicofol is a cost effective and most useful acaricide in tropical and sub tropical agriculture in India .dicofol does not posses any characteristic of parent POP	
Mirex CAS No: 2385-85-5	Production	As allowed for the Parties listed in the Register	China/ May 2009	The annual output of Mirex powder is in the range of 10-30 tons.			
	Use	Termiticide	China/ May 2009	The annual consumption of mirex powder is in the range of 10-30 tons.	Mirex is used to control termites in structures of houses, dams and underground cable boxes.		

[1] The remarks column may be used to specify further limitations on the scope of the specific exemptions to be applied by the Party (*e.g.,* area, timing and techniques of applications as well as target organisms in the case of pesticides); expected emissions from production; whether intermediates are to be further processed on- or off-site; degree of purity of the chemical with type of impurities; and the number of extensions to the specific exemption that have been granted to a particular party.

[2] Production and use of DDT for the acceptable purpose of disease vector control in accordance with part II of Annex B are registered in a separate DDT register.

Table 2.2–2 Provisional DDT register pursuant to paragraph 1 of Part II of Annex B of the Stockholm Convention

Party	Production notification (x = received)	Use notification (x = received)	Date of notification	Comments
China, People's Republic of	X	X	2 February 2005	
India	X	X	27 October 2006	Malaria (Anopheles culicifacies ,An fluviatilis, An. Minimus, An. Dirus) Kala-azar (Sandfly) M/s Hindustan Insecticide Limited (HIL) is the sole manufacturer of DDT in the country.
Marshall Islands		X	22 May 2004	Acceptable purpose: Disease vector control in accordance with Part II of Annex B (Malaria / Other related illnesses)
Myanmar		X	8 August 2006	Malaria vector targeted - Anopheles mosquito

Table 2.2–3 Listing notifications of articles in use pursuant to Note (ii) of Annex A and Note (ii) of Annex B of the Stockholm Convention

Party	Chemical	Article in use	Date of notification
Japan	Chlordane	termiticide in structures of houses where Chlordane occurs as a constituent	30th August 2002
	Heptachlor	termiticide in structures of houses where Heptachlor occurs as a constituent	30th August 2002

2.2.2 Agricultural use and regulations

The information on agricultural use and regulations on POP substances from PTS reports[8], NIPs[9], Proceedings of the Workshop on Environmental Monitoring of Persistent Organic Pollutants (POPs) in East Asian Countries[10] and information submitted from countries in the region are shown below (also see Annex A.1).

(1) Aldrin

In Indonesia and Mongolia, Aldrin was not historically used for agricultural and pest control purpose, and China used Aldrin only for experimental purpose. Currently, most of the countries in Asia-Pacific Region (*e.g.* Cambodia, China, Japan, Jordan, Lebanon, Mongolia, Nepal, Philippines, Qatar, Singapore, Thailand and Vietnam) have banned Aldrin for agricultural and pest control uses.

(2) Chlordane

In Mongolia, Chlordane was not historically used for agricultural and pest control purpose. China registered Chlordane to the Convention for termicide use as a specific exemption, and Chlordane can only be used and/or produced until May 2009. Japan has already banned the use of Chlordane, but Japan registered that Chlordane can be found as termiticide in structures of houses.

Recently, most of the countries in this region (*e.g.* Cambodia, Japan, Jordan, Lebanon, Mongolia, Nepal, Philippines, Qatar, Singapore, Thailand and Vietnam) have banned the use of Chlordane for pest control and agricultural purpose.

(3) DDT

China, India, Marshal Islands, and Myanmar are still using DDT for vector control as an acceptable purpose to the Convention. China and India also registered DDT for the production of dicofol as a specific exemption. Currently, most of the countries in this region (*e.g.* Bahrain, Bhutan, Cambodia, Japan, Jordan, Kuwait, Lebanon, Mongolia, Nepal, Oman, Pakistan, Qatar, Saudi Arabia, Singapore, Sri Lanka, Thailand, UAE and Vietnam) have banned DDT for agricultural and pest control uses.

(4) Dieldrin

In Mongolia and Uzbekistan, Dieldrin was not historically used for agricultural and pest control purpose, and China used Dieldrin only for experimental purpose. Currently, most of the countries in this region (*e.g.* Bahrain, Cambodia, Iraq, Japan, Jordan, Kuwait, Lebanon, Mongolia, Nepal, Oman, Pakistan, Philippines, Qatar, Saudi Arabia, Singapore, Sri Lanka, Thailand, UAE and Vietnam) have banned Dieldrin for agricultural and pest control uses.

(5) Endrin

In China (excluding Taiwan), Indonesia, Mongolia, Kazakhstan and Kyrgyzstan, Endrin was not historically used for agricultural and pest control purpose. Currently, most of the countries in this region (*e.g.* Cambodia, Japan, Jordan, Lebanon, Mongolia, Nepal, Philippines, Qatar, Singapore, Thailand, and Vietnam) have banned Endrin for agricultural and pest control uses.

(6) Heptachlor

In China (excluding Taiwan), Indonesia, and Mongolia, Heptachlor was not historically used for agricultural and pest control purpose. Even though Japan has already banned the use of Heptachlor, Japan registered that Heptachlor can be found in structures of the houses, because Heptachlor is a component of technical chlordane which had been used as a termiticide.

Currently, most of the countries in this region (*e.g.* Cambodia, Japan, Jordan, Lebanon, Nepal, Philippines, Qatar, Singapore, Thailand and Vietnam) have banned Heptachlor for agricultural and pest control uses.

(7) HCB

In Indonesia, Malaysia, Mongolia, Philippines, Thailand, and Uzbekistan, HCB was not historically used for agricultural and pest control purpose. Currently, most of the countries in this region (*e.g.* Cambodia, China, Japan, Lebanon, Singapore, and Vietnam) have banned the use of HCB for agricultural and pest control uses.

(8) Mirex

In India, Iran, Japan, Kazakhstan, Kyrgyzstan, Mongolia, Nepal, Philippines, Sri Lanka, Tajikistan, Thailand, and Uzbekistan, Mirex was not historically used for agricultural and pest control purpose. China registered Mirex for termicide use as a specific exemption, and Mirex can be used and/or produced until May 2009.

Currently, most of the countries in this region (*e.g.* Bahrain, Bangladesh, Cambodia, Japan, Kazakhstan, Kyrgyzstan, Kuwait, Lebanon, Nepal, Oman, Pakistan, Qatar, Saudi Arabia, Singapore, Taiwan (China), Thailand, UAE and Vietnam) have banned the use of Mirex for agricultural and pest control uses.

(9) Toxaphene

In Japan, Sri Lanka, and Uzbekistan, Toxaphene was not historically used for agricultural and pest control purpose. Currently, most of the countries in this region (*e.g.* Cambodia, China, Japan, Mongolia, Lebanon, Nepal, Philippines, Qatar, Singapore and Vietnam) have banned the use of Toxaphene for agricultural and pest control uses.

2.2.3 Industrial use and regulations

The information on industrial use and regulations from PTS reports[8] and NIPs[9] in each POPs are shown below (also see Annex A.2).

(1) DDT

In China and India, DDT is used and/or produced as intermediate for the Dicofol production. The expiry date for this specific exemption is May 2009 for China and April 2011 for India.

(2) HCB

In China, HCB is used as intermediate for the production of Na-PCP. On the other hand, Japan, Singapore, and Vietnam have banned HCB for the industrial use.

(3) PCB

In Indonesia, there is no regulation on PCB. China has regulation on PCB pollution control, but the treatment of PCB containing electrical equipment is still not implemented. In Jordan, there is no regulation on handling, disposal and banning of PCB, but recent regulation banned importing and using oils containing PCB more than 0.005% of PCB by weight.

Lebanon banned the entry of PCB products into the country and banned PCB for industrial use. In Philippines, Chemical Control Order provides guidelines for the phase out of the use, sale, and importation of PCB electrical equipment. Under the same Order, responsibilities and liabilities for the improper management and handling of PCB and its wastes has been established.

In Tajikistan, there is no system for regulation of their use, utilization and destruction for PCB. On the other hand, Singapore and Thailand banned the use of PCB for industrial uses.

Japan has banned PCB for use, production and importation since 1974. For PCB stockpiles which were stored until now, efforts have been made to properly dispose PCB wastes in accordance with the PCB Special Measures Law, enacted in 2001. Such efforts must be reinforced in the future.

Qatar banned the entry of PCB products into the country and banned PCB for industrial use. It also started replacing PCB containing electrical generators.

2.2.4 FAO statistic information on consumption of POPs pesticides

There are statistical data on consumption of Aldrin, Chlordane, DDT, Dieldrin and Toxaphene from FAO. The quantity data on active ingredient for each pesticide since 1964 is shown in Annex A.3. This information is considered to be reported from each country, and there are some years with the lack of data. In addition, some data are found to have an order of magnitude more than those of close years. Thus, it is difficult to state that these data reflect the facts of the exact consumption of POPs pesticide. Nevertheless, the data are important for estimating the level of consumption from 1960's to 1980's.

2.2.5 Information on the emission inventories

Information on the inventory of the following POPs formed and released unintentionally from anthropogenic sources is listed below (also see Annex B.1 – B.3).

(1) PCDD, PCDF, and *dl*-PCB

In Japan, the Law Concerning Special Measures against Dioxins was promulgated in 1999 and reduction target of the national release of dioxins (PCDD, PCDF and *dl*-PCB) was to reduce by approximately 90% since 1997. According to the data publicized in September 2004, the estimated dioxins emission in FY 2003 was reduced by 95% since FY 1997.

The new target revised in 2005 required that dioxin emission shall be reduced by 15% since FY 2003. The estimated emission in FY 2006 decreased by 20% since FY 2003, and is showing a steady reduction of the dioxins (see Annex B.1).

(2) HCB

Ministry of the Environment, Japan organized the emission inventory of HCB for 2002 and 2006. Emission from waste incinerators decreased from 2002 to 2006 (see Annex B.2).

(3) PCB

Ministry of the Environment, Japan organized the emission inventory of PCB for 2002 and 2006. Emission from secondary zinc production and cement kilns increased from 2002 to 2006 (see Annex B.3).

3. ORGANIZATION OF REGIONAL IMPLEMENTATION

3.1 Preparatory workshops

To facilitate Regional Monitoring Report for Asia-Pacific Region, the three workshops and one tele-conference was held for this region (Table3.1-1). At each workshop, ROG members discussed structure of the report, selection of data, capacity building, etc.

Work plans and time tables to finalize the regional monitoring report are summarized in Table 3.1-2.

Table 3.1–1 Preparatory workshops for regional monitoring report in Asia-Pacific region

	The Asia-Pacific Regional Organization Group Inception Workshop	**Telephone Conference**	**Workshop to facilitate of the regional monitoring reports under the global monitoring plan for persistent organic pollutants**	**Asia-Pacific ROG Members Workshop to Finalize the Regional Report for the Global Monitoring Plan for POPs**
Date	September 17th – 19th 2007	March 26th 2008	May 19th – 23rd 2008	June 24th – 25th 2008
Location	Beijing, China	Various	Geneva, Switzerland	Doha, Qatar
Objective	The first meeting of ROG in the Asia-Pacific Region for the communication on the international cooperation for the first effectiveness evaluation, consultation for the preparation of the RMR	To discuss consultants for report drafting and to nominate the drafting team	To provide a forum for participants to draft the regional monitoring reports that will be integrated to the global monitoring report for submission to COP4.	To review on the data and decide the data to be included in the regional report; to discuss and finalize on the detail structure of the report; to discuss the mechanism for further review and revision of the report
Items dealt	Existing monitoring and data gap in each country, assistance and cooperation for the capacity building, communication on the implementation system of future work and schedule.	Report of recent status in each sub-regions, Nomination of a drafting team.	Progress information by international monitoring programmes/concerning, Discussion on issues of concern.	Data of not-core media Data before 1998 Data of long- distance transport QA/QC data Country/sub-regional countries report
Remarks	The regional organization group members held a meeting on Thursday 20 September 2007 in Beijing to establish the final Asia-Pacific strategy to develop the regional monitoring plan.	Initial outline of regional report will be prepared by Japanese consultant. Mr. Zheng and Mr. Votadroka will prepare TOR for the two consultants according to the MOU supporting the ROG activities and organize expedited appointment of the consultants. The ROG members from India, Syria, and Qatar will submit all available information they collected and compiled to Mr. Zheng. Ms. Hala Al-Easa will investigate possibility of holding the regional drafting workshop in June 2008 in Qatar.	Decisions made on data of not-core media; long range transport, etc. Decisions made on various timelines. Discussions on regional report template and Executive Summary. Discussions on various concerns.	Data before 1998 will not be included in the report. However, some data related to the historical importance may be presented and briefly described. Data of not-core media will be briefly discussed in text and may be included in Annex. Data of long-distance transport will be briefly discussed in text. Country/sub-regional countries report will be included in annexure of the regional report LOD or LOQ for “not-detected” data, the data source and QA/QC will be provided

Table 3.1-2 Work plans and time tables to finalize the regional monitoring report

Work plan	Time table
Submission of sub-regional reports	July 7, 2008
ROG members will send their comments and suggestions on data gap and strategy for filling gaps, capacity-building needs, POPs monitoring strategy for further evaluation, etc to drafting team.	Before July 15, 2008
Submission of the first draft regional report to all ROG members	One week before the end of July 2008
ROG members provide feedbacks on major or critical points to drafting team	Before the end of July 2008
ROG members send the first draft regional report to all countries in the region. Efforts should be made to inform each country that report has been sent to them, *e.g.*, through the Focal Point of each country and sending reminder email, etc.	August 1, 2008
ROG members receive comments from all countries on the 1st draft of the regional report. If there was no response by this date, ROG members will consider that it is agreeable/acceptable.	end of August 2008
ROG meeting to discuss the modifications on the 1st draft regional report and to finalize the report	September 2008
Submission of revised draft of the regional monitoring report to the Secretariat	October 15, 2008

3.2 Establishment and responsibilities of the regional organization group

As the result of discussion at the ROG Workshop described in 3.1, six regional organization group members took responsibility for the countries within their sub-region for collecting data and preparing the first regional monitoring report.

Table 3.2–1 Sub-regional framework of responsibilities in ROG members

ROG member	Selected member of contries within the sub-region		
Syria	● Iraq ● Jordan	● Lebanon ● Palestine	● Yemen
Qatar	● Bahrain ● Kuwait	● Oman ● Saudi Arabia	● United Arab Emirates
India	● Afghanistan ● Bangladesh ● Bhutan	● Iran ● Maldives ● Nepal	● Pakistan ● Sri Lanka
China	● Korea (DPRK) ● Lao People’s Republic ● Mongolia	● Vietnam ● Kazakhstan ● Kyrgyzstan	● Tajikistan ● Turkmenistan ● Uzbekistan
Japan	● Brunei Darussalam ● Cambodia ● Indonesia	● Korea (Republic of) ● Malaysia ● Myanmar	● Philippines ● Singapore ● Thailand
Fiji	● Samoa ● Cook Islands ● French Polynesia ● Guam ● Kiribati ● Micronesia (Federal States of) ● Marshall Islands	● Nauru ● New Caledonia ● Niue ● N. Mariana Islands ● Palau (Republic of) ● Papua New Guinea ● Pitcairn Islands	● Samoa ● Solomon Islands ● Tokelau ● Tonga ● Tuvalu ● Vanuatu ● Wallis and Futuna

Table 3.2-1 ROG members for sub-regions

Country	Member
China	Mr. Minghui Zheng
Fiji	Mr. Waisea Votadroka
India	Mr. G. K. Pandey
Japan	Mr. Yasuyuki Shibata
Qatar	Ms. Hala Sultan Saif Al-Easa
Syria	Mr. Fouad Elok

3.3 Agreement on a basic framework to provide comparable information

The ROG members have agreed that data submitted in the regional report should include information regarding QA/QC, such as LOD, blank testing, recovery, accuracy and precision, etc. Information of sampling (location, method, procedure) and analytical method should be provided. Moreover, the source of data should be provided.

3.4 Regionally developed and executed implementation plans

The existing sub-regional initiative of POPs Monitoring Project in East Asian Countries, conducted by Ministry of the Environment of Japan, comprises of two parts: (1) organizing workshops to discuss and guide the Project; and (2) providing technical assistance for background field monitoring of POPs in air (*e.g.* sampling, high resolution GC/MS analysis, data validation, QA/QC). For the project of Background Air Monitoring of POPs in East Asian Countries from 2004-2007, eight countries (Cambodia, Indonesia, Japan, Republic of Korea, Mongolia, Philippines, Thailand and Vietnam) have reported the result of the monitoring.

At the ROG Workshop in Beijing, regional capacity limitation and capacity building were discussed. Countries in the region were encouraged to seek opportunities for sharing regional data and for developing multi-country approaches and joint programmes to secure international funding. The representative of China noted the need for external assistance for developing countries, including in quality assurance and quality control. To obtain that external assistance which then could be used to assist countries in the region, China had prepared a draft project proposal for submission to the Global Environment Facility for a medium sized project with a duration of 14 months and with UNEP acting as the implementing agency. Countries of the region were requested to express their interest in joining in the project proposal and to indicate possible in-kind contributions. Cambodia, Lao (Peoples Republic), Mongolia and Vietnam expressed their interest to join the proposal. The representative from Fiji informed that a similar proposal had been prepared for the Pacific Islands and would be submitted to GEF for consideration with UNEP acting as implementing agency and the Pacific Regional Environment Programme (SPREP) as executing agency.

It was also decided that strategic partnerships with international programmes would be established for capacity enhancement and production of supplementary monitoring data in order to fill data gaps, especially in developing countries. Examples for the conceivable strategic partnerships are shown in Table 3.4-1.

Table 3.4–1 Conceivable Strategic Partnerships in this Region

Strategic partnerships with international programmes	● Japan to SEA; ● China-Mongolia; ● Pacific (Fiji)-RECETOX; ● Pacific - ENTOX lab - AUSTAID; ● Qatar-GAPS; ● India –SA; ● Korea to SA; ● Fiji - Orebro University, Sweden; ● UNIDO-RENPAP
Strategic country-to-country partnership	● Japan-Korea Dioxin analytical method harmonization; ● Japan – Pacific (Fiji) –Supply of High Volume Sampler and analysis of samples;
Through multi-country approaches	● Regional approach for analyzing dioxins/furans and other POPs (rather buy analysis as establish a lab everywhere); ● Share data regionally which have been created in other countries in the region; ● Develop joined projects to seek funds
Others	● Through seeking international funding, if necessary ● National activities/linkages with the National Implementation Plans to leverage resources ● Experts coming to laboratories which need capacity strengthening; ● In-lab training for dioxin analysis

3.5 Information gathering strategy

ROG agreed that information gathering would be carried out on the basis of the format used at information warehouse in Republic of Korea (Fig. 3.5-1), but the detail of information collecting procedure has not been discussed. The screening of the existing data for the Regional Monitoring Report was agreed as described below.

1. Evaluation by the regional organization group of specific data elements and study reports from newly identified regional programmes (as included in the amended list) in accordance with the criteria set out in the Global Monitoring Plan.
2. By the focal point of each country in Asia-Pacific Region, the raw (or aggregated) data would be sent to ROG member. The information related to the data, such as Meta data and QA/QC, should be sent to the ROG member.
3. ROG members will send available data submitted in their sub-region to the monitoring report drafter. The data and information will be provided in accordance to the template provided by UNEP, taking into consideration core information is formatted, and any other material should be in the prescribed format to be annexed.
4. Supplementary monitoring activities/additional information should be submitted as soon as they are available.

An example of the data collection sheet was proposed at Geneva Workshop (see Appendix 1).

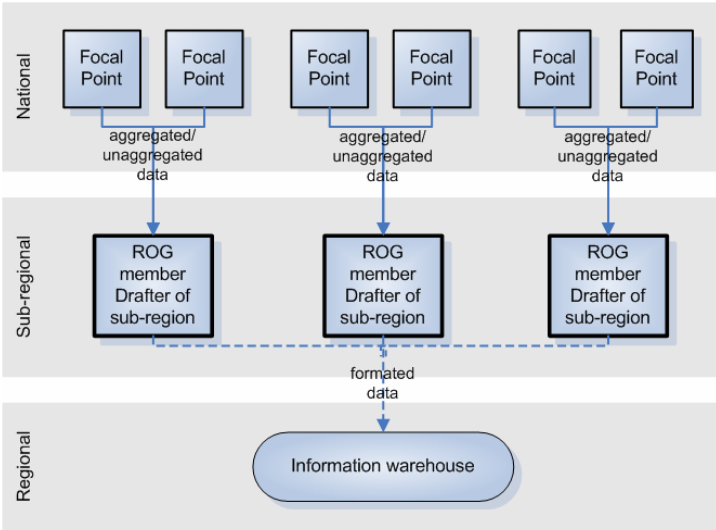


Figure 3.5–1 Conceptual image of information gathering

There is also a way to get information by analysing samples stored in the sample bank to obtain the concentrations of POPs in the past. The sample banking programmes in Japan are shown in Table 3.5-1. In Republic of Korea and China, the sample banking system is now under development.

Table 3.5–1 Sample banking in Japan

States	Programmes	Organization	Media	Storage
Japan	Time Capsule Program for Environmental Specimens	National Institute for Environmental Studies	Bivalves, Fish, Others (atmospheric, human milk, marine reptile)	Liquid nitrogen vapor (-150°C)
	Environmental Specimen Bank for Global Monitoring (ES-bank)	Ehime University, Center for Marine Environmental Studies	Wildlife species & organs, Atmospheric, aquatic, Sediment and Soil *etc*.	Liquid nitrogen vapor (-150°C)

3.6 Strategy for using information from existing programmes

General outlines of existing international and national POPs monitoring programmes are shown in Appendix 2. Information used for the Regional Monitoring Report is basically summarized from data obtained from the existing programmes. ROG members agreed to include country/sub-regional countries report in the annexure of the regional report.

3.7 Preparation of the monitoring reports

The ROG agreed to discuss and submit data and the sub-regional reports. The drafting team will work and complete the first draft of the regional report accordingly. The first draft regional report will be sent to all countries in the region. ROG members should receive comments from sub-regional countries on the first draft of the regional report. Discussions among the ROG members and drafting team will be conducted for the modifications on the first draft regional report and to finalize the report.

4. METHODS FOR SAMPLING, ANALYSIS AND DATA HANDLING

Various methods for sampling and analysis for POPs testing have been applied in countries of Asia-Pacific region (Table 4-1, Table 4-2). However, in the recent background testing, the sampling, analysis and data handling were conducted in principle in accordance with "Guidance on the Global Monitoring Plan for Persistent Organic Pollutants[1]."

Table 4–1 Sampling, Analytical Method and QA/QC for monitoring programmes (core media)

Country	Activities/programmes	Media	Sampling	Analytical procedures	QA/QC
China	POPs background survey	Air	• Quartz fiber filter and PUF • High volume sampler for collecting only those particles smaller than 10 micrometers diameter: 250ml/min, 3 days, total 900m^3 • High volume sampler: 700L/min, 24hr, total 1000m^3 (for Hong Kong SAR, China)	For PCDD/PCDF; *dl*-PCB, indicator PCB, HCB, Mirex, DDT • ASE with hexane/DCM • Clean-up: acid-modified silica gel and multiple silica columns, alumina columns and carbon columns • GC-HRMS For other POPs: • ASE with hexane and CH_2Cl_2 • Clean-up: Florisil column • GC-LRMS	• Recovery test • Blank test • Spiked samples • Duplicate • Travel blank test Participation in proficiency testing
	POPs background survey	Human milk	• **"Guidelines for Developing a National Protocol"** of 4th WHO survey of human milk • 3 to 8 weeks after delivery • >50 ml milk in total by hand in 3 consecutive days. • Stored in freezer at -20 °C	For PCDD/PCDF; *dl*-PCB, marker PCB • Soxhlet with hexane/DCM • Clean-up: acid silica gel columns and basic alumina for marker PCB • Clean-up: acid-modified silica gel and multiple silica columns, alumina columns and carbon columns for dioxins and dl-PCB • GC-HRMS For other POPs: • Soxhlet with hexane/DCM • Clean-up: GPC • GC-LRMS	• Recovery test • Blank test • Spiked samples • Duplicate • Travel blank test Participation in proficiency testing
Fiji	Fiji Pilot Study on Application of Passive Air Samplers for the Determination of POPs concentrations in ambient air [11]	Air	• Passive air sampling with using polyurethane foam (PUF) • Exposure time: 12 weeks (estimated 3.5 m^3/day; total 300 m^3)	For PCB: • Dichloromethane extraction • GC-ECD after with PCB 30 and 185 for surrogate recovery standard. For DDT: • Dichloromethane extraction • GC-ECD	• Recovery test • Travel Blank test • Laboratory Blank test

Country	Activities/programmes	Media	Sampling	Analytical procedures	QA/QC
Japan	Chemicals In the Environment [12]	Air	• Quartz fiber filter and PUF • High Volume sampler: 700 L/min, 24 hr, total 1,000 m^3 • Middle Volume sampler: 100 L/min, 7 days, total 1,000 m^3 • Low Volume sampler: 3 L/min, 24 hr, total 4 m^3	For Toxaphene: • Cleanup in a Florisil column • GC/NCI-HRMS-SIM For other POPs: • Cleanup in a Florisil column • GC/HRMS-SIM or GC/NCI-HRMS-SIM with the addition of ^{13}C-labeled substances as surrogate standard substances	• Recovery test • Blank test • Calibration curve and their linearity check • Duplicate measurement • Travel blank test
		Human milk	• Collected in Kanto-Koshinetsu region and Tohoku region	•	•
		Blood	• Collected in Tohoku region	•	•
	Survey on accumulation and exposure of Dioxins [13]	Blood	• Collected all over the country • Fasting state • 25 mL/donor • Man/woman with age of 15 and 70	• Addition of ^{13}C-labeled substances as surrogate standard substances • Liquid-liquid extraction with saturated ammonium sulfate and ethanol/hexane • Clean-up with multiple silica column and carbon column • GC-MS	•
	Osaka Prefecture [14,15]	Human milk	• Collected from primiparous breast-feeding women	Organochlorine Pesticide: • Cleanup in a Florisil column • GC/MS PCBs: • Cleanup in a Florisil column • GC-ECD	•
	Other studies [16,17]	Air	• High Volume sampler: 24 hr • Low Volume sampler: two weeks	• Cleanup in several types of column • HRGC/HRMS or GC-ECD	•
	Other studies [18,19]	Human milk	• Collected from primiparous breast-feeding women in Osaka Prefecture	For PCB: • HRGC/HRMS-SIM • Hexane extraction and purification by a multistage column of silica gel. • Addition of ^{13}C-labeled substances as surrogate standard substances	•
	Other studies [20]	Blood	• Collected 10 mL of blood with questionnaire of lifestyle from women aged from xx to xx	• HRGC/HRMS method [21]	•

Country	Activities/programmes	Media	Sampling	Analytical procedures	QA/QC
India			•	•	•
Oman			•	•	•
Syria			•	•	•
Cambodia, Indonesia, Japan, Republic of Republic of Korea, Mongolia, Philippines, Thailand, Vietnam	POPs Monitoring Project in East Asian Countries [22]	Air	• Quartz fiber filter and PUF • High Volume sampler: 700 L/min, 24 hr, total 1,000 m^3 • Middle Volume sampler: 100 L/min, 7 days, total 1,000 m^3 • Low Volume sampler: 3 L/min, 24 hr, total 4 m^3	For Toxaphene: • Cleanup in a Florisil column • GC/NCI-HRMS-SIM For other POPs: • Cleanup in a Florisil column • GC/HRMS-SIM or GC/NCI-HRMS-SIM with the addition of ^{13}C-labeled substances as surrogate standard substances	• Recovery test • Blank test • Standard samples containing known concentration of analytes • Duplicate measurement • Travel blank test • Participation in proficiency testing
Fiji and Kiribati	Determination of Persistent organic pollutions in human breast milk in the South Pacific Region nations [23]	Human milk	• Based on WHO protocol • Strategy for selecting donors: • Interview potential donors, and consider diet, occupational exposure, rural and urban residence and proximity to potential POPs releasing activities	• Cleanup in gel permeation chromatography, silica column and florisil column • HRGC/HRMS • Addition of ^{13}C-labeled internal standard substances and surrogate standard, 1,2,3,4-$^{13}C_{12}$-TCDD for PCDD/PCDF and $^{13}C_{12}$-PCB 80 for PCB analysis.	• Inter-laboratory quality assessment studies

Table 4–2 Sampling and Analytical Method, and QA/QC for monitoring programmes (other media)

Country	Activities/programmes	Media	Sampling	Analytical procedures	QA/QC
Japan	Chemicals in the environment [12]	Water	• Small-volume sampling: about 10 L of water is taken using a 10-L Erlenmeyer flask with extraction using solid-phase disk • Large-volume sampling: 50 L for HCB, heptachlor and low chlorinated PCB and 250 L for other POPs. Soxhlet extraction using PUF and glass fiber filters.	For Toxaphene: • Cleanup in a Florisil column • GC/NCI-HRMS-SIM For other POPs: • Cleanup in a Florisil column • GC/HRMS-SIM or GC/NCI-HRMS-SIM with the addition of ^{13}C-labeled substances as surrogate standard substances	• Recovery test • Blank test • Duplicate measurement • Travel blank test
		Sediment	• Take 3 samples/site and don't dry the sediment. Centrifuged at 3,000 rpm for about 20 minutes before the analysis		
		Biota (Japanese seabass)	• Several individuals (1~2 year-old) of 20~30cm are used as one sample.		
	Survey on accumulation and exposure of Dioxins[13]	Biota	• Fasting state • 25 mL/donor	• Alkali decomposition or Soxhlet extraction with toluene • Clean-up with silica gel column, and alumina column or carbon column • HRGC-HRMS-SIM	• Recovery test • Blank test • Duplicate measurement • Travel blank test
		Food	• Collected all over the country • All meals for 3 consecutive days	• Addition of ^{13}C-labeled substances as surrogate standard substances • Soxhlet extraction with toluene and/or Liquid-liquid extraction with hexane • Clean-up with multiple silica gel column and carbon column • GC-MS	• Recovery test • Blank test • Duplicate measurement • Travel blank test
Syria	Organochlorine insecticides residues in soil of Damascus countryside (Al Ghota – Jesrin) and costal area at Tartous and Lattakia provinces	Soil	• Over a period of 11 months at two levels, at (0-10) cm deep, and at (30-45) cm deep, from agricultural land under intensive cultivation.	• GC-ECD for Chlordane, Lindane, Endrin, Aldrin and DDT, DDE, DDD	• Detection limits
	Pesticides residues in ground water in Damascus countryside (Al Ghota – Jesrin), and surface water in Aleppo at Al Safira channel	Ground and surface water	•	• GC-ECD	• Detection limits

5. Results

5.1 Ambient air

In the Asia-Pacific Region, several international and national POPs air-monitoring programmes are available. For example, passive sampling was conducted in Fiji in collaboration with RECETOX. In POPs Monitoring Project in East Asian Countries, sampling was operated in eight countries. In China and Japan, some national ambient POPs air monitoring programmes are performed (see Table 5.1–1). Detailed information on air concentration in the region is shown in Annex C.

Table 5.1–1 Summary for air monitoring programmes

sampling	Country	Period	Location	Number of site/sample (/year)	POPs	Remarks
Active	China	2007-2008	11 provinces	2 samples/site	PCB, HCB, Aldrin, Dieldrin, Endrin, DDT, Chlordane, Heptachlor, Mirex, PCDD/PCDF and *dl*-PCB	Ministry of Environmental Protection Chinese Centers for Disease Control and Prevention
	Hong Kong SAR, China	Since 1997	Central/Western and Tsuen Wan	Once every month/site	PCDD/PCDF and PCB	Environmental Protection Department
		2004	Tap Mun, Yuen Long and Tsuen Wan	On project basis	Aldrin, chlordane, DDT, dieldrin, endrin, HCB, heptachlor and mirex	Environmental Protection Department
	Cambodia, Indonesia, Japan, Republic of Korea, Mongolia, Philippines, Thailand, Vietnam	2004-2007	Background	1-7 sites 2-30 samples	Aldrin, Chlordane, DDT, Dieldrin, Endrin, HCB, Heptachlor, Mirex, PCB, Toxaphene	POPs Monitoring Project in East Asian Countries; Ministry of the Environment[18]
	Japan	FY1997-2006	Throughout the nation	68-979 sites	PCDD/PCDF, *dl*-PCB	Ministry of the Environment[24]
		2002-2005	Throughout the nation	34-37 sites 34-102 sample	Aldrin, Chlordane, DDT, Dieldrin, Endrin, HCB, Heptachlor, Mirex, PCB, Toxaphene	After 2003, monitoring was conducted twice a year (warm and cold intervals); Ministry of the Environment[12]
		Couple of years between 1974 and 2001	Kobe		PCBs	Nakano et al., 2008[16], Nakano, 2003[17]
passive	Fiji	2006-2007	Background	3 sites	DDT, PCB	RECETOX[11]
unknown	India				Aldrin, DDT	Chandra, et al. 1992[25]
			Ahmedabad		DDT	NIOH, 1984-85[26]
	Oman	Oct 2005	Muscat	4 samples, 4 sites	DDT, HCB, PCB	Information submitted from Oman[27]

(1) Aldrin

In all colleted air samples from the 11 provinces of China, Aldrin was not detected with the detection limit of 1 pg/m^3. In Hong Kong SAR, China, the average Aldrin concentration in the air monitored in 2004 was 10.9 pg/m^3.

In India, the reported level of Aldrin in the air is between 1.0 and 240 μg/m^3 [21].

Japan is continuously monitoring Aldrin in the air throughout the nation (34 to 37 sites) since 2002[12]. The concentration range was between nd and 14 pg/m^3. POPs Monitoring Project in East Asian Countries is also monitoring Aldrin in the air at Hateruma Island, which is background site, since 2004[22]. The results from either activity were obtained only for first three or four years, and temporal trend cannot be estimated. The detail result is shown in Annex C, C.2.

POPs Monitoring Project in East Asian Countries is also monitoring Aldrin in the air at Cambodia, Indonesia, Republic of Korea, Mongolia, Philippines, Thailand and Vietnam since 2005[22]. The concentration varies with the countries (na, 0.11 or <0.17 pg/m^3). The detailed result is shown in Annex C, C.3.

(2) Chlordane

In the air samples of China, cis-Chlordane and trans-Chlordane were detected in the ranges from ND to 0.81 pg/m^3 and ND to 4.1 pg/m^3, respectively. The detail results are presented in Annex C, C4. In Hong Kong SAR, China, the average Chlordane concentration in the air monitored in 2004 was 2.66 pg/m^3.

Japan is continuously monitoring Chlordane in the air throughout the nation (34 to 37 sites) since 2002[12]. For *cis*-Chlordane, the concentration range was between 0.86 and 1600 pg/m^3. POPs Monitoring Project in East Asian Countries is also monitoring Chlordane in the air at Hateruma Island, which is background site, since 2004, and range of the concentration for *cis*-Chlordane is 0.52-20 pg/m^3 [22]. The results from either activity were obtained only for first three or four years, and temporal trend cannot be estimated. The detailed result is shown in Annex C, C2.

POPs Monitoring Project in East Asian Countries is also monitoring Chlordane in the air at Cambodia, Indonesia, Republic of Korea, Mongolia, Philippines, Thailand and Vietnam since 2005[22]. The concentration varies with the countries (0.55-27 pg/m^3). The detailed result is shown in Annex C, C.3.

(3) DDT

In the air samples of China, the concentrations of 2,4'-DDE, 4,4'-DDE, 4,4'-DDD, 2,4'-DDT and 4,4'-DDT were ND-3.79, ND-9.45, ND-0.29, ND-0.21 and ND-0.46 pg/m^3, respectively, while 2,4'-DDD was not-detected in all samples with the detection limit of 0.01pg/m^3 (Annex C, C4). In Hong Kong SAR, China, the average DDT concentration in the air monitored in 2004 was 40.23 pg/m^3.

Fiji has monitored DDT in the air at three sites from July 2006 to June 2007[11]. DDT was highest in Laucala (45 pg/m^3) while it only reached half of this value (26 pg/m^3) in Nausori (see Annex C, C.1). Generally there was a low spatial and seasonal variability of the DDT concentrations, probably due to a low spatial and seasonal variability of the POP concentrations, probably due to low variability of metrological conditions (temperature range within 5 ^{o}C, consistent wind direction) and the lack of local sources of pollution.

In India, the reported level of DDT in the air is between 0.076 and 528 μg/m^3 [25]. And India has monitored DDT in the air collected from industrial city, Ahmedabad[26]. The range of the concentration was between 7.21 and 51.19 ng/m^3. Maximum mean level of 37.07 ng/m^3 was reported in June, and generally, levels in summer were higher than winter, and lowest in monsoon season.

Japan is continuously monitoring DDT in the air throughout the nation (34 to 37 sites) since 2002[12]. For *p,p'*-DDT, the concentration range was between 0.25 and 37 pg/m^3. POPs Monitoring Project in East Asian Countries is also monitoring DDT in the air at Hateruma Island, which is background site, since 2004, and range of the concentration for *p,p'*-DDT is nd-3.0 pg/m^3 [22]. The results from either activity were obtained only for first three or four years, and temporal trend cannot be estimated. The detailed result is shown in Annex C, C.2.

POPs Monitoring Project in East Asian Countries is also monitoring DDT in the air at Cambodia, Indonesia, Republic of Korea, Mongolia, Philippines, Thailand and Vietnam[22]. The concentration varies with the countries (for *p,p'*-DDT, <0.1-41 pg/m^3). The detailed result is shown in Annex C, C.3.

Oman has monitored DDT in four samples of ambient air (outdoor) in Oct 15 to 30, 2005[27]. For ambient air, samples were collected in iron foundry, cement production factory, university near hospital waste incinerator and the hotel.

(4) Dieldrin

In all colleted air samples from the 11 provinces of China, Dieldrin was not detected with the detection limit of 1 pg/m^3. In Hong Kong SAR, China, the average Dieldrin concentration in the air monitored in 2004 was 6.29 pg/m^3).

Japan is continuously monitoring Dieldrin in the air throughout the nation (34 to 37 sites) since 2002[12]. The concentration range was between 0.73 and 280 pg/m^3. POPs Monitoring Project in East Asian Countries is also monitoring Dieldrin in the air at Hateruma Island, which is background site, since 2004, and range of the concentration is nd-19 pg/m^3 [22]. The results from either activity were obtained only for first three or four years, and temporal trend cannot be estimated. The detailed result is shown in Annex C, C2.

POPs Monitoring Project in East Asian Countries is also monitoring Dieldrin in the air at Cambodia, Indonesia, Republic of Korea, Mongolia, Philippines, Thailand and Vietnam[22]. The concentration varies with the countries (<0.06-34 pg/m^3). The detailed result is shown in Annex C, C.3.

(5) Endrin

In all colleted air samples from the 11 provinces of China, Endrin was not detected with the detection limit of 1 pg/m^3. In Hong Kong SAR, China, the average Endrin concentration in the air monitored in 2004 was 15.75 pg/m^3.

Japan is continuously monitoring Endrin in the air throughout the nation (34 to 37 sites) since 2002[12]. The concentration range was between nd and 6.5 pg/m^3. POPs Monitoring Project in East Asian Countries is also monitoring Endrin in the air at Hateruma Island, which is background site, since 2004, and range of the concentration is nd-0.67 pg/m^3 [22]. The results from either activity were obtained only for first three or four years, and temporal trend cannot be estimated. The detailed result is shown in Annex C, C2.

POPs Monitoring Project in East Asian Countries is also monitoring Endrin in the air at Cambodia, Indonesia, Republic of Korea, Mongolia, Philippines, Thailand and Vietnam[22]. The concentration varies with the countries (nd-11 pg/m^3). The detailed result is shown in Annex C, C.3.

(6) Heptachlor

In all colleted air samples from the 11 provinces of China, Heptachlor was not-detected with the detection limit of 1 pg/m^3. In Hong Kong SAR, China, the average Heptachlor concentration in the air monitored in 2004 was 68.13 pg/m^3.

Japan is continuously monitoring Heptachlor in the air throughout the nation (34 to 37 sites) since 2002[12]. The concentration range was between 0.2 and 240 pg/m^3. POPs Monitoring Project in East Asian Countries is also monitoring Heptachlor in the air at Hateruma Island, which is background site, since 2004, and range of the concentration is nd-5.2 pg/m^3 [22]. The results from either activity were obtained only for first three or four years, and temporal trend cannot be estimated. The detailed result is shown in Annex C, C2.

POPs Monitoring Project in East Asian Countries is also monitoring Heptachlor in the air at Cambodia, Indonesia, Republic of Korea, Mongolia, Philippines, Thailand and Vietnam[22]. The concentration varies with the countries (<0.03-23 pg/m^3). The detailed result is shown in Annex C, C.3.

(7) HCB

In the air samples of China, HCB was detected in the range from 25 to 1846 pg/m^3 (Annex C, C4). In Hong Kong SAR, China, the average HCB concentration in the air monitored in 2004 was 15.74 pg/m^3.

Japan is continuously monitoring HCB in the air throughout the nation (34 to 37 sites) since 2002[12]. The concentration range was between 47 and 3000 pg/m^3. Environmental Monitoring of Persistent Organic Pollutants in East Asian Countries also monitoring HCB in the air at Hateruma Island, which is background site, since 2004, and range of the concentration is 13-125 pg/m^3 [22]. The results from either activity were obtained only for first three or four years, and temporal trend cannot be estimated. The detailed result is shown in Annex C, C2.

POPs Monitoring Project in East Asian Countries is also monitoring HCB in the air at Cambodia, Indonesia, Republic of Korea, Mongolia, Philippines, Thailand and Vietnam[22]. The concentration varies with the countries (70-330 pg/m^3). The detailed result is shown in Annex C, C.3.

Fiji has monitored HCB in the air at three sites from July 2006 to June 2007[11]. HCB concentrations in four seasons at the three sites varied from 2.4 to 7.5 pg m^{-3}.

(8) Mirex

In the air samples of China, Mirex was detected in the range from ND to 0.11 pg/m^3 (Annex C, C4). In Hong Kong SAR, China, the average Mirex concentration in the air monitored in 2004 was 10.65 pg/m^3.

Japan is continuously monitoring Mirex in the air throughout the nation (34 to 37 sites) since 2002[12]. The concentration range was between nd and 0.24 pg/m^3. POPs Monitoring Project in East Asian Countries is also monitoring Mirex in the air at Hateruma Island, which is background site, since 2004, and range of the concentration is nd-0.32 pg/m^3 [22]. The results from either activity were obtained only for first three years, and temporal trend cannot be estimated. The detailed result is shown in Annex C, C2.

POPs Monitoring Project in East Asian Countries is also monitoring Mirex in the air at Cambodia, Indonesia, Republic of Korea, Mongolia, Philippines, Thailand and Vietnam[22]. The concentration varies with the countries (<0.005-1.8 pg/m^3). The detailed result is shown in Annex C, C.3.

(9) Toxaphene

Japan is continuously monitoring Toxaphene in the air throughout the nation (34 to 37 sites) since 2002[12]. For Parlar-26, the concentration range was between nd and 0.77 pg/m^3. POPs Monitoring Project in East Asian Countries is also monitoring Toxaphene in the air at Hateruma Island, which is background site, since 2004, and Toxaphene was not detected in all sampling site[22]. The results from either activity were obtained only for first three years, and temporal trend cannot be estimated. The detailed result is shown in Annex C, C2.

POPs Monitoring Project in East Asian Countries is also monitoring Toxaphene in the air at Cambodia, Indonesia, Republic of Korea, Mongolia, Philippines, Thailand and Vietnam[22]. The concentration varies with the countries (for Parlar-26, <0.07-11 pg/m^3). The detailed result is shown in Annex C, C.3.

(10) PCB

In the air samples of China, the total concentration of marker PCBs was detected in the range from 6.7 to 108.3 pg/m^3 (Annex C, C4). In Hong Kong SAR, China, annual average air concentration of PCBs ranged from 320 to 870 pg/m^3. The detail annual results are presented in Annex C, C5.

Japan is continuously monitoring PCB in the air throughout the nation (34 to 37 sites) since 2002[12]. The results from either activity were obtained only for first three years, and temporal trend cannot be estimated (16-3300 pg/m^3). The detailed result is shown in Annex C, C.2. A monitoring of PCB in the air was also conducted in Kobe, Japan since 1970s [16,17]. The result shows that the air concentration of PCB had declined after the banning of PCB use in 1974.

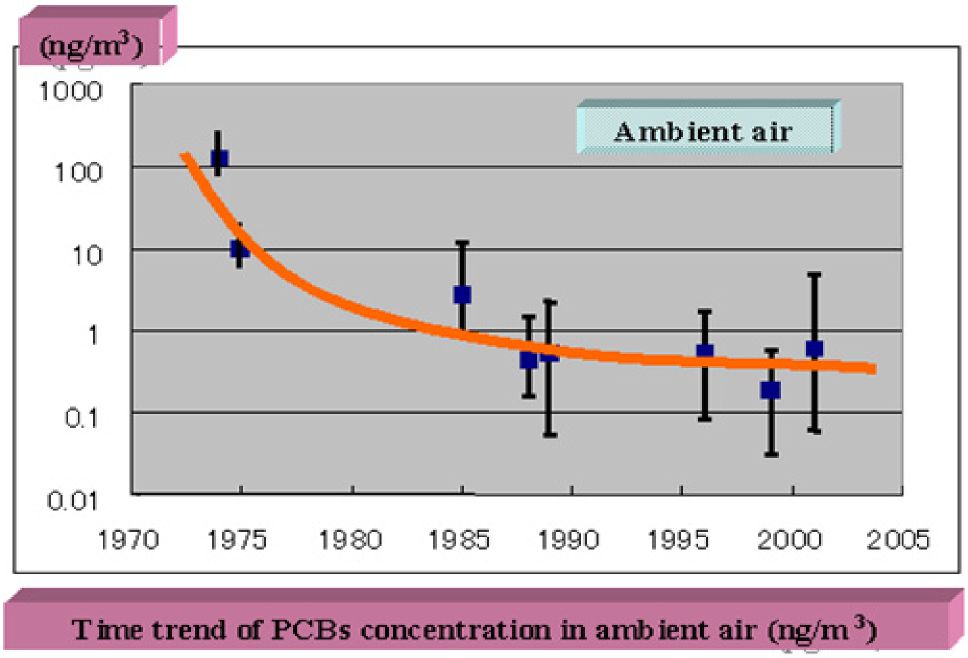


Figure 5.1-1 Time trend of PCBs in ambient air of Japan

Fiji has monitored PCB in the air at three sites from July 2006 to June 2007[11]. The result is shown in Figure 5.1-1. PCB concentrations in four seasons at the three sites varied from 3.2 to 13.5 ng filter^{-1} for the sum of 7 indicator PCBs which roughly corresponds to the range of 10 to 45 pg m^{-3} (see Annex C, C.1).

(11) PCDD/PCDF and *dl*-PCB

In the air samples of China, the mean WHO-TEQ (WHO1997) concentrations of dl-PCB, PCDD/PCDF, and total WHO-TEQ were 1.24, 14.02 and 15.26 fg/m^3, respectively. The TEQ was calculated by using the value of 1/2 of the detection limit, when the measured value was below the detection limit. The detail results are presented in Annex C, C4.

In Hong Kong SAR, China, annual average air concentration of PCDDs/PCDF ranged from 0.05 to 0.12 pg I-TEQ/m^3 (Annex C, C5).

In Japan, PCDD/PCDF and *dl*-PCB have been monitored throughout the nation (max of 979 sites per year) since FY1997[24].The annual average concentration gradually decreased from 0.55 pg-TEQ/m^3 in 1997 (68 sites) to 0.051 pg-TEQ/m^3 in 2006 (763 sites). Significant reduction of the emission from waste incineration facilities was considered as the main factor of this result (Table 5.1–2).

Table 5.1–2 PCDD/PCDF and *dl*-PCB concentrations in air from general sampling sites in Japan

FY	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Average	0.55	0.23	0.18	0.14	0.14	0.093	0.064	0.058	0.051	0.051
Range	0.010 - 1.4	0.0 - 0.96	0.0065 - 1.1	0.0073 - 1.0	0.0090 - 1.7	0.0066 - 0.84	0.0066 - 0.72	0.0083 - 0.55	0.0039 - 0.61	0.0053 - 0.40
(Number of sites)	(68)	(458)	(463)	(920)	(979)	(966)	(913)	(892)	(825)	(763)

Note 1 It limits to the sites surveyed twice or more a year (at least in the summer and winter).
Note 2 I-TEF(1988) had been used for the calculation of toxicity equivalent until FY 1998 and WHO-TEF(1998) has been used since FY 1999.
Note 3 In principle, before FY 1998, the toxicity equivalent is calculated as zero, when the measured value of each isomer is below the minimum determination limit. After FY 1999, the toxicity equivalent is calculated by using the value of 1/2 of the detection limit, when the measured value of each isomer is below the detection limit.

5.2 Human tissues

5.2.1 Milk

In the Asia-Pacific Region, several international and national POPs human milk monitoring programmes are available. In WHO milk survey, China, Fiji, Kiribati, Philippines and Tonga are involved. In China, India, Japan, some national POPs monitoring programmes on human milk are performed (see Table 5.2-1).

Table 5.2–1 Summary for national human milk monitoring programmes in China, India, Japan

<table>
<tr><th>Country</th><th>period</th><th>location</th><th>number of samples/sites</th><th>POPs</th><th>Remarks</th></tr>
<tr><td rowspan="3">China</td><td>2007-2008</td><td>12 provinces and 6 metropolises</td><td>1800</td><td>PCB, HCB, Aldrin, Dieldrin, Endrin, DDT, Chlordane, Heptachlor, Mirex, PCDD/PCDF and Coplanar PCB</td><td>Chinese Centers for Disease Control and Prevention</td></tr>
<tr><td>1999-2000</td><td>Hong Kong SAR</td><td>8 pooled samples</td><td>DDT, PCB</td><td>Hong Kong Baptist University[28]</td></tr>
<tr><td>2001-2002</td><td>Hong Kong SAR</td><td>13 pooled samples</td><td>PCDD/PCDF, dl-PCB</td><td>WHO Human Milk Survey, 3rd round[23,29]</td></tr>
<tr><td>Fiji and Tonga</td><td></td><td></td><td></td><td>PCDD/PCDF, dl-PCB</td><td>WHO Human Milk Survey, 3rd round[23]</td></tr>
<tr><td>Fiji</td><td>2006</td><td>2006:
Vunisea (rural),
Valelevu (urban)</td><td>2006:
2 samples (20 donors/ sample)</td><td>PCB, HCB, Aldrin, Dieldrin, Endrin, DDT, Chlordane, Heptachlor, Toxaphene, Mirex, PCDD/PCDF, dl-PCB</td><td>WHO Human Milk Survey, 4th round[23]</td></tr>
<tr><td rowspan="3">India</td><td></td><td>Chennai, Perungudi, Chidambaram, Parangipettai</td><td>4 sites</td><td>Chlordane, DDT, HCB, PCB</td><td>Subramanian et al., 2007[30]</td></tr>
<tr><td>1999-2003</td><td></td><td></td><td>Chlordane, DDT, HCB, PCB, PCDD/PCDF</td><td>Tanabe and Kunisue, 2007[31]</td></tr>
<tr><td>1979, 1980, 1981-82, 1984-85, 1985-86, 1994</td><td>Ahmedad, Bangalore, Bombay, Delhi, Kolkata, Lucknow, Ludhiana</td><td>6-75 samples</td><td>DDT</td><td>Several studies; Bhatnagar VK, 2003[32]</td></tr>
<tr><td rowspan="8">Japan</td><td>2004-2005(FY)</td><td>Tohoku region</td><td>2004:
20 samples
2005:
50 samples</td><td>PCB, HCB, Aldrin, Dieldrin, Endrin, DDT, Chlordane, Heptachlor, Toxaphene, Mirex, PCDD/PCDF, dl-PCB</td><td>Ministry of the Environment[12]</td></tr>
<tr><td>2004-2005(FY)</td><td>Kanto and Koshinetsu districts</td><td>2004:
10 samples
2005:
15 samples</td><td>PCB, HCB, Aldrin, Dieldrin, Endrin, DDT, Chlordane, Heptachlor, Toxaphene, Mirex, PCDD/PCDF, dl-PCB</td><td>Ministry of the Environment[12]</td></tr>
<tr><td>1973-2004</td><td>Osaka</td><td>19-39 samples</td><td>PCDD/PCDF, dl-PCB</td><td>Konishi et al. 2006a[18] Frozen samples were used.</td></tr>
<tr><td>1973-1986
1988-2000(FY)</td><td>Osaka</td><td>20-39 samples</td><td>PCB</td><td>Konishi et al. 2006b[19]</td></tr>
<tr><td>1972-2006(FY)</td><td>Osaka</td><td>41-67 samples</td><td>PCB</td><td rowspan="4">Osaka Prefecture[15]</td></tr>
<tr><td>1986-2006(FY)</td><td>Osaka</td><td>47-61 samples</td><td>Chlordane</td></tr>
<tr><td>1972-1982
1986-2006(FY)</td><td>Osaka</td><td>9-61 samples</td><td>DDT</td></tr>
<tr><td>1980-1982
1986-2006(FY)</td><td>Osaka</td><td>25-61 samples</td><td>HCB</td></tr>
<tr><td>Kiribati</td><td>2006(FY)</td><td></td><td>1 pooled sample (50 donors)</td><td>PCB, HCB, Aldrin, Dieldrin, Endrin, DDT, Chlordane, Heptachlor, Toxaphene, Mirex, PCDD/PCDF and dl-PCB</td><td>WHO Human Milk Survey, 4th round[23]</td></tr>
<tr><td>Philippines</td><td></td><td></td><td></td><td>PCDD/PCDF, dl-PCB</td><td>WHO Human Milk Survey, 3rd round[23]</td></tr>
</table>

(1) Aldrin

In the human milk samples collected from the urban and rural areas of China, Aldrin was detected in the ranges from ND to 3.8 pg/g fat and ND to 10.6 pg/g fat, respectively. The detail results are presented in Annex D, D4.

There is a report from Ministry of the Environment, Japan which is monitoring Aldrin in human milk in Japan[12]. The samples were collected in Tohoku region and Kanto Koshinetsu region in FY 2004 and FY 2005, and Aldrin was not detected from the samples in either of the region.

Fiji and Kiribati have monitored Aldrin in human milk within the framework of WHO Human Milk Survey (4th round survey) [23]. The result is shown in Table 5.2-2 and Annex D, D.3.

(2) Chlordane

In the milk samples of China, Chlordane was not detected in urban samples, while cis-Chlordane was detected in only one rural sample at 1.1 pg/g fat.

There is a report of human milk monitoring on Chlordane from FY 1986 to FY 2006 in Osaka, Japan. The target was human milk from the primiparous women. Chlordane was detected between 51.7 and 120 ng/g fat. There is also a report from Ministry of the Environment, Japan which is monitoring Chlordane in human milk in Japan[12]. The samples were collected in Tohoku region and Kanto Koshinetsu region in FY 2004 and FY 2005, and the concentration range for cis-Chlordane was 200 - 3,100 pg/g fat for Tohoku region. The detailed result is shown in Annex D, D.2.

From the report from Osaka, average concentration decreased from 1986 to 1992, but in 1993, the concentration again increased to the concentration level in 1988. The clear temporal trend could not be seen.

Fiji and Kiribati have monitored Chlordane in human milk within the framework of WHO Human Milk Survey (4th round survey) [23]. The result is shown in Table 5.2-2 and Annex D, D.3.

In India, there are several studies monitoring Chlordane in human milk [30, 31].

(3) DDT

In the urban milk samples of China, the concentrations of 2,4'-DDE, 4,4'-DDE, 2,4'-DDD, 4,4'-DDD, 2,4'-DDT and 4,4'-DDT were ND-6.8, 1.1-978.8, ND-3.2, 2.9-702.9, ND-14.6 and ND-62.2 pg/g fat, respectively. In the rural milk samples, the concentrations of 2,4'-DDE, 4,4'-DDE, 2,4'-DDD, 4,4'-DDD, 2,4'-DDT and 4,4'-DDT were ND-5.7, 3.3-1660.4, ND-5.0, 3.6-518.3, 3.8-25.9 and 7.7-110.5 pg/g fat, respectively (Annex D, D4).

In the human breast milk collected in Hong Kong SAR, China from 1999 to 2000, the mean concentration of total DDT was 2683 ng/g fat. The detail data are presented in Annex D. D5.

In India, human milk monitoring was conducted in Chennai, Chidambaram, Parangipettai, and Perungudi, all situated at or near the southeastern Bay of Bengal[30]. It was found that the levels of DDT increased in Chennai mothers' milk in the last decade. And there is another study analyzing DDT in India[31]. There are also some studies monitoring DDT in human milk[32]. The results are shown in Annex D, D.1.

There is a report of human milk monitoring on *p,p'*-DDT and *p,p'*-DDE from FY 1972 to FY 2006 (excluding FY 1983 to FY 1985) in Osaka, Japan[12]. The target was human milk from the primiparous women. DDT was detected between 122 and 4,000 ng/g fat. There is also a report from Ministry of the Environment, Japan which is monitoring DDT in human milk in Japan[12]. The samples were collected in Tohoku region and Kanto Koshinetsu region in FY 2004 and FY 2005, and the concentration range for *p,p'* - DDT was 2,300 - 19,000 pg/g fat for Tohoku region. The detailed result is shown in Annex D, D.2.

From the report from Osaka, average concentration decreased from 1972 to 1990's, and the levels after 1990's are constant.

Fiji and Kiribati have monitored DDT in human milk within the framework of WHO Human Milk Survey (4th round survey) [23]. The result is shown in Table 5.2-2 and Annex D, D.3.

(4) Dieldrin

In all human milk samples of China, Dieldrin was not-detected.

There is a report from Ministry of the Environment, Japan which is monitoring Dieldrin in human milk in Japan[12]. The samples were collected in Tohoku region and Kanto Koshinetsu region in FY 2004 and FY 2005, and the concentration range was 2,100 - 17,000 pg/g fat for Tohoku region. The detailedresult is shown in Annex D, D.2.

Fiji and Kiribati have monitored Dieldrin in human milk within the framework of WHO Human Milk Survey (4th round survey) [23]. The result is shown in Table 5.2-2 and Annex D, D.3.

(5) Endrin

In all human milk samples of China, Endrin was not detected except for one urban sample that had concentration of 15 pg/g fat.

There is a report from Ministry of the Environment, Japan which is monitoring Endrin in human milk in Japan[12]. The samples were collected in Tohoku region and Kanto Koshinetsu region in FY 2004 and FY 2005, and the concentration range was nd - 490 pg/g fat for Tohoku region. The detailed result is shown in Annex D, D.2.

Fiji and Kiribati have monitored Endrin in human milk within the framework of WHO Human Milk Survey (4th round survey) [23]. The result is shown in Table 5.2-2 and Annex D, D.3.

(6) Heptachlor

In the human milk samples collected from the urban and rural areas of China, Heptachlor was detected in the ranges from ND to 1.9 pg/g fat and ND to 17.8 pg/g fat, respectively (Annex D, D4).

There is a report from Ministry of the Environment, Japan which is monitoring Heptachlor in human milk in Japan[12]. The samples were collected in Tohoku region and Kanto Koshinetsu region in FY 2004 and FY 2005, and the concentration range was nd - 370 pg/g fat for Tohoku region. The detailed result is shown in Annex D, D.2.

Fiji and Kiribati have monitored Heptachlor in human milk within the framework of WHO Human Milk Survey (4th round survey) [23]. The result is shown in Table 5.2-2 and Annex D, D.3.

(7) HCB

In the human milk samples collected from the urban and rural areas of China, HCB was detected in the ranges from 18.4 to 45.7 pg/g fat and 19.3 to 56.8 pg/g fat, respectively (Annex D, D4).

In India, there is human milk monitoring on HCB[30, 31].

There is a report of human milk monitoring on HCB from FY 1980 to FY 2006 (excluding FY 1983 to FY 1985) in Osaka, Japan. The target was human milk from the primiparous women. HCB was detected between 7.11 and 79 ng/g fat. There is also a report from Ministry of the Environment, Japan which is monitoring HCB in human milk in Japan[12]. The samples were collected in Tohoku region and Kanto Koshinetsu region in FY 2004 and FY 2005, and the concentration range was nd - 370 pg/g fat for Tohoku region. The detailed result is shown in Annex D, D.2.

From the 1st report, average concentration decreased from 1981 to 1990's, and the concentration level after 1990's is about the same.

Fiji and Kiribati have monitored HCB in human milk within the framework of WHO Human Milk Survey (4th round survey) [23]. The result is shown in Table 5.2-2 and Annex D, D.3.

(8) Mirex

In the human milk samples collected from the urban and rural areas of China, Mirex was detected in the ranges from ND to 6.2 pg/g fat and ND to 8.1 pg/g fat, respectively (Annex D, D4).

There is a report from Ministry of the Environment, Japan which is monitoring Mirex in human milk in Japan[12]. The samples were collected in Tohoku region and Kanto Koshinetsu region in FY 2004 and FY 2005, and the concentration range was nd - 370 pg/g fat for Tohoku region. The detailed result is shown in Annex D, D.2.

Fiji and Kiribati have monitored Mirex in human milk within the framework of WHO Human Milk Survey (4th round survey) [23]. The result is shown in Table 5.2-2 and Annex D, D.3.

(9) Toxaphene

There is a report from Ministry of the Environment, Japan which is monitoring Toxaphene in human milk in Japan[12]. The samples were collected in Tohoku region and Kanto Koshinetsu region in FY 2004 and FY 2005, and the concentration range for Parlar-26 was 760 - 7,000 pg/g fat for Tohoku region. The detailed result is shown in Annex D, D.2.

Fiji and Kiribati have monitored Aldrin in human milk within the framework of WHO Human Milk Survey (4th round survey) [23]. The result is shown in Table 5.2-2 and Annex D, D.3

(10) PCB

In the human milk samples collected from the urban and rural areas of China, the total marker PCB was detected in the ranges from 4114 to 28742 pg/g fat and 2370 to 20764 pg/g fat, respectively (Annex D, D4).

In the human breast milk collected in Hong Kong SAR, China from 1999 to 2000, the mean concentration of total indicator PCBs was 36 ng/g fat (Annex D. D5).

In India, there is human milk monitoring on PCB[30, 31].

There is a report of human milk monitoring on PCB from FY 1972 to FY 2006 in Osaka, Japan. The target was human milk from the primiparous women. Also there is a report on monitoring (1973 to 2000, excluding 1987) of the human milk from primiparous women aged from 25 to 29 in Osaka, Japan[19]. The 2nd report analyzed isomers of the PCB.

From the 1st report, PCB concentration has gradually decreased from 1972 to 1980's, and the concentration level after 1990's is about the same (range: 97-1,510 ng/g fat). From the 2nd report, average concentration of tetra-, penta-, hexa-, and hepta-CB was on a decline from 1973, and decline rate is lower for high chlorinated isomers than low chlorinated isomers. Concentrations for total PCBs were 42.8-126.2 ng/g fat.

There is also a report from Ministry of the Environment, Japan which is monitoring PCB in human milk in Japan[12]. The samples were collected in Tohoku region and Kanto Koshinetsu region in FY 2004 and FY 2005, and the concentration range was 31,000 - 280,000 pg/g fat for Tohoku region. The detailed result is shown in Annex D, D.2.

Fiji and Kiribati have monitored Aldrin in human milk within the framework of WHO Human Milk Survey (4th round survey) [23]. The result is shown in Table 5.2-2 and Annex D, D.3.

(11) PCDD/PCDF and *dl*-PCB

In the urban milk samples of China, the WHO-TEQ values of dl-PCB and PCDD/PCDF were in the ranges from 0.82 to 3.36 pg/g fat and 1.7 to 6.56 pg/g fat, respectively. In the rural milk samples of China, the WHO-TEQ values of dl-PCB and PCDD/PCDF were in the ranges from 0.61 to 2.29 pg/g fat and 1.65 to 6.67 pg/g fat, respectively (Annex D, D4).The WHO-TEQ data of the human milk samples of China are presented in Table 5.2–2.

Table 5.2–2 Median WHO-TEQ (pg/g fat) for human milk in China

	dl-PCBs WHO-TEQ		PCDD/Fs WHO-TEQ		Total WHO-TEQ	
	Urban area	Rural area	Urban area	Rural area	Urban area	Rural area
Lower bound	1.65	1.72	3.75	3.31	5.40	5.01
Middle bound	1.65	1.72	3.91	3.33	5.56	5.05
Upper bound	1.65	1.72	3.94	3.37	5.59	5.09

In the human breast milk collected in Hong Kong SAR, China from 2001 to 2002, the mean concentrations of PCDD/PCDF and *dl*-PCBs were 8.25 and 4.67 pg WHO-TEQ/g fat, respectively. The detail data are presented in Annex D. D5.

In India, there is human milk monitoring on PCDD/PCDF[31]. Levels of dioxins and dioxin related compounds (DRCs) in the mothers living around the open dumping site were notably higher than those from the reference site and other Asian developing countries. This result indicates that significant pollution sources of DRCs are present in the dumping site of India and the residents there have been exposed to relatively higher levels of these contaminants possibly via bovine milk.

There is a report of human milk monitoring on PCDD/PCDF and Coplanar PCB from 1997 to 2004 in Osaka, Japan[18]. Target was human milk from the primiparous women, and frozen stored samples were used. Concentrations for total dioxins were 11.3-66.0 pg-TEQ/g fat. There is also a report from Ministry of the Environment which is monitoring PCDD/PCDF and *dl*-PCB in human milk in Japan[12]. The samples were collected in Tohoku region and Kanto Koshinetsu region in FY 2004 and FY 2005, and the concentration range was 2.5 - 45 pg-TEQ/g fat for Tohoku region. The detailed result is shown in Annex D, D.2.

From the report from Osaka, total TEQ concentration of PCDD/PCDF/*dl*-PCB decreased with time, and the trend is about the same for the TEQ concentrations calculated with either of the TEF values (WHO-2005 TEF, WHO-1998 TEF or NATO-TEF). And from the temporal trend of TEQ concentrations for PCDD, PCDF, and *dl*-PCB (non-*ortho* PCB and mono-*ortho* PCB), decline of non-*ortho* PCB seems to contribute mainly to the total concentration of the PCB.

Hong Kong SAR of China, Fiji, Kiribati, Philippines and Tonga have monitored PCDD/PCDF and colpanar PCB in human milk within the framework of WHO human milk survey (3rd round survey)[23]. The result is shown in Table 5.2-2, Table 5.2-3 and Annex D, D.3.

Table 5.2–3 Result of 4th-round WHO human milk survey

	Fiji (rural)	Fiji (urban)	Kiribati
Aldrin (ng/g fat)	ND	ND	ND
Chlordane 1) (ng/g fat)	1.7	1.7	1.5
Dieldrin (ng/g fat)	1.6	2.8	1.6
DDT 2) (ng/g fat)	573.5	804.3	188.9
Endrin 3) (ng/g fat)	ND	ND	ND
Heptachlor 4) (ng/g fat)	ND	ND	ND
HCB (ng/g fat)	2.4	3.8	3.2
Toxaphene 5) (ng/g fat)	ND	ND	1.4
Mirex (ng/g fat)	ND	ND	ND
PCB 6) (ng/g fat)	8.6	14.4	10.1
WHO-PCDD/PCDF-TEQ (pg/g fat)	4.5	3.6	3.7
WHO-PCB-TEQ (pg/g fat)	1.46	2.03	3.07

Note: ND=Not Detected (<0.5 ng/g fat)
1) sum of *cis*-chlordane, *trans*-chlordane and oxychlordane, calculated as chlordane
2) sum of *o,p'*-DDT, *p,p'*-DDT, *p,p'*-DDE, and *p,p'*-DDD, calculated as DDT
3) sum of endrin and endrin ketone, calculated as endrin
4) sum of heptachlor and heptachlor-epoxide (*cis/trans*), calculated as heptachlor
5) sum of parlar 26, parlar 50 and parlar 62
6) sum of PCB-28, 52, 101, 138, 153, 180

Table 5.2–4 Result of 3rd-round WHO human milk survey

	Fiji	Hong Kong SAR	Philippines	Tonga
WHO-PCDD/PCDF-TEQ (pg/g fat)	3.34	8.25	3.94	2.82
WHO-PCB-TEQ (pg/g fat)	1.75	4.67	2.38	1.27
Sum indicator PCB (ng/g fat)	17	45	26	--

5.2.2 Blood

In the Asia-Pacific Region, POPs monitoring programmes on human blood are available. In India and Japan, some national monitoring programmes on human blood are performed (see Table 5.2-5).

The POPs monitoring on human blood for several sites in Japan are operated for several years between 1980 and 2005.

Table 5.2–5 Summary for human blood monitoring programmes on POPs in India and Japan

country	period	location	number of samples/sites	POPs	Remarks
India	1975, 1982, 1985, 1992, 2005	Ahmedabad, Delhi, Haridwar, Lucknow, New Delhi	10-340 samples	DDT	Several studies; Bhatnagar VK, 2003[32]
Japan	1980, 1995, 2003	9 prefectures	1980, 1995: 40 samples 2003: 90 samples	PCB	serum Ministry of Health, Labour and Welfare (Health Labour Sciences Research Grant) [20]
	2002-2006 (FY)	5 regions 15 district	259-291 samples	PCDD/PCDF, *dl*-PCB	Ministry of the Environment[22]
	2004-2005 (FY)	Tohoku region	2004: 20 samples 2005: 50 samples	PCB, HCB, Aldrin, Dieldrin, Endrin, DDT, Chlordane, Heptachlor, Toxaphene, Mirex, PCDD/PCDF and *dl*-PCB	umbilical blood Ministry of the Environment[22]
	2005(FY)	Tohoku region	15 samples	PCB, HCB, Aldrin, Dieldrin, Endrin, DDT, Chlordane, Heptachlor, Toxaphene, Mirex, PCDD/PCDF and *dl*-PCB	maternal blood Ministry of the Environment[22]

(1) Aldrin

There is a report from Ministry of the Environment, Japan which monitored Aldrin in umbilical blood and maternal blood in Japan[12]. The samples were collected in Tohoku region in FY 2004 and FY 2005 for umbilical blood, and in FY 2005 for maternal blood. Aldrin was detected in the range of nd - 25 pg/g fat. The detailed result is shown in Annex E, E.2.

(2) Chlordane

There is a report from Ministry of the Environment, Japan which is monitoring Chlordane in umbilical blood and maternal blood in Japan[12]. The samples were collected in Tohoku region in FY 2004 and FY 2005 for umbilical blood, and in FY 2005 for maternal blood. Cis-Chlordane was detected in the range of 210 - 2,100 pg/g. The detailed result is shown in Annex E, E.2.

(3) DDT

There are reports available on the levels of pesticides residues in human blood samples from India[32]. The result is shown in Annex E, E.1.

There is a report from Ministry of the Environment, Japan which monitored DDT in umbilical blood and maternal blood in Japan[12]. The samples were collected in Tohoku region in FY 2004 and FY 2005 for umbilical blood, and in FY 2005 for maternal blood. *p,p'*-DDT was detected in the range of 560 – 10,000 pg/g fat. The detailed result is shown in Annex E, E.2.

(4) Dieldrin

There is a report from Ministry of the Environment, Japan which monitored Dieldrin in umbilical blood and maternal blood in Japan[12]. The samples were collected in Tohoku region in FY 2004 and FY 2005 for umbilical blood, and in FY 2005 for maternal blood. Dieldrin was detected in the range of 1,400 - 14,000 pg/g fat. The detailed result is shown in Annex E, E.2.

(5) Endrin

There is a report from Ministry of the Environment, Japan which monitored Endrin in umbilical blood and maternal blood in Japan[12]. The samples were collected in Tohoku region in FY 2004 and FY 2005 for umbilical blood, and in FY 2005 for maternal blood. Endrin was not detected in either umbilical blood or maternal blood. The detailed result is shown in Annex E, E.2.

(6) Heptachlor

There is a report from Ministry of the Environment, Japan which monitored Heptachlor in umbilical blood and maternal blood in Japan[12]. The samples were collected in Tohoku region in FY 2004 and FY 2005 for umbilical blood, and in FY 2005 for maternal blood. Heptachlor was detected in the range of nd - 170 pg/g fat. The detailed result is shown in Annex E, E.2.

(7) HCB

There is a report from Ministry of the Environment, Japan which monitored HCB in umbilical blood and maternal blood in Japan[12]. The samples were collected in Tohoku region in FY 2004 and FY 2005 for umbilical blood, and in FY 2005 for maternal blood HCB was detected in the range of 5,600 - 40,000 pg/g fat. The detailed result is shown in Annex E, E.2.

(8) Mirex

There is a report from Ministry of the Environment, Japan which monitored Mirex in umbilical blood and maternal blood in Japan[12]. The samples were collected in Tohoku region in FY 2004 and FY 2005 for umbilical blood, and in FY 2005 for maternal blood. Mirex was detected in the range of 110 - 2,900 pg/g fat. The detailed result is shown in Annex E, E.2.

(9) Toxaphene

There is a report from Ministry of the Environment, Japan which monitored Toxaphene in umbilical blood and maternal blood in Japan[12]. The samples were collected in Tohoku region in FY 2004 and FY 2005 for umbilical blood, and in FY 2005 for maternal blood. Parlar-26 was detected in the range of 230 - 3,000 pg/g fat. The detailed result is shown in Annex E, E.2.

(10) PCB

There is chemical risk study supported by Ministry of Health, Labour and Welfare of Japan, which analyzed PCB in human serum samples in Japan[20]. The samples were collected from 9 prefectures in 1980, 1995 and 2003. By comparing the geometric mean and median of the concentrations for each year, the concentrations of PCB seem to decrease with time.

There is also a report from Ministry of the Environment, Japan which monitored PCB in umbilical blood and maternal blood in Japan[12]. The samples were collected in Tohoku region in FY 2004 and FY 2005 for umbilical blood, and in FY 2005 for maternal blood. PCB was detected in the range of 12,000 - 160,000 pg/g fat. The detailed result is shown in Annex E, E.2.

(11) PCDD/PCDF and *dl*-PCB

There is a report from Ministry of the Environment, Japan which monitored PCDD/PCDF and *dl*-PCB in umbilical blood and maternal blood in Japan[12]. The samples were collected in Tohoku region in FY 2004 and FY 2005 for umbilical blood, and in FY 2005 for maternal blood. PCDD/PCDF and *dl*-PCB was detected in the range of 1.1 - 59 pg-TEQ/g fat. The detailed result is shown in Annex E, E.2.

There is also another programme monitoring PCDD/PCDF and *dl*-PCB in human blood from Ministry of the Environment, Japan since 2002[13]. The total concentrations for PCDD/PCDF and *dl*-PCB were 0.98-110 pg-TEQ /g lipid. The detailed result is shown in Annex E, E.2.

5.3 Other media

In Asia-Pacific Region, POPs monitoring programmes on ground- and underground water, sediment, soil, biota and food are operated.

5.3.1 Water

In India, there are monitoring on Aldrin, Dieldrin and DDT in River Yamuna[33]. Sample was collected in March, June, September and December 2007, and sampling location was Palla, Nizamuddin 1/2, Nizamuddin 1/4, Agra Canal – Kalindi Kunj, Agra Canal before confluence, Mathura D/s and Agra D/s. All samples collected were not traceable. There are also a monitoring of PCB conducted at River Yamuna, India in May 1999 and November 2002[33]. The result is shown in Annex F, F.1.

In Japan, there is continuous water monitoring throughout the nation (36 to 47 sites) in FY 2002 to 2005, which was conducted by Ministry of the Environment[12]. Aldrin, Chlordane, DDT, Dieldrin, Endrin, Heptachlor, HCB, Mirex and Toxaphene are monitored in this programme. In other programme, Ministry of the Environment is also continuously investigating ground water pollution by PCDD/PCDF and *dl*-PCB since FY 1998 throughout the nation (188 to 1479 sites) [24]. The maximum concentrations of PCDD/PCDF and *dl*-PCB are on decrease since FY 2000 at least, and the effect of strengthened regulation of the sources after the national law was enforced in 2000 can be observed. The result is shown in Annex F, F.1.

In Syria, there is a study which is monitoring water from various areas. The result is shown in Annex F, F.1.

5.3.2 Ground- and underground-water

In India, monitoring of pesticide residue (including POPs; Aldrin, DDT and Heptachlor) in groundwater was conducted in and around Delhi[33]. Samples were collected every month between April 2007 and March 2008, and 21 to 62 samples were collected each month. There result is shown in Annex F, F.2.

Japan is continuously investigating ground water pollution by PCDD/PCDF and *dl*-PCB since FY 1998 throughout the nation (188 to 1479 sites) [24].

In Syria, there is a study which is monitoring ground water from the coastal area, Latakia and Tartous provinces. The result is shown in Annex F, F.2.

5.3.3 Bottom sediment in water

In India, the monitoring of PCB was conducted at River Yamuna in May 1999 and November 2002[33]. The result is shown in Annex F, F.3.

In Japan, there is a continuous sediment monitoring throughout the nation (62 to 63 sites) in FY 2002 to 2005 conducted by Ministry of the Environment[12]. Aldrin, Chlordane, DDT, Dieldrin, Endrin, Heptachlor, HCB, Mirex and Toxaphene are monitored in this programme. In other programme, Ministry of the Environment is also continuously monitoring PCDD/PCDF and *dl*-PCB in the sediment throughout the nation (205 to 1836 sites) since FY 1998 [24]. There is no clear decline of the average concentrations in FY 1998 to FY 2006. The result is shown in Annex F, F.3.

5.3.4 Soil

Japan is continuously investigating soil pollution by PCDD/PCDF and *dl*-PCB throughout the nation (286 to 3735 sites) since FY 1998[24]. The result is shown in Annex F, Table F.4-1.

In Syria, there was a study on impact of pesticides residues in soil of coastal area at Tartous and Lattakia provinces. The result is shown in Annex F, Table F.4-2.

5.3.5 Biota

There are several monitoring studies of POPs concentrations in biota, conducted in India. The results of the studies are summarized in Annex F, Table F.5–3. The results reflect the heavy use of the organchlorine, especially DDT in the past before 1985, the date banning of all organochlorine insecticides.

Ministry of the Environment, Japan is implementing sensitive analysis for the stored Japanese seabass samples from Tokyo Bay and Osaka Bay, which was collected in 1993 to 2001 (excluding 1996) [12]. Aldrin, Chlordane, DDT, Dieldrin, Endrin, Heptachlor and HCB were monitored in this programme. In the same programme, Mirex and Toxaphene were analyzed only for the perch samples collected in 1993 in Tokyo Bay and Osaka Bay.

In Japan, Survey on accumulation and exposure of dioxins is also conducted by Ministry of the Environment, Japan since 1998[13]. PCDD/PCDF and *dl*-PCB were analyzed for common cormorant, jungle crow, large Japanese field mouse, raccoon dog and finless porpoise. The result is shown in Annex F, F.5.

There is also a study on POPs concentrations in Northern fur seal collected between 1972 and 1998 in Japan[34,35]. The Concentration of DDTs and PCBs in 1998 was 3.7 % and 14 % of the level in 1976, respectively. The result is shown in Annex F, F.5.

5.3.6 Food

There is chemical risk study supported by Ministry of Health, Labour and Welfare, Japan, which analyzed PCB in food samples in Japan[20]. The samples were collected in 9 prefectures in 1980, 1995 and 2003. By comparing the geometric mean, concentrations seem to decrease with time.

In Japan, there is also a survey on dioxins in the diet of Japanese. The result is shown in Annex F, F.6.

5.3.7 Tap water

There are monitoring of raw water on PCDD/ PCDF and *dl*-PCB in Japan. The samples were collected from water treatment plants in FY 2004 to FY 2006 (5 cities per year), and the concentration range was 0.014-0.24 pg TEQ/L. Because the monitoring period is short, the temporal trend is unclear.

5.4 Information concerning long range transport

All 12 initial POPs have potential for long range transport. The substances released in the Asia-Pacific Region may transport via air or water, and reach far away from the emission source (*e.g.* Arctic). There are some ways to understand the environmental movement of the listed chemicals, and examples are described in Guidance on the Global Monitoring Plan for Persistent Organic Pollutants[1]. These include:

- For POPs that are mainly transported by air (the “flyers”), GMP data can be assessed using information on atmospheric transport potential (*e.g.* characteristic transport distances (CTD) values) and knowledge of air currents. CTD for some POPs are described in Table 5.4-1.
- Back trajectory analysis (relatively simple in terms of data and infrastructure support). This can be extended to generate probability density maps for better interpretation of trend data with respect to advection inputs for GMP sites.
- Using regional- and global-scale models (more complex and demanding in terms of input data, although a range of models are available); GMP data can be used to initialize models and evaluate transport pathways on a regional and trans-regional (trans-continental scale). This is a specialized and resource demanding technique that may be difficult to implement.
- As a further option the regional organisation groups could set up a small team of experts to prepare a report or reports, based upon published literature and / or the data derived from the air monitoring component of the GMP. With this approach, interpretive techniques such as modelling and back trajectory analysis would be a part of the reports reviewed by the experts, and not directly a component of the GMP.

Table 5.4–1 Characteristic travel distances (CTDs, km) for air for selected POPs[1,36]

Chemical	CTD (km)
Hexachlorobenzene	110,000
PCB (tetra homolog)	8,900
p,p'-DDE	2,800
Toxaphene	2,500
PCB (hepta homolog)	1,900
Dieldrin	1,100
Chlordane	1,000
p,p'-DDT	830
2378-TCDD	810
OCDD	460
Aldrin	100

PCB-polychlorinated biphenyl; DDT – dichlorodiphenyltrichloroethane;
DDE – dichlorodiphenyltrichloroethane; TCDD – tetrachlorodibenzodioxin;
OCDD – octachlorodibenzodioxin.

In Asia-Pacific Region, there are few studies on models or trajectory analysis on POPs. Examples for the studies on trajectory analysis and regiona-/global-scale modelling in Asia-Pacific Region are shown in Annex G, G.1 and G.2, respectively.

5.5 Information of monitoring in Antarctica

There are several studies monitoring POPs in Antarctica. Some articles on the science magazines studying POPs in Antarctica are listed in Annex G.

6. Conclusions and Recommendation

Highlights of collected regional data on POPs levels in air and human milk/blood

In the Asia-Pacific Region, several international and national POPs monitoring programmes on air and human milk are available. For the air, passive sampling was conducted in Fiji in collaboration with RECETOX. In POPs Monitoring Project in East Asian Countries which is initiated by Japan, sampling was operated in ten countries (Cambodia, Indonesia, Japan, Republic of Korea, Lao PDR, Malaysia, Mongolia, Philippines, Thailand and Vietnam). In China and Japan, some ambient POPs air monitoring programmes are performed. For human milk, China (including Hong Kong SAR of China), Fiji, Kiribati, Philippines and Tonga have been involved in 3rd or 4th round WHO human milk survey. China, India and Japan also have some national POPs monitoring programmes on human milk and/or blood.

It should be noted that only a few countries in the Region reported the POPs data. Some countries have been collecting POPs data for longer and more intensively than others, but most countries have not.

Generally, the reported levels of POPs in the air were on the averaged high side when compared with concentrations in other parts of the world. The reported data provide baseline information of POPs in some countries. However, some POPs were not detected either because of the levels were really low or the detection limits of analytical method were not low enough, which may provide difficulty for future comparison. Also, some data were collected in particular period of the year as a snap shot, and more data will be necessary for the discussion of the long-range transport.

For human samples, the data are lacking over the region. More data are needed to provide baseline for future evaluation. Trend data in Japan, however, showed clear decline of dioxins, PCBs and other POPs levels in recent decades.

- In China, POPs monitoring is convinced that its framework, as one of the existing sub-regional initiatives that contribute to the effectiveness evaluation of the Stockholm Convention, will provide background data on the media considered to be essential, and will contribute to further operation of the global monitoring programme. A relatively wide scope of inventory on POPs in the air and in human milk has been performed in 2007-2008. The air sample collection covered 11 provinces, while the investigation on POPs in human milk covered 12 provinces and metropolises.

In Hong Kong SAR, China, monitoring of some POPs in ambient air is part of the regular toxic air pollutants monitoring programme. Since mid-1997, the POPs (dioxins and total PCBs) have been measured. As there has not been any significant and large-scale use of organo-chlorine pesticides (OC pesticides) recorded in Hong Kong for years, the monitoring of OC pesticides is not included in the regular monitoring programme but was carried out on a project basis.

- Fiji has conducted a pilot study on the application of passive samplers for the determination of POPs concentrations in ambient air from June 2006 to May 2007. The POPs Monitoring Study was initiated through collaborations between the Research Centre for Environmental Chemistry and Ecotoxicology (RECETOX) of the Czech Republic and the Institute of Applied Sciences of the University of the South Pacific in Fiji. The project was expected to evolve into a regional monitoring program to cover a number of South Pacific regional countries after its initial pilot stage. The obtained results provide baselines of air concentrations for 3 sampling sites in the Fiji Islands. These data represent the first measurements of POPs in ambient air, which will be useful for assessing temporal and spatial trends, and regional and global transport of POPs in air.

FIji and Tonga participated in the 3rd round WHO human milk survey. Fiji and Kiribati monitored POPs in human milk within the framework of WHO human milk survey (4th round survey).

- India has initiated the process of developing the National Implementation Plan with United Nations Industrial Development Organization (UNIDO) as the GEF Executing Agency. The project will prepare a National Implementation Plan for India as required by the Stockholm Convention on POPs. The purpose of the project is to enable India to take the first steps towards implementation of the Convention.

There have been few studies of POPs in air, which are not conclusively reflective of POPs levels in ambient air of India. Reports are available on the levels of pesticides residues in human blood samples from India in 2005. India also has limited data on some POPs (*e.g.* Chlordane, DDT, HCB, PCB and dioxins) from human milk monitoring programs. The available information clearly indicates the presence of some of the listed POPs in the environment and human tissues. The available data, however, is not sufficient to draw any trend on the levels of POPs in India.

- Japan is continuously monitoring POPs in the air throughout the nation since 2002. POPs Monitoring Project in East Asian Countries is also monitoring POPs in the air at Hateruma Island for the background information since 2004. The results from both activities were obtained only for first three or four years, and temporal trend cannot be estimated. The POPs Monitoring Project in East Asian Countries is also monitoring POPs in the air at Cambodia, Indonesia, Republic of Korea, Mongolia, Philippines, Thailand and Vietnam since 2005.

There is a report from Ministry of the Environment, Japan which is monitoring POPs in human milk in Japan. The samples were collected in Tohoku region and Kanto Koshinetsu region in 2004 and 2005.

- Oman has undergone a period of rapid development characterized by expanding oil, industrial and energy sectors, with their obvious potential for the emission of POPs. For DDT, air samples during the sampling campaign provided in Sultanate of Oman were analyzed in 2005. There was no previous detailed dioxin emission inventory for Oman. The inventory of dioxins emissions in the environment therefore became necessary especially within the context of the entire inventory of POPs in the Sultanate of Oman, in accordance with preparations for the implementation of the Stockholm Convention, especially the introduction of systematic monitoring and supervision over production and use of POPs, followed by the gradual cessation of their use.

- The unintentional production of dioxins and furans in Qatar is small. The estimated and measured amounts of dioxins and furans released to the environment in Qatar compared to more industrialized nations are moderate. The analyses of the periodically issued reports from departments dealing with pesticides in Qatar showed that the State of Qatar is neither using nor storing any of the POPs pesticides mentioned in the Stockholm Convention for POPs. Possible sources of dioxins in Qatar are limited to relatively few industries and institutions. There are, however, areas where more information needed to be collected in order to verify the estimates. The information about the levels of contamination in the local environment is almost non-existent and only a few regular analyses are being done.

- Syria reported data of some POPs in non-core media (*e.g.*, water and soil).The soil result reflects the heavy use of the organchlorine and specially DDT before they were banned in 1985. The impact of POPs contamination on ground and surface water was investigated.

- In the Asia-Pacific Region, limited POPs monitoring programmes on human blood are available. Some national monitoring programmes on human blood have been performed in India (only on DDT) and Japan. The POPs monitoring on human blood for several sites in Japan were operated for several years between 1980 and 2005.

Existing barriers and recommendations

Most countries in the Region are developing countries or countries with their economies in transition. Many countries lack funds for technology development and transfer. Thus, facility for POPs monitoring and inventory is limited, especially for dioxins analysis. In addition, the knowledge base and techniques of specialists in parts of the Region cannot meet the requirements of up-to-date administration or research. In some cases, there is also insufficient monitoring of POPs, lack of programs on emission control and insufficient quality control. Because monitoring data do not exist in most countries to enable the assessment of long-range transport of POPs in the Region, substantial effort will be needed to fill the data and technical gaps and to assess the long-range transport of POPs in the Region. It is noted that regional and international cooperation are urgently required.

Country representatives and ROG members assessed the capacity needed to monitoring POPs in the regional counties through collection of information. While Japan has comparatively well-established POP monitoring systems within the Region, other countries in the region basically still lack capacity. In China, the process of establishing an inventory of POPs with a national implementation plan as required by the Stockholm Convention is going well. Fiji started the air monitoring with passive sampling method more recently, but the monitoring highly depends on collaboration and Fiji as well as it sub-regional countries have no facility for POPs inventory programs. The capacity lack is also identified in Qatar, India and most of other countries in the region. The difficulties involved in the lack of POPs monitoring capacity for most countries within the Region include lack of funds and advanced technology as well as insufficient knowledge and training of special personnel.

Thus, capacity building for POPs monitoring programs for most countries in the region remains to be top priority and recommendation. More qualified data on POPs concentrations are needed in order to obtain the whole picture of basic background of POPs in the region. In particularly, resources are required to improve analytical facilities and methods for the determination of POPs. This entails more trained personnel and the acquisition of appropriate analytical facilities and the funds to maintain and operate the instrument. A major effort associated with improving analytical capability for POPs needs to ensure good quality assurance and quality control among laboratories, which may include the regular use of reference standards and/or certified reference materials, regional training programs and inter-laboratory comparison exercises, and the identification of reference laboratories in the region for specific POPs.

The ROG members of the Region strongly suggest that collection of POPs information should be continued. More data on POPs sources and concentrations are needed. It is essential for representatives of different countries to meet on a regular basis to update information and improve Regional communication. It is also recommended that financial assistance should be actively sought from international funding agencies such as the World Bank and GEF for supporting technology transfer for studies into PTS and related activities.

Countries in the region should be encouraged to participate in ongoing efforts to promote the implementation of the Convention. In particular, countries in the region should be encouraged to provide data of POPs and to participate in the inventory activities. Analytical capability for the POPs monitoring may be enhanced through existing mechanisms of collaborations and with seeking funds from national and international organizations. Countries in the region can be encouraged to take better advantage of activities being conducted by the co-operative mechanism of UNEP/WHO for human milk monitoring program of POPs. The effort of UNEP/WHO program of analysis of dioxins and dioxin-like PCBs in human milk could be expanded to include other POPs, and more countries should be encouraged to participate in the program.

Reference

1 Guidance on the Global Monitoring Plan for Persistent Organic Pollutants; Preliminary version, February 2007 (Amended in May 2007) UNEP

2 The World Bank, Data & Research, Data, Key Development Data & Statistics. http://www.worldbank.org/ (Accessed March,2008); Palestine, Cook Islands, Nauru, Niue, Pitcairn Islands, Tokelau, Tuvalu, Wallis and Futuna are not available.

3 United Nations, Department of Economic and Social Affairs, Population Division (2007), World Population Prospects: The 2006 Revision. CD-ROM Edition - Comprehensive Dataset (United Nations publications, forthcoming); supplemented by official national statistics published in United Nations Demographic Yearbook 2004, available from the United Nations Statistics Division website, http://unstats.un.org/unsd/demographic/products/dyb/default.htm (accessed Dec 2007); and data compiled by the Secretariat of the Pacific Community (SPC) Demography Programme, available from the SPC website, http://www.spc.int/prism/social/demog.html (accessed Dec 2007).

4 Map Machine, National Geographic Society (http://plasma.nationalgeographic.com/mapmachine/, access on Mar. 2008)

5 JRA-25 Atlas; http://ds.data.jma.go.jp/gmd/jra/atlas/jpn/atlas-top.htm (accessed Mar 2008)

6 World Health Organization (2007) Malaria Elimination - A field manual for low and moderate endemic countries (http://www.who.int/malaria/docs/elimination/MalariaElimination_BD.pdf)

7 Registers (http://www.pops.int/documents/registers/, access on Mar. 2008)

8 UNEP Chemicals (2002) Regionally Based Assessment of Persistent Toxic Substances (Central & Northeast Asia, Indian Ocean, South East Asia & South Pacific, Pacific Islands and Mediterranean Region; http://www.chem.unep.ch/Pts/regreports/regreports.htm)

9 National Implementation Plans transmitted pursuant to Article 7(b) of the Stockholm Convention (http://www.pops.int/documents/implementation/nips/submissions/default.htm, access on Mar. 2008)

10 Ministry of the Environment, Japan. (2002-2005) Proceedings of the Workshop on Environmental Monitoring of Persistent Organic Pollutants (POPs) in East Asian Countries.

11 Klanova. J. et al. Application of Passive Air Smplers for the Dtermination of POPs concentrations in ambient air. Pilot Study in the Southern Pacific, Fiji 2006. (submitted by Fiji)

12 Ministry of the Environment, Japan. (-2006) Chemicals in the Environment.(http://www.env.go.jp/chemi/kurohon/en/index.html; Access on July 2008)

13 Ministry of the Environment, Japan. (1998-2006) Survey on accumulation and exposure of Dioxins. (http://www.env.go.jp/chemi/dioxin/chosa/yasei.html)

14 Konishi, Y. et al. (2001) Continuous Surveillance of Organochlorine Compounds in Human Breast Milk from 1972 to 1998 in Osaka, Japan. *Arch. Environ. Contam.Toxicol.* **40**, 571-578

15 Information Submitted from Ministry of Health, Labour and Welfare, Japan.

16 Nakano, T., Konishi, Y., Masho, R. (2008) Trends of PCB Congener Patterns in Japanese Environmental Media, Food, Breast Milk, and Blood in view of Risk Assessment. In *PCBs -Human and Environmental Disposition and Toxicology*, The University Illinois Press, pp.7-pp.29

17 Nakano, T. (2003) Current status of PCB prblems-Outline of PCB analysis and recent environmental levels. *Kagaku-to Kyoiku* **51** (9), 532-535.

18 Konishi, Y. et al. (2006a) Trends if Dioxin Contamination of Human Breast Milk – Effect if "Dioxin special measures Law". *J. Environ. Chem*. **16**, 677-689.

19 Konishi, Y. et al. (2006b) Surveillance of Polychlorinated Biphenyl Congeneric Patterns in Human Breast Milk from 1973 to 2000 in Osaka, Japan. *Environ. Health. Perspect. Medicine*. **11**, 38-44.

20 Koizumi, A. et al. (2005) Study on foundation of Specimen Banking for Long-Term Monitoring of Human Exposure to Assess the Risk of the POPs. Research on Food Safety, Health Labour Sciences Research Grant. (in Japanese)

21 Takasuga, T. et al. (2006) Isotope dilution analysis of polychlorinated biphenyls (PCBs) in transformer oil and global commercial PCB formulations by high resolution gas chromatography-high resolution mass spectrometry. *Chemosphere* **62**, 469-484

22 POPs Monitoring Project in East Asian Countries (2007) Background Air Monitoring of Persistent Organic Pollutants in East Asian Countries 2004-2007 (http://www.env.go.jp/en/chemi/pops/eaws/background04-07.pdf)

23 Malisch, R. et al. Determination of persistent organic pollutants concentrations in human breast milk in the South Pacific region nations of Fiji and Kiribati under the WHO human milk survey. (submitted by Fiji)

24 Environmental Survey of Dioxins. Ministry of the Environment, Japan. (http://www.env.go.jp/en/headline/headline.php?serial=652)

25 Chandra, et al. 1992

26 Bhatnagar VK, (2003) In proc"Symposium on Risk assessment of Pesticides Residues in Water & Food" Sponsored by ICMR& ITRC , Publ **ILSI-India**

27 Information Submitted from Oman

28 Wong CK, Leung KM, Poon BH, Lan CY, Wong MH. (2002). Organochlorine hydrocarbons in human breast milk collected in Hong Kong and Guangzhou. *Archives of Environmental Contamination and Toxicology* **43**, 364-372.

29 Hedley AJ, Wong TW, Hui LL, Malisch R and Nelson EAS. (2006). Breast milk dioxins in Hong Kong and Pearl River Delta. *Environmental Health Perspective* **114**(2), 202 – 208.

30 Subramanian, A., Ohtake, M., Kunisue, T. and Tanabe, S. (2007) High levels of organochlorines in mothers' milk from Chennai (Madras) city, India. *Chemosphere* **68** (5), 928-939.

31 Tanabe, S. and Kunisue, T. (2007) Persistent organic pollutants in human breast milk from Asian countries. *Environ Pollution* **146** (2), 400-413.

32 Nhatnagar VK, (2003) In proc "Symposium on Risk assessment of Pesticides Residues in Water & Food" Sponsored by ICMR & ITRC, Publ ILSI-India

33 Monitoring of Pesticide Residue at National Level in Ground Water in NCR Region in and around Delhi under IARI Project. Central Pollution Control Board, Delhi.

34 Kajiwara, N. et al. (2004) Polybrominated Diphenyl Ethers and Organochlorines in Archived Northern Fur Seal Samples from the Pacific Coast of Japan, 1972-1998. *Environmental Science and Technology*, **38** (14). 3804-3808. (cited in Tanabe, 2008)

35 Tanabe, S. (2008) Environmental Pollution by Brominated Frame Retardants. *Kagaku*, **78** (7). 747-753. (in Japanese)

36 Beyer, A. et al. (2000) Assessing Long-Range Transport Potential of Persistent Organic Pollutants. *Environmental Science and Technology*, **34**, 699-703. (cited in UNEP, 2007)

Annex A

Information on use and regulations for POPs in Asia-Pacific Region

A.1 Information on pesticide and agricultural use and regulations

A.1.1 Information from NIP [1]

Table A.1.1–1 Information of Regulation on POPs Pesticide in Asia and Pacific Region

	Historically no use	Banned on use	Exemption
Aldrin	China+ Qatar	Cambodia*, China, Japan, Jordan, Lebanon, Mongolia, Nepal, Philippines, Singapore, Thailand, Vietnam	
Chlordane	Qatar	Cambodia*, Japan, Jordan, Lebanon, Mongolia, Nepal, Philippines, Singapore, Thailand, Vietnam	China (vector control)
DDT		Cambodia*, Japan, Jordan, Lebanon, Mongolia, Nepal, Singapore, Thailand, Vietnam	China (indoor vector control, intermediate for dicofol production), Philippines (vector control)
Dieldrin	China+ Qatar	Cambodia*, Japan, Jordan, Lebanon, Mongolia, Nepal, Philippines, Singapore, Thailand, Vietnam	
Endrin	China+ Qatar	Cambodia*, Japan, Jordan, Lebanon, Mongolia, Nepal, Philippines, Singapore, Thailand, Vietnam	
Heptachlor		Cambodia*, Japan, Jordan, Lebanon, Nepal, Philippines, Singapore, Thailand, Vietnam	
Hexachlorobenzene	Philippines, Qatar,Sri Lanka, Thailand	Cambodia*, China, Japan, Lebanon (Singapore?) , Vietnam	
Mirex	Japan, Philippines,Qatar, Sri Lanka, Thailand	Cambodia*, Japan, Lebanon, Nepal, Singapore, Thailand, Vietnam	
Toxaphene	Japan	Cambodia*, China, Japan, Jordan, Mongolia, Nepal, Philippines, Singapore, Thailand, Vietnam	

* due to the weakness of law enforcement and other constraints, practical application of these legislative instruments has not really happened up to date.

+ It was used as research purpose

[1] Reference: National Implementation Plan (Cambodia, China, Japan, Jordan, Lebanon, Mongolia, Nepal, Philippines, Singapore, Thailand and Vietnam)
http://chm.pops.int/Countries/NationalImplementation/tabid/253/language/en-US/Default.aspx (access on July 2008)

Table A.1.1–2 Chlordane use distribution in China from 1997-2001

Province (municipality)	Annual Consumption (ton)*					Five years accumulated consumption (ton)
	1997	1998	1999	2000	2001	
Zhejiang	93.6	114	110.3	108.4	84.8	511.2
Jiangsu	86.2	111.1	103.4	96.4	78.8	475.8
Guangdong	40	64.5	100.7	99.5	70.9	375.6
Sichuan	58.2	67.6	65.6	32.2	41.1	264.6
Jiangxi	37.9	48.7	53	69.2	48.2	256.9
Hunan	30.4	31.6	34.3	36.1	37.6	170.1
Guangxi	7.6	14.6	20.6	22.3	21.3	86.4
Anhui	8.6	10.2	11.9	17	23	70.7
Hubei	9.1	6.4	5.5	5.1	6.5	32.5
Fujian	12.1	3.8	7.8	1	0.8	25.5
Chongqing	4.7	5.1	4.8	4.6	3.8	23
Shanxi	5	3	1	0	0	9
Shanghai	1.1	0.8	0.8	0.7	0.8	4.2
Shandong	0.4	0.4	0.4	0.3	0.3	1.8
Liaoning	1	0	0	0	0	1
Yunnan	0	0	0.5	0.3	0.3	1
Hainan	0.5	0	0	0	0	0.5
Beijing	0	0	0	0.003	0.001	0.003

* These data come from those used by termite prevention and control institutions which have been investigated.

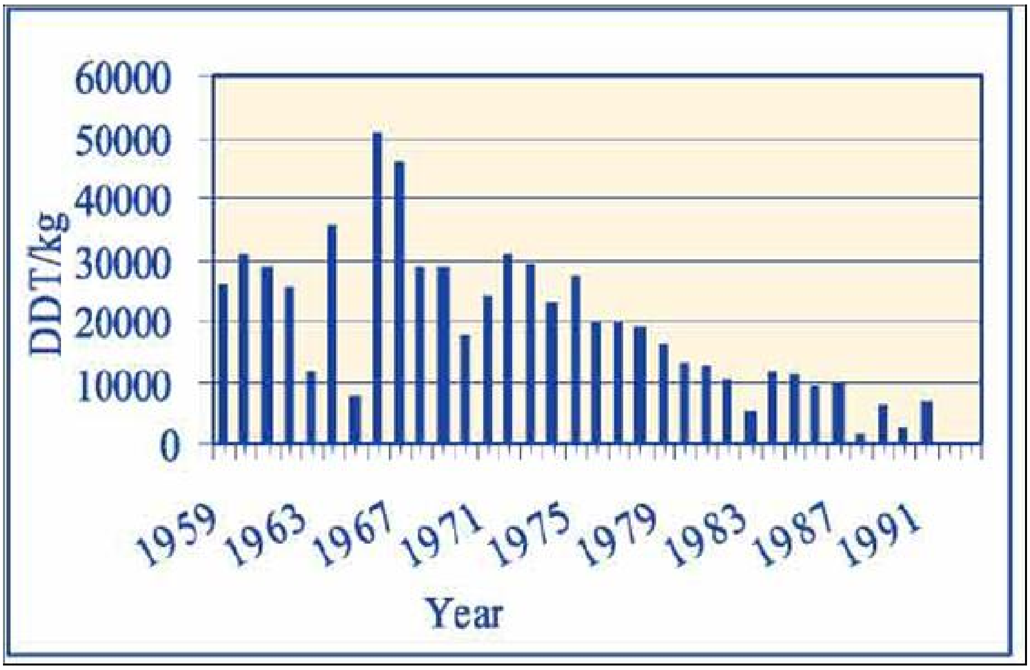


Figure A.1.1–1 Quantity of DDT used in Malaria Control Program during 1959-1991 in Jordan

Table A.1.1–3 Usage of POPs Pesticides in Mongolia

No	Soum, aimag	Used period	Amount (tons)	Deposit (tons)
	Hexachlorobenzene (HCB) (C_6Cl_6)			
1	Arkhangai aimag Ikh tamir soum	1970-1980	320	-
2	Bayan-Ulgii aimag Tsengel soum	1970	1000	-
3	Uvurkhangai aimag Esun zuil soum	1970	15	-
4	Dornod aimag Bayandun soum	1980-1987	-	-
5	Selenge aimag Mandal soum Dulaan khaan	1990-1992 1992-1997	250 500	- -
6	Sukhbaatar aimag Ongon Munkhkhaan Dari ganga Khalzan	 1999-2003 1990 - 1970	 20 40 30 150	 - - - -
7	Tuv aimag Lun soum Ugtaal /secondary school/ Jargalant /secondary school/	 1989 1987 -	 250 + 0.6	 - 0.5 0.1
8	Khovd aimag Khovd Myangad Must	 1972-1982 1969-1989 1970-1990	 400 + 3000	 - - -
9	Darkhan-uul aimag Sharuun gol	2002-2003	8	-
Total 17 soums of 9 aimags			5983.6	0.6
	Chlordane ($C_{10}H_6Cl_6$)			
1	Bayankhongor aimag Baatsagaan	-	70	
2	Dornogobi aimag Khatanbulag	2003	1.5	
3	Gobi-Altai aimag Tugrug	1973-1990	85	
4	Selenge aimag Sant	1976-1990	5	
5	Sukhbaatar aimag Ongon	1999-2003	150	
6	Khuvsgul aimag Shine-Ider	2003	+	
Total 6 soums of 6 aimags			311.5	
	Aldrin ($C_{12}H_8Cl_6$)			
1	Zavkhan aimag Uliastai soum Telmen soum	 1990 2003	 10 10	
2	Selenge aimag Khuder soum	-	1	
3	Khuvsgul aimag Jargalant soum	2001	40	
Total 4 soums of 3 aimags			61	

No	Soum, aimag	Used period	Amount (tons)	Deposit (tons)
Dieldrin ($C_{12}H_8Cl_6O$)				
1	Sukhbaatar aimag Tumentsogt	1982-1995	162.5	
Heptachlor ($C_{10}H_5Cl_7$)				
1	Bayankhongor aimag Baatsagaan soum Bayan-Ovoo Galuut Jinst	- - - -	100 20 25 19	
2	Khovd aimag Khovd soum	1972-1982	400	
3	Khuvsgul aimag Shine-ider soum	2003	0.5	
Total 6 soums of 3 aimags			564.5	

A.1.2 Information from PTS reports [2]

Table A.1.2–1 List of Countries in each subregion (Only countries in Asia and Pacific Region)

Central & Northeast Asia	Indian Ocean	South East Asia and South Pacific	Pacific Islands	Mediterranean
Afghanistan China Democratic People's Republic of Korea Japan Kazakhstan Kyrgyzstan Mongolia Republic of Korea Tajikistan Turkmenistan Uzbekistan	Bahrain Bangladesh Bhutan India Iran (Islamic Republic of) Iraq Kuwait Maldives Nepal Oman Pakistan Qatar Saudi Arabia Sri Lanka United Arabic Emirates Yemen	Brunei Cambodia Indonesia Lao People's Republic Myanmar Malaysia Papua New Guinea Philippines Singapore Thailand Vietnam	Cook Islands Federated States of Micronesia Fiji French Polynesia Guam Kiribati Marshall Islands Nauru New Caledonia Niue Northern Mariana Islands Palau Pitcairn Islands Samoa Solomon Islands Tokelau Tonga Tuvalu Vanuatu Wallis and Futuna	Jordan Lebanon Palestine Syrian Arab Republic

[2] Reference: UNEP Chemicals (2002) Regionally Based Assessment of Persistent Toxic Substances
(Central & Northeast Asia, Indian Ocean, South East Asia & South Pacific, Pacific Islands and Mediterranean Region)
http://www.chem.unep.ch/Pts/regreports/regreports.htm

(1) Central and Northeast Asia

Table A.1.2–2 Information of regulation on use of POPs in Central and Northeast Asia

	Historically no use	Ban on use	Exemption
Aldrin	China, Mongolia	all countries	
Chlordane	Mongolia	all countries, except for China and Japan	China (termiticide), Japan (wooden articles previously treated with chlordane as termicide)
DDT		all countries, except for China and Republic of Korea	China (intermediate and for vector control), Republic of Korea (contaminant in dicofol)
Dieldrin	Mongolia, Uzbekistan	all countries	
Endrin	China*, Mongolia, Kazakhstan, Kyrgyzstan	all countries	
Heptachlor	China*, Mongolia	all countries, except for China* and Tajikistan	
Hexachlorobenzene	Japan, Republic of Korea, Mongolia, Uzbekistan	Tajikistan, China (Taiwan province)	China (termiticide)
Mirex	Republic of Korea, Japan, Mongolia, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan.	China (Taiwan province), Japan, Kazakhstan, Kyrgyzstan	
Toxaphene	Japan, Uzbekistan	all countries, except for Uzbekistan	

* excluding Taiwan province
all countries: all countries in this region listed in Table A.1.2–1.

(2) Indian Ocean

Table A.1.2–2 Information of regulation on POPs in Indian Ocean Region

	Historically no use	Ban	Exemption
Aldrin		all countries	
Chlordane		all countries	
DDT		Bahrain, Bhutan, Kuwait, Oman, Pakistan, Qatar, Iran, Saudi Arabia, UAE, Sri Lanka	India (vector control), Bangladesh (vector control), Nepal (vector control), Pakistan (vector control), Iran
Dieldrin		Bahrain, Iran, Kuwait, UAE, Oman, Pakistan, Qatar, Saudi Arabia, Sri Lanka	India, Nepal
Endrin		all countries	
Heptachlor		all countries	
Hexachlorobenzene		all countries	
Mirex	India, Iran, Nepal, Sri Lanka	Bahrain, Bangladesh, Kuwait, Oman, Pakistan, Qatar, Saudi Arabia, UAE	
Toxaphene	Sri Lanka	all countries	

There is no specific Information on "Ban" (e.g. "Ban on use", "Ban on import")
all countries: all countries in this region listed in Table A.1.2–1.

(3) South East Asia and South Pacifics

Table A.1.2–2 Information of regulation on use of POPs in South East Asia and South Pacifics

	Historically no use	Ban on use	Exemption
Aldrin	Indonesia	all countries, except Indonesia, Thailand	
Chlordane		all countries, except Philippines, Thailand	
DDT		all countries*, except Malaysia, Papua New Guinea, Philippines, Thailand	Malaysia (research, education), Papua New Guinea (Malaria Control), Philippines (Malaria Control)
Dieldrin		all countries, except Thailand	
Endrin	Indonesia	all countries, except Indonesia, Malaysia, Philippines	
Heptachlor	Indonesia	all countries, except Indonesia, Philippines	PNG (termiticide)
Hexachlorobenzene	Malaysia	all countries, except Lao, Malaysia, Philippines, Singapore	Philippines, Singapore
Mirex		all countries, except Cambodia, Philippines, Vietnam	Cambodia, Philippines
Toxaphene		all countries	

all countries: all countries in this region listed in Table A.1.2–1.

(4) Pacific Islands

As an exemption, Solomon Islands and Papua New Guinea is using DDT for vector control purpose.

(5) Mediterranean

There is no relevant information in PTS report of the Mediterranean Region.

A.1.3 Information from Proceeding of the Workshop on Environmental Monitoring of POPs in East Asian Countries [3]

Table A.1.3–1 Information of regulation on use of POPs in East Asian Countries

	Historically no use	Ban on use	Exemption
Aldrin	China	Brunei Darussalam, Cambodia, China, Indonesia, Republic of Korea, Laos, Malaysia, Papua New Guinea, Philippines, Singapore, Thailand, Vietnam	
Chlordane		Brunei Darussalam, Cambodia, Indonesia, Republic of Korea, Laos, Malaysia, Papua New Guinea, Singapore, Thailand, Vietnam	China (termicude)
DDT	Mongolia	Brunei Darussalam, Cambodia, Indonesia, Republic of Korea, Laos, Malaysia, Singapore, Thailand, Vietnam	China (vector control)
Dieldrin	China	Brunei Darussalam, Cambodia, China, Indonesia, Republic of Korea, Laos, Malaysia, Papua New Guinea, Philippines, Singapore, Thailand, Vietnam	
Endrin	China, Mongolia	Brunei Darussalam, Cambodia, China, Indonesia, Republic of Korea, Laos, Papua New Guinea, Philippines, Singapore, Thailand, Vietnam	
Heptachlor		Brunei Darussalam, Cambodia, Indonesia, Republic of Korea, Laos, Malaysia, Philippines, Singapore, Thailand, Vietnam	
Hexachlorobenzene	Republic of Korea	China, Indonesia, Singapore, Thailand, Vietnam	
Mirex	Cambodia, Republic of Korea	Cambodia, Indonesia, Singapore, Thailand	China (termicude)
Toxaphene	Cambodia	China, Indonesia, Republic of Korea, Singapore, Thailand	

Table A.1.3–2 DDT usage in Viet Nam

Year	Quantity (kg)
1992	237,748
1993	33,935
1994	151,675

Table A.1.3–3 The use of DDT (ton) for malaria disease control in Indonesia (1974-1983)

Provinces	1974/ 1975	1975/ 1976	1976/ 1977	1977/ 1978	1978/ 1979	1979/ 1980	1980/ 1981	1981/ 1982
West Java	151.7	143.6	181.2	260.9	260.5	121.8	116.8	118.4
Central Java	383.9	264.4	1,334.3	1,518.8	1,467.3	114.5	515.4	693.1
Yogya	46.9	171.9	161.3	130.7	154.8	45.0	43.3	100.2
East Java	444.7	874.1	1,583.6	1,547.1	1,409.8	768.5	522.7	356.0
Bali	32.0	44.1	32.5	50.7	33.2	33.1	29.3	23.9
North Smtr	67.8	69.1	50.9	69.4	64.3	68.7	64.1	56.4
South Smtr	24.6	30.2	21.7	32.4	31.2	26.8	40.0	42.6
Lampung	16.4	30.1	22.4	40.5	40.6	55.8	69.4	73.6
South Slws	21.3	26.7	29.7	34.7	38.8	35.3	38.1	45.0
Others	103.0	139.3	161.2	191.9	241.3	279.9	313.4	374.3
Total	1,375.6	1,748.1	3,578.7	3,867.6	3,741.6	2,549.3	1,752.1	1,888.6

[3] Reference: Ministry of the Environment, Japan (2002) Proceedings of the Workshop on Environmental Monitoring of Persistent Organic Pollutants (POPs) in East Asian Countries
Ministry of the Environment, Japan (2005) Proceedings of the 3rd Workshop on Environmental Monitoring of Persistent Organic Pollutants (POPs) in East Asian Countries

A.1.4 Information submitted from countries in the region

(1) Bahrain

In Bahrain, numbers of chemicals are banned, including Aldrin, Chlordane, DDTs, Dieldrin, Endrin, Heptachlor, HCB, Mirex and Toxaphene.

A.2 Information on industrial use and regulations

A.2.1 Information from NIP

Table A.2.1–1 Information of regulation on industrial POPs in Asia and Pacific Region

	Banned on technical/industrial use	Exemption
HCB	Singapore, Vietnam	China (intermediate to produce Na-PCP)
PCB	Lebanon, Singapore, Thailand	

Reference: National Implementation Plan (Cambodia, China, Japan, Jordan, Lebanon, Mongolia, Nepal, Philippines, Singapore, Thailand and Vietnam)
http://chm.pops.int/Countries/NationalImplementation/tabid/253/language/en-US/Default.aspx (access on July 2008)

A.2.2 Information from PTS reports

Table A.2.2–1 Information of regulation on industrial POPs in Asia and Pacific Region

	Ban	Exemption
PCB	Indonesia, Japan, Laos	Philippines, Vietnam
HCB	Brunei Darussalam, Indonesia, Laos, Malaysia, Singapore, Thailand, Vietnam	Philippines

Reference: UNEP Chemicals (2002) Regionally Based Assessment of Persistent Toxic Substances (Central & Northeast Asia, Indian Ocean, South East Asia & South Pacific, Pacific Islands and Mediterranean Region) http://www.chem.unep.ch/Pts/regreports/regreports.htm

A.2.3 Information submitted from countries in the region

(1) Bahrain

In Bahrain, numbers of chemicals are banned, including PCBs.

A.3 Information from FAO statistics [4]

Table A.3–1 Consumption of Aldrin (metric tons)

	1964	1965	1966	1967	1968	1969	1970	1971	1972
Bangladesh									
Bhutan									
Burma	21.4	25.4	19.2		1.3	10.5	1.9	0.8	
India	105.2	92.4	560.5	305.9		162.6	142.3		1100
Indonesia	28								
Iraq	62.4								
Japan	186.1	187.3	207.2	229.1	224	231.5	162.8	150	50.7
Korea, South	357	151.6	59.1	63.6	86.4	93.1	95	100	
Kuwait									0.8
Pakistan	129.1								
Philippines									
Ryukyu Island	7	7	12	6.9	12.7				
Sri Lanka						5.5	6	7	
Syria	2								
Total	908.2	473.7	868	615.5	329.4	504.2	408	257.8	1152.3

	1973	1974	1975	1976	1977	1978	1979	1980
Bangladesh					13.4			
Bhutan							2	
Burma						112.5	231.4	
India	1200	1270	952	914	3503	140	161	50
Indonesia								
Iraq								
Japan	1.2							
Korea, South			36.4	40.1	43.9	40.7	42.4	
Kuwait	0.8	1.1						
Pakistan		130.5	22.4	29.7	109.5	32.3	24	1.9
Philippines								
Ryukyu Island								
Sri Lanka								
Syria								
Total	1202.8	1401.6	1010.8	983.8	3669.8	325.5	460.8	51.9

	1981	1982	1983	1984	1985	1986	1987	1988
Bangladesh								
Bhutan								
Burma				656.7	533.4	812.1		
India	179	54		89	25	59	47	576
Indonesia								
Iraq								
Japan								
Korea, South								
Kuwait								
Pakistan	5.5	8.3		29.6		10.8	13.8	
Philippines	152	121						
Ryukyu Island								
Sri Lanka	2	1						
Syria								
Total	338.5	184.3	0	775.3	558.4	881.9	60.8	576

[4] Reference: Food and Agriculture Organization of the United Nations. (1969-1989) FAO production yearbook.

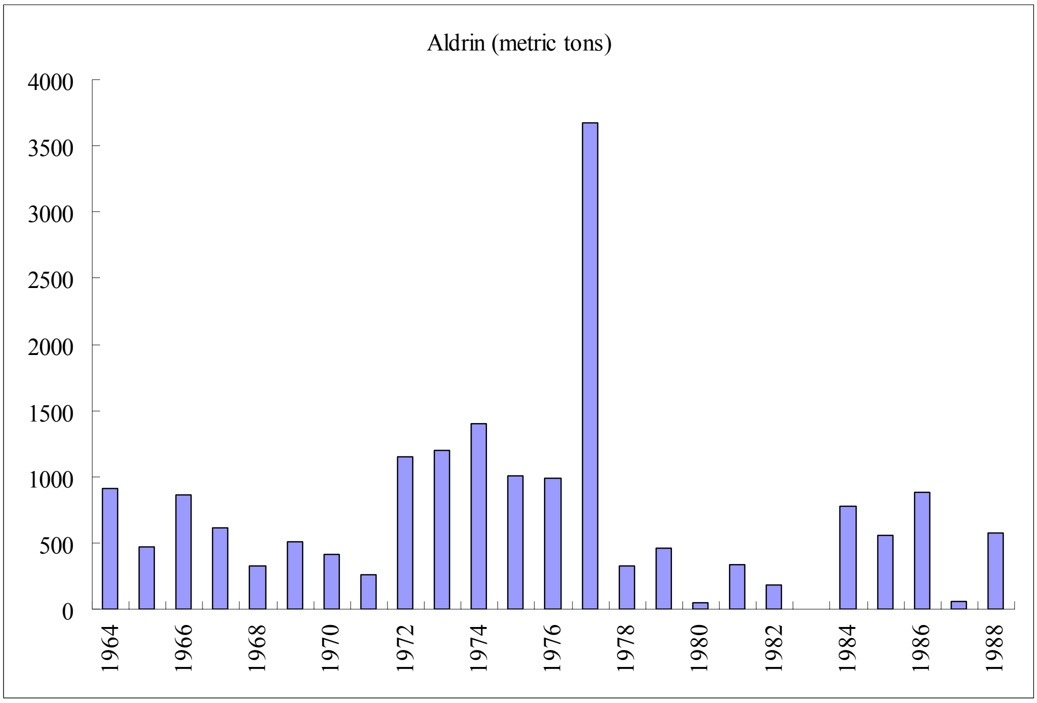


Figure A.3–1 Consumption of Aldrin (metric tons)

Table A.3–2 Consumption of Chlordane (metric tons)

	1964	1965	1966	1967	1968	1969	1970	1971
India	15.2	23.6	180.6	150		115.6	116.9	
Iraq	7.4							
Kuwait		0.1	0.2	0.3		0.2	0.4	0.4
Lebanon				0.4				
Ryukyu IS			99.9	38.2	124.1			
Syria	266							
Guam		0.1	0.2					
Total	288.6	23.8	280.9	189.3	125.3	117	118.5	1.2

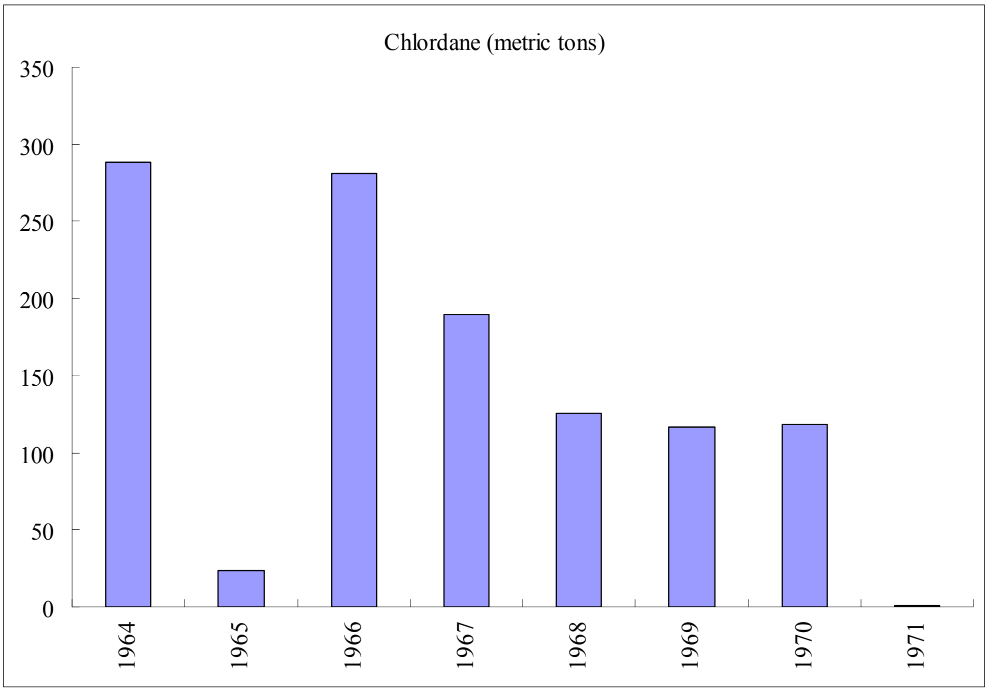


Figure A.3–2 Consumption of Chlordane (metric tons)

Table A.3–3 Consumption of DDT (metric tons)

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Brunei		0.3	0.3	0.3		0.1	0.1	0.1	10	10	10		
Burma	177.3	19.8	43.7	11.7		12.2	20.3	6.1					
Cambodia	6.2	35	92.4	191.7		194.4	66.8	100					
Ceylon (Sri Lanka)				4.6	60.5								
India	732.9	1688.5	2697.2	2871		2612.5	3581.9		1500	2700	4000	4360	6550
Indonesia	28.7												
Iraq	2												
Iran									1385.6	492.3			
Japan	784.8	789.7	844.6	933.4	978.3	895.1	400.9	400					
Jordan			85.6	11.2		100	120	120	31	10			
Korea, South	60.9	49.7	14.1	24.9	48.9	82.1	90	100					
Kuwait			0.1	0.3		0.2	0.2	0.2					
Laos	3.2	7.5				4.5	0.9	2	1	1	1	8.8	1.2
Malaysia	6.4												
Lebanon				14.2	30.2	40	50	60					
Pakistan	122.2										128.4		
Philippines	4.3												
Ryukyu Is	4.2	5.9	1.8	1.1	0.7								
Syria	311.6												
Western Samoa			2.3	2.7	4.8								
Total	2364.7	2696.4	3902.1	4067.1	1223.4	3961.1	4341.1	798.4	2937.6	3223.3	4149.4	4368.8	6551.2

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Brunei												
Burma		44.4	20.1					46.6	47.1	49.8		
Cambodia												
Ceylon (Sri Lanka)												
India	3000	4720	4201	4046	1100	645		390	177	270	379	3949
Indonesia												
Iraq												
Iran												
Japan												
Jordan												
Korea, South												
Kuwait												
Laos	74.9											
Malaysia												
Lebanon												
Pakistan		77.8	90.2		103.4	53.6		110.7		81.6	34.1	423.4
Philippines												
Ryukyu Is												
Syria												
Western Samoa												
Total	3074.9	4842.2	4311.3	4046	1203.4	698.6	0	547.3	224.1	401.4	413.1	4372.4

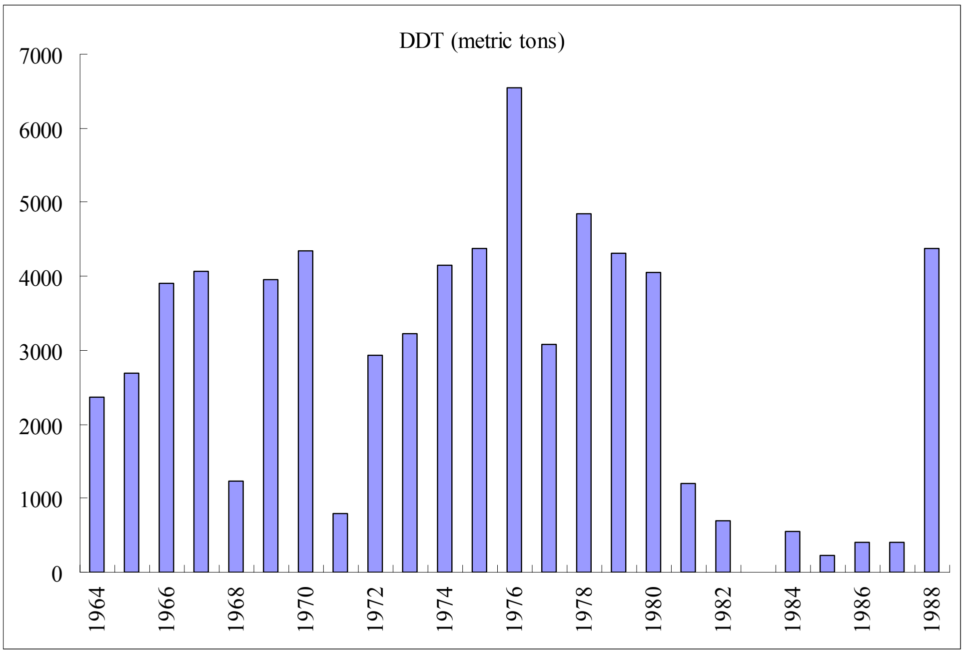


Figure A.3–3 Consumption of DDT (metric tons)

Table A.3–4 Consumption of Dieldrin (metric tons)

	1964	1965	1966	1967	1968	1969	1970	1971
Burma			0.4	0.1		0.1	0.4	0.5
Cambodia		0.2	0.5			0.1	0.8	0.5
India	19.7	12.3	9.8	149.5				
Indonesia	9.3							
Iraq	0.2							
Japan	8.4	9.4	7.8	6.7	6.1	7.6	3.5	3
Korea Rep of	12	6.9		7.6	10.1	3.4	5	5
Lebanon				1.5	1.1	1.5	1.5	1.5
Malaysia	0.4							
Pakistan	8.2							
Syria	0.3							
Samoa	1.4	2.5	3.5					
Total	71.9	38.3	27	168.4	20.3	13.7	12.2	10.5

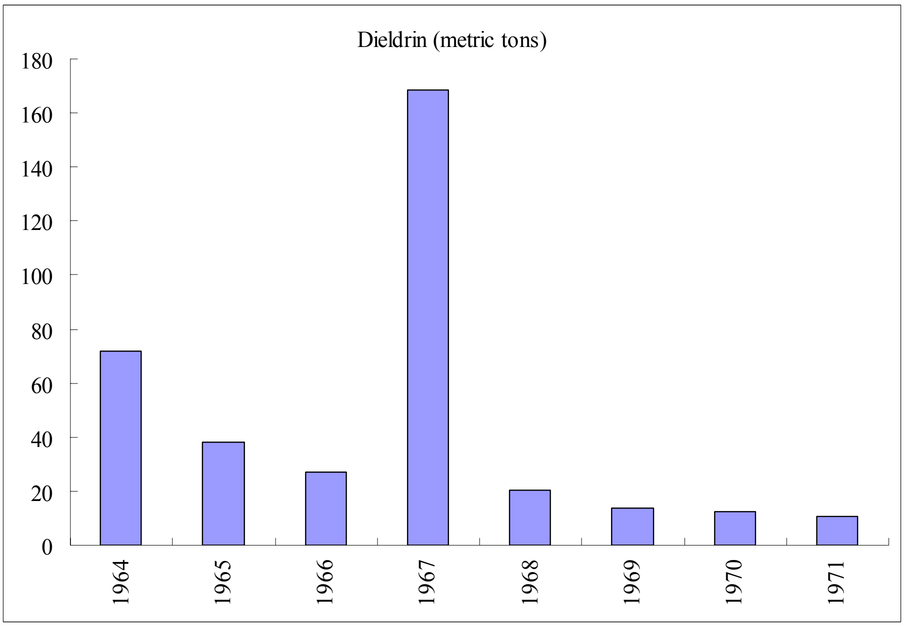


Figure A.3–4 Consumption of Dieldrin (metric tons)

Table A.3–5 Consumption of Toxaphene (metric tons)

	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Cambodia				44.5		103.8	25.5	50	95.4	
Ceylon				12.3	1.1					
India			26.3	10.5		100	151		500	425
Iran									150	82.4
Korea, REP										
Pakistan	18.2									
Sri Lanka						1	1	1		
Syria	1085.4									
Total	1153.6	40	66.3	107.3	31.1	229.8	202.5	71	793.9	557.4

	1974	1975	1976	1977	1978	1979	1980	1981	1982
Cambodia									
Ceylon									
India	200	821	86	435					
Iran									
Korea, REP		9.8	11.2	21.1	35	55.1	19.5	13.8	2.5
Pakistan			2.6	1.2	13.2	5.6	8.6	3	
Sri Lanka									
Syria									
Total	216	830.8	99.8	457.3	48.2	60.7	28.1	16.8	2.5

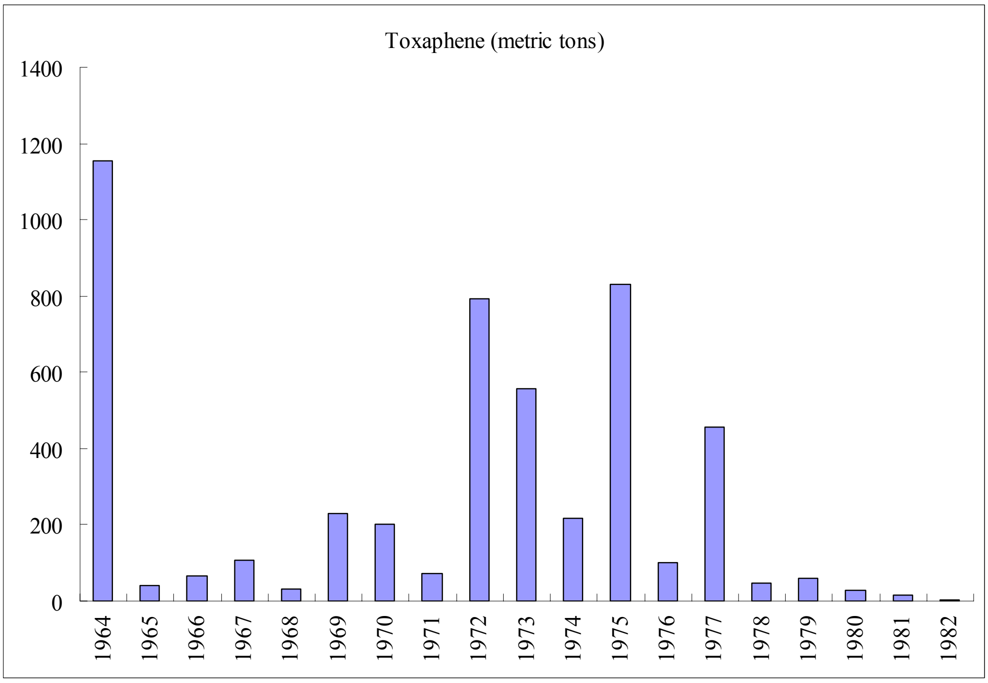


Figure A.3–5 Consumption of Toxaphene (metric tons)

Annex B

Emission Inventories in each country of Asia-Pacific Region

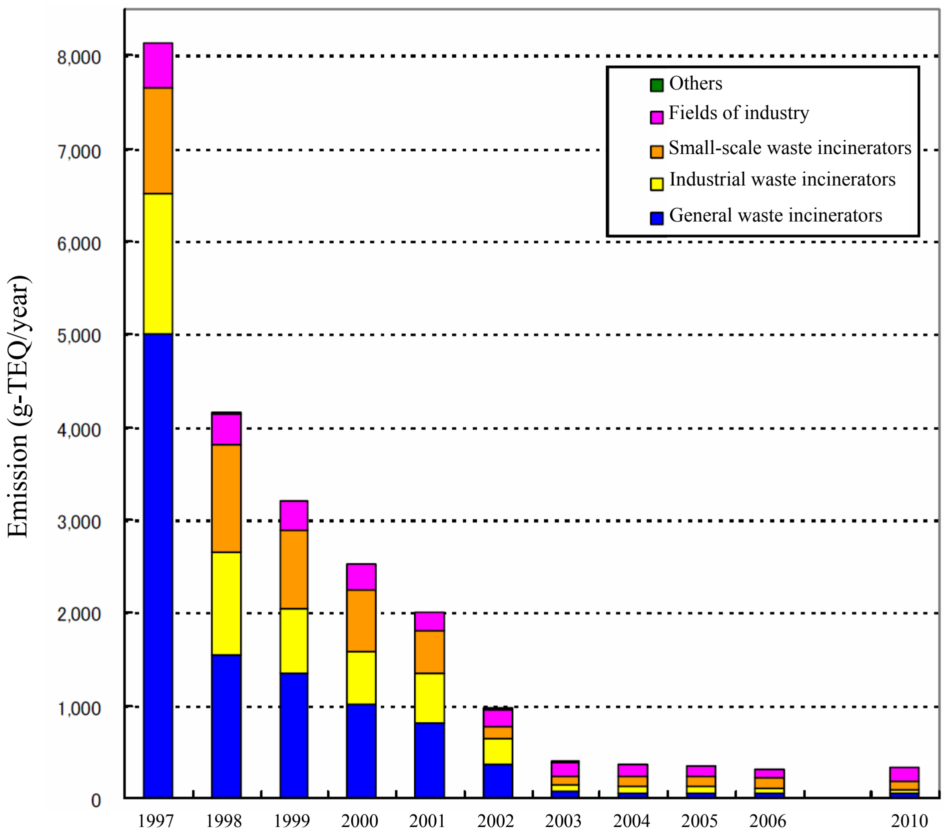
B.1 PCDD, PCDF, and co-PCB

(1) Japan

Table B.1–1 Dioxins (PCDD/Fs and co-PCBs) Emission Inventory in Japan

Sources of Dioxin Emissions	Total Amount of Dioxins Emission (g-TEQ/year)									
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1 Fields of waste disposal	7205 - 7658	3355 - 3808	2562 - 2893	2121 - 2252	1689 - 1801	748 - 771	219 - 244	215 - 237	213 - 237	193 - 218
"Water"	5.3	5.3	5.3	2.5	1.5	0.87	0.6	0.65	0.36	0.78
2 Fields of industry	470	335	306	268	205	189	149	125	110	93
"Water"	6.3	5.8	5.8	5	1.8	1.2	0.93	1	1	0.75
3 Others	4.8 - 7.4	4.9 - 7.6	4.9 - 7.7	4.9 - 7.6	4.7 - 7.5	4.3 - 7.2	4.4 - 7.3	4.2 - 7.2	4.2 - 7.2	4.0 - 7
"Water"	1.2	1.2	1.2	1.2	1	0.53	0.56	0.37	0.47	0.24
Total	7680 - 8135	3695 - 4151	2874 - 3208	2394 - 2527	1899 - 2013	941 - 967	372 - 400	344 - 369	327 - 354	289 - 317
"Water"	12.8	12.3	12.4	8.7	4.4	2.6	2.1	2	1.8	1.8

Note: "Water" in the table means the amount emitted into water
Reference: Ministry of the Environment, Japan (2007) Dioxins Emission Inventory for 2006.
http://www.env.go.jp/en/headline/headline.php?serial=654



Reference: Ministry of the Environment, Japan (2007) Dioxins Emission Inventory for 2006.
http://www.env.go.jp/press/press.php?serial=9180 (in Japanese)

Figure B.1–1 Trends of the emission of dioxins in Japan

(2) **Qatar**

Table B.1–2 Dioxins and Frans Emissions Calculated from Actual Analyses in 2006, Qatar

Waste stream	Analysis	Annual release in g TEQ/year	Comments
Flue gas from dedicated incinerator	0.013-0.06 ng/Nm^3	0.001-0.005	
Water from biological wastewater plant	0-9.5 pg/l	0- 0.0006	
Dry sludge from biological wastewater plant	320 ng/kg	0.001-0.0015	Controlled storage on site
Spent catalyst	40-57 ng/g	2.5-4	Controlled storage on site

Reference: Information submitted from Qatar

Table B.1–3 Summary of PCDD and PCDF Formation in g TEQ/year

Category	Emissions to the air	To waste water	In solid waste
Incineration	0.4820		0.083
Metals production	0.1200		1.728
Power generation	0.2200		
Biomass burning	0.7650		
Cement production	7.5000		
Asphalt mixing			
Transportation	1.2000		
Oil and gas industry	0.3450	<0.0006	4.002
Tobacco	0.0002		
Total	10.6322	<0.0006	5.813

Reference: Information submitted from Qatar

B.2 Hexachlorobenzene (HCB)

HCB emission inventory in Japan

Table B.2–1 HCB emission inventory in Japan

Source of emission	Emission (kg/year) 2002 [1]	Emission (kg/year) 2006 [2]
Part II Source categories	85	86
Waste incinerators	44 Water 0.061	25 Water
Cement kilns	11	12
Production of pulp	0.08 Water 0.080	0 Water
Thermal processes in the metallurgical industry	30	49
Secondary copper production	-	-
Sinter plants in the iron and steel industry	16	16
Secondary aluminum production	3	3.2
Secondary zinc production	11	30
Part III Source categories	100	92
Thermal processes in the metallurgical industry not mentioned in Part II	100	91
Fossil fuel-fired utility and industrial boilers	0.38	0.23
Firing installations for wood and other biomass fuels	0.034	0.2
Specific chemical production processes	0.24	0.28
Crematoria	0.16	0.17
Smouldering of copper cables	0.42	0.44
Other source categories	1.9	1.3
Total	190	179

Note: Part II Source categories: Source categories in Part II of Annex C of the Stockholm Convention
Part III Source categories: Source categories in Part III of Annex C of the Stockholm Convention
Reference: 1) National Implementation Plan, Japan (2006)
2) Information submitted from Ministry of the Environment, Japan

B.3 Polychlorinated Biphenyls (PCB)

PCB emission inventory in Japan

Table B.3–1 PCB emission inventory in Japan

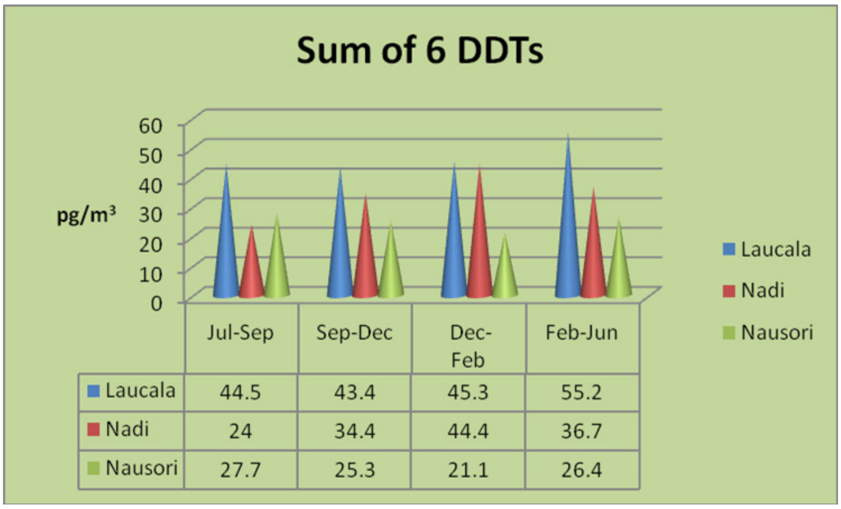
Source of emission	Emission (kg/year) 2002 [1]	Emission (kg/year) 2006 [2]
Part II Source categories	450	565
Waste incinerators	15 Water 0.18	14 Water
Cement kilns	350	424
Production of pulp	5.7 Water 5.7	0 Water
Thermal processes in the metallurgical industry	82	120
Secondary copper production	-	-
Sinter plants in the iron and steel industry	45	45
Secondary aluminum production	10	11
Secondary zinc production	26	64
Part III Source categories	100	95
Thermal processes in the metallurgical industry not mentioned in Part II	100	94
Fossil fuel-fired utility and industrial boilers	0.84	0.69
Firing installations for wood and other biomass fuels	0.28	0.29
Specific chemical production processes	0.031	0.04
Crematoria	0.44	0.46
Smouldering of copper cables	0.084	0.09
Other source categories	5.1	5.9
Total	560	654

Note: Part II Source categories: Source categories in Part II of Annex C of the Stockholm Convention
Part III Source categories: Source categories in Part III of Annex C of the Stockholm Convention
Reference: 1) National Implementation Plan, Japan (2006)
2) Information submitted from Ministry of the Environment, Japan

Annex C

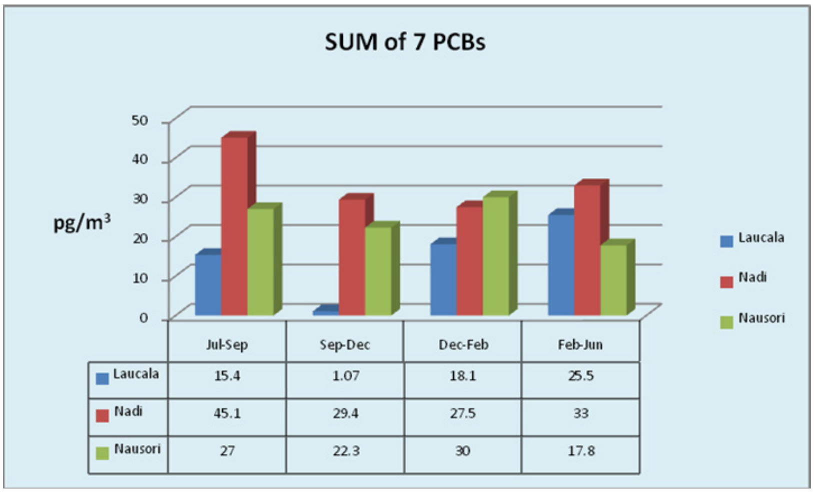
Detail information on air concentration in the region

C.1 Fiji



6 DDTs: *p,p'*-DDT, *o,p'*-DDT, *p.p'*-DDD, *o,p'*-DDD, *p.p'*-DDE, *o,p'*-DDE

Figure C.1–1 Total concentrations of 6 DDTs in Fiji



7 PCBs: PCB 28, 52, 101, 118, 138, 153, 180

Figure C.1–2 Total concentrations of 7 PCBs in Fiji

C.2 Japan

Table C.2–1 Air concentrations of POPs in Japan

		median (range) (pg/m^3)						
		2002	2003 warm	2003 cold	2004 warm	2004 cold	2005 warm	2005 cold
Total PCBs		100 (16-880)	340 (36-2600)	120 (17-630)	250 (25-3300)	130 (20-1500)	210 (23-1500)	64 (20-380)
HCB		93 (57-3000)	130 (81-430)	90 (64-320)	130 (47-430)	89 (51-390)	90 (27-250)	68 (44-180)
Aldrin		nd (nd-3.2)	1.9 (nd-28)	0.44 (0.03-6.9)	nd (nd-14)	nd (nd-13)	0.56 (nd-10)	nd (nd-1.8)
Deldrin		5.4 (0.73-110)	22 (2.1-260)	5.2 (tr(0.82)-110)	22 (1.1-280)	6.9 (0.81-76)	12 (1.5-200)	3.6 (0.88-50)
Endrin		0.28 (nd-2.5)	0.95 (0.081-6.2)	0.2 (0.042-2.1)	0.68 (tr(0.054)-6.5)	0.26 (nd-1.9)	tr(0.3) (nd-2.9)	nd (nd-0.7)
DDT	*p,p'*-DDT	1.8 (0.25-22)	6.6 (0.75-24)	1.6 (0.31-11)	5.1 (0.41-37)	1.7 (0.29-13)	4.2 (0.44-31)	0.99 (0.25-4.8)
	p,p'-DDE	2.7 (0.56-28)	7 (1.2-51)	2.4 (1.1-22)	6.3 (0.62-95)	2.6 (0.85-43)	5.7 (1.2-42)	1.5 (0.76-9.9)
	p,p'-DDD	0.13 (nd-0.76)	0.35 (0.063-1.4)	0.14 (tr(0.037)-0.52)	0.27 (tr(0.036)-1.4)	0.12 (tr(0.025)-0.91)	0.26 (tr(0.07)-1.3)	tr(0.07) (nd-0.29)
	o,p'-DDT	2 (0.41-40)	7.7 (0.61-38)	1.4 (0.43-6.4)	5.4 (0.54-22)	1.4 (0.35-9.4)	3.1 (0.67-14)	0.67 (0.32-3)
	o,p'-DDE	0.56 (0.11-8.5)	1.5 (0.17-7.5)	0.47 (0.18-1.7)	1.2 (0.14-8.9)	0.49 (0.14-3.9)	1.5 (0.33-7.9)	0.59 (0.24-2)
	o,p'-DDD	0.18 (nd-0.85)	0.42 (0.059-1.3)	0.14 (0.062-0.42)	0.33 (tr(0.052)-2.6)	tr(0.13) (nd-0.86)	0.19 (tr(0.07)-0.9)	tr(0.07) (nd-0.21)
Chlordane	*cis*-Chlordane	40 (0.86-670)	120 (6.4-1600)	38 (2.5-220)	160 (2.3-1000)	49 (1.2-290)	120 (3.4-1000)	19 (1.4-260)
	trans-Chlordane	48 (0.62-820)	150 (6.5-2000)	44 (2.5-290)	190 (2.2-1300)	60 (1.5-360)	130 (3.2-1300)	23 (1.9-310)
	Oxychlordane	0.98 (nd-8.3)	2.7 (0.41-12)	0.88 (0.41-3.2)	2 (0.41-7.8)	0.76 (0.27-3.9)	2 (0.65-8.8)	0.5 (0.27-2.2)
	cis-Nonachlor	4 (0.071-62)	15 (0.81-220)	3.5 (0.18-23)	15 (0.36-130)	4.4 (0.087-28)	14 (0.3-160)	1.6 (0.08-34)
	trans-Nonachlor	30 (0.64-550)	100 (5.1-1200)	28 (2.1-180)	120 (1.9-870)	39 (0.95-240)	95 (3.1-870)	16 (1.2-210)
Heptachlor	Heptachlor	14 (0.2-220)	41 (1.1-240)	16 (0.39-65)	36 (0.46-200)	18 (0.53-100)	29 (1.1-190)	7.9 (0.52-61)
	cis-Heptachloro epoxide		3.5 (0.45-28)	1.3 (0.49-6.6)	2.9 (0.65-9.7)	1.1 (0.44-7)	1.7 (tr(0.10)-11)	0.81 (0.43-2.9)
	trans-Heptachloro epoxide		tr(0.038) (nd-0.3)	nd (nd-tr(0.094))	nd (nd-tr(0.38))	nd	tr(0.12) (nd-1.2)	nd (nd-0.32)
Toxaphene	Parlar-26		0.31 (tr(0.17)-0.77)	tr(0.17) (tr(0.091)-0.27)	0.26 (tr(0.17)-0.46)	tr(0.15) (tr(0.094)-0.5)	nd	nd
	Parlar-50		nd (nd-tr(0.37))	nd	nd	nd	nd	nd
	Parlar-62		nd	nd	nd	nd	nd	nd
Mirex			0.12 (0.047-0.19)	0.043 (tr(0.091)-0.099)	0.11 (tr(0.042)-0.16)	tr(0.047) (tr(0.019)-0.23)	tr(0.09) (tr(0.05)-0.24)	tr(0.04) (nd-tr(0.08))

Reference: Ministry of the Environment, Japan. Chemicals in the Environment.
http://www.env.go.jp/chemi/kurohon/en/index.html (Access on July 2008)

Table C.2-2 Concentrations of POPs in Ambient Air at Hateruma Island, Japan in 2004 (pg/m^3)

Chemicals	Apr.	July	Aug.	Sept.	Oct.	Nov.	Dec.
HCB	42	108	16	99	65	43	115
Aldrin	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Dieldrin	2.2	4.1	3.7	2.6	n.d.	(0.86)	n.d.
Endrin	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
p,p'-DDT	n.d.	n.d.	n.d.	3.0	1.7	n.d.	n.d.
p,p'-DDE	1.5	(0.48)	(0.43)	8.0	0.82	0.94	2.9
p,p'-DDD	(0.32)	(0.44)	(0.27)	2.0	n.d.	5.9	n.d.
o,p'-DDT	3.1	n.d.	n.d.	26	1.8	3.8	3.7
o,p'-DDE	2.1	0.26	(0.04)	12	0.66	0.85	3.3
o,p'-DDD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
trans-Chlordane	22	4.4	4.8	14	1.8	4.6	19
cis-Chlordane	17	5.2	4.9	12	2.0	3.6	15
trans-Nonachlor	12	3.1	3.1	8.7	1.8	3.0	13
cis-Nonachlor	1.5	(0.62)	(0.54)	(1.22)	n.d.	n.d.	1.4
Oxychlordane	(0.83)	n.d.	n.d.	n.d.	n.d.	n.d.	(0.80)
Heptachlor	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
trans-Heptachlorepoxide	1.7	0.53	0.43	0.65	0.71	0.68	0.41
cis-Heptachlorepoxide	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Mirex	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Toxaphene (Parlar-26)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Toxaphene (Parlar-50)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Toxaphene (Parlar-62)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

n.d.: not detected.
italic letter.: reference value because surrogate recovery was out of 40 to 120 percent.
n.a.: not available because surrogate recovery was out of 25 to 150 percent.
Values in parenthesis show that it was within IDL to IQL.

Table C.2-3 Concentrations of POPs in Ambient Air at Hateruma Island, Japan in 2005 (pg/m^3)

Chemicals	Jan.	Mar.	May	June	July	Aug.	Sept.	Nov.	Dec.
HCB	305	57	114	71	41	39	44	52	49
Aldrin	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Dieldrin	19	n.d.	2.9	n.d.	(1.8)	n.d.	n.d.	(1.0)	n.d.
Endrin	n.d.	n.d.	n.d.	n.d.	(0.42)	n.d.	n.d.	n.d.	n.d.
p,p'-DDT	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
p,p'-DDE	5.2	0.40	1.3	0.50	(0.40)	n.d.	(0.31)	(0.60)	4.7
p,p'-DDD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
o,p'-DDT	6.0	n.d.	1.8	n.d.	(1.3)	n.d.	(0.48)	1.8	(1.1)
o,p'-DDE	4.3	n.d.	0.70	0.30	0.28	(0.10)	(0.11)	0.46	1.9
o,p'-DDD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
trans-Chlordane	30	n.d.	2.3	(0.60)	n.d.	n.d.	n.d.	(1.30)	n.d.
cis-Chlordane	20	(0.60)	2.4	(0.70)	(0.52)	(0.50)	(0.74)	1.7	(0.55)
trans-Nonachlor	15	(0.40)	1.5	3.7	(0.39)	(0.33)	(0.45)	1.0	(0.47)
cis-Nonachlor	3.3	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Oxychlordane	1.0	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Heptachlor	5.2	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	(0.57)	n.d.
trans-Heptachlorepoxide	1.2	n.d.	n.d.	n.d.	n.d.	0.50	0.80	0.55	n.d.
cis-Heptachlorepoxide	n.d.	n.d.	n.d.	n.d.	(0.13)	(0.14)	(0.12)	(0.15)	n.d.
Mirex	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Toxaphene (Parlar-26)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Toxaphene (Parlar-50)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Toxaphene (Parlar-62)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

n.d.: not detected.
italic letter.: reference value because surrogate recovery was out of 40 to 120 percent.
n.a.: not available because surrogate recovery was out of 25 to 150 percent.
Values in parenthesis show that it was within IDL to IQL.

Table C.2-4 Concentrations of POPs in Ambient Air at Hateruma Island, Japan in 2006 (pg/m^3)

Chemicals	Mar.	Apr.	May	July	Aug.	Oct.	Nov.	Dec.
HCB	47	26	25	13	35	94	88	65
Aldrin	*n.d.*	*n.d.*	*n.d.*	*n.d.*	*n.d.*	n.a.	n.a.	n.a.
Dieldrin	n.d.	n.d.	n.d.	n.d.	(0.76)	3.5	0.24	0.41
Endrin	n.d.	n.d.	n.d.	n.d.	n.d.	0.33	n.d.	n.d.
p,p'-DDT	n.d.	n.d.	n.d.	n.d.	n.d.	1.1	n.d.	n.d.
p,p'-DDE	n.d.	n.d.	n.d.	n.d.	n.d.	1.6	2.2	0.9
p,p'-DDD	2.3	2.9	1.8	1.6	0.84	n.d.	n.d.	n.d.
o,p'-DDT	(0.55)	2.3	1.9	2.2	(0.90)	2.1	0.84	1.6
o,p'-DDE	0.55	0.57	0.31	0.46	(0.15)	1.1	0.53	0.88
o,p'-DDD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
trans-Chlordane	(0.66)	(0.60)	n.d.	(0.67)	(2)	2.1	2.2	1.8
cis-Chlordane	(0.76)	(0.59)	n.d.	(0.58)	1.4	1.9	1.5	1.5
trans-Nonachlor	n.d.	n.d.	n.d.	n.d.	n.d.	0.9	1.3	1.1
cis-Nonachlor	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	(0.17)	n.d.
Oxychlordane	n.d.	n.d.	n.d.	n.d.	n.d.	(0.51)	(0.50)	(0.33)
Heptachlor	n.d.	n.d.	(0.66)	2.9	n.d.	0.44	0.35	n.d.
trans-Heptachlorepoxide	0.57	0.68	0.71	0.68	0.77	n.d.	n.d.	n.d.
cis-Heptachlorepoxide	n.d.	n.d.	n.d.	n.d.	n.d.	0.72	0.62	0.49
Mirex	n.d.	n.d.	n.d.	n.d.	n.d.	0.15	0.17	0.23
Toxaphene (Parlar-26)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Toxaphene (Parlar-50)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Toxaphene (Parlar-62)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

n.d.: not detected.
italic letter.: reference value because surrogate recovery was out of 40 to 120 percent.
n.a.: not available because surrogate recovery was out of 25 to 150 percent.
Values in parenthesis show that it was within IDL to IQL.

Table C.2-5 Concentrations of POPs in Ambient Air at Hateruma Island, Japan in 2007 (pg/m^3)

	Feb	Mar.	Apr.	May	June	July
HCB	95	125	108	94	68	64
Aldrin	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Dieldrin	3.2	4.5	4.3	3.5	6.7	5.4
Endrin	0.34	0.22	0.25	0.34	0.23	0.67
P,p'-DDT	1.1	n.d.	2.1	n.d.	1.2	n.d.
P,p'-DDE	2.3	1.8	1.4	0.48	1.1	0.6
P,p'-DDD	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
o,p'-DDT	2.5	4.8	2.9	0.58	1.6	(0.17)
o,p'-DDE	0.63	1.2	0.94	0.21	0.17	(0.05)
o,p'-DDD	n.d.	0.38	n.d.	n.d.	(0.12)	n.d.
trans-Chlordane	1.2	4.8	2.8	1.3	2.3	1.8
cis-Chlordane	1.4	4.4	2.8	1.8	2.2	1.8
trans-Nonachlor	0.77	2.7	1.8	1.0	1.0	1.3
cis-Nonachlor	n.d.	(0.15)	n.d.	(0.15)	n.d.	n.d.
Oxychlordane	(0.32)	(0.52)	(0.51)	(0.47)	(0.44)	n.d.
Heptachlor	0.51	3.8	0.45	0.46	n.d.	0.22
trans-Heptachlorepoxide	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
cis-Heptachlorepoxide	0.36	1.1	0.72	0.62	0.49	0.81
Mirex	0.18	0.20	0.16	0.21	0.13	0.32
Toxaphene(Parlar-26)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Toxaphene(Parlar-50)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
Toxaphene(Parlar-62)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

n.d.: not detected.
n.a.: not available because surrogate recovery was out of 25 to 150 percent.
Values in parenthesis show that it was within IDL to IQL.

C.3 East Asian Countries [5]

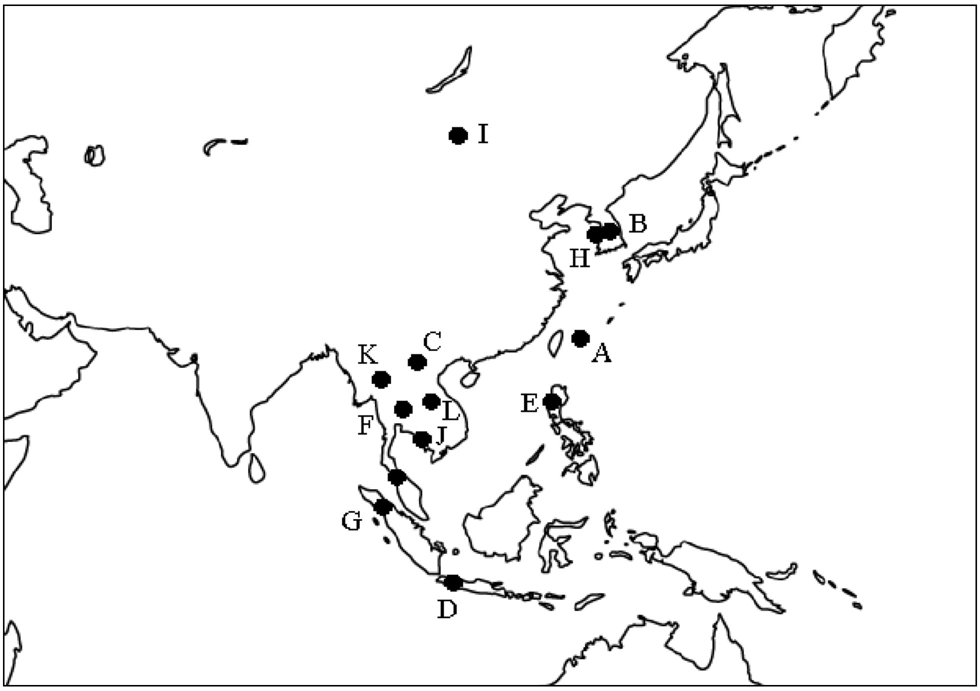


Figure C.3–1 Map of Sampling sites of POPs Monitoring Project in East Asian Countries

Table C.3–1 Air concentrations of Aldrin in East Asian Countries

Country	sites	2005	2006	2007
Cambodia	J	-	n.a.	-
Indonesia	D	n.a.	-	-
	G	-	n.a.	-
Republic of Korea	B	n.a.	n.a.	n.a.
	H	-	n.a.	n.a.
Mongolia	I	-	<0.17	-
Philippines	E	-	n.a.	-
Thailand	F	-	n.a.	-
	K	-	-	n.a.
Vietnam	C	0.11	n.a.	-

n.a.: not available because surrogate recovery was out of 25 to 150 percent.
−: no information

[5] Reference: POPs Monitoring Project in East Asian Countries (2007) Background Air Monitoring of Persistent Organic Pollutants in East Asian Countries 2004-2007 http://www.env.go.jp/en/chemi/pops/eaws/background04-07.pdf

Table C.3-2 Air concentrations of Chlordane in East Asian Countries

Chemical	Country	sites	2005	2006	2007
cis-Chlordane	Cambodia	J	-	n.a.	-
	Indonesia	D	11	-	-
		G	-	1.7	-
	Republic of Korea	B	-	-	1.3
		H	-	-	1.1
	Mongolia	I	-	(0.66)	-
	Philippines	E	-	2.3	-
	Thailand	F	-	27	-
		K	-	-	(0.55)
	Vietnam	C	2.1	2.3	-
trans-Chlordane	Cambodia	J	-	n.a.	-
	Indonesia	D	18	-	-
		G	-	2.4	-
	Republic of Korea	B	<0.02	*1.4*	1.4
		H	-	*2.3*	1.0
	Mongolia	I	-	*<0.58*	-
	Philippines	E	-	3.5	-
	Thailand	F	-	45	-
		K	-	-	<0.58
	Vietnam	C	2.8	2.8	-
cis-Nonachlor	Cambodia	J	-	<0.56	-
	Indonesia	D	2.3	-	-
		G	-	0.21	-
	Republic of Korea	B	-	-	<0.1
		H	-	-	1.4
	Mongolia	I	-	<0.56	-
	Philippines	E	-	0.36	-
	Thailand	F	-	3.2	-
		K	-	-	<0.56
	Vietnam	C	0.38	0.06	-
trans-Nonachlor	Cambodia	J	-	n.a.	-
	Indonesia	D	9.3	-	-
		G	-	1.2	-
	Republic of Korea	B	<0.02	<0.02	<0.05
		H	-	<0.02	1.2
	Mongolia	I	-	(0.66)	-
	Philippines	E	-	1.7	-
	Thailand	F	-	19	-
		K	-	-	<0.65
	Vietnam	C	1.7	0.84	-
Oxychlordane	Cambodia	J	-	<1.8	-
	Indonesia	D	(0.61)	-	-
		G	-	0.26	-
	Republic of Korea	B	<0.08	<0.08	<0.1
		H	-	<0.08	<0.1
	Mongolia	I	-	<1.8	-
	Philippines	E	-	0.26	-
	Thailand	F	-	1.7	-
		K	-	-	<1.8
	Vietnam	C	n.d.	0.22	-

Italic letter: reference value because surrogate recovery was out of 40 to 120 percent.
Values in parenthesis show that it was within IDL to IQL.
−: no information

Table C.3-3 Air concentrations of Dieldrin in East Asian Countries

Country	sites	2005	2006	2007
Cambodia	J	-	1.5	-
Indonesia	D	34	-	-
	G	-	19	-
Republic of Korea	B	<0.06	<0.06	<0.1
	H	-	<0.06	<0.1
Mongolia	I	-	(0.68)	-
Philippines	E	-	*1.5*	-
Thailand	F	-	23	-
	K	-	-	(0.51)
Vietnam	C	0.78	1.1	-

Italic letter: reference value because surrogate recovery was out of 40 to 120 percent.
Values in parenthesis show that it was within IDL to IQL.
−: no information

Table C.3-4 Air concentrations of DDTs in East Asian Countries

Chemicals	Country	sites	2005	2006	2007
o,p'-DDD	Cambodia	J	-	1.0	-
	Indonesia	D	1.00	-	-
		G	-	1.3	-
	Republic of Korea	B	-	<0.04	<0.05
		H	-	<0.04	<0.05
	Mongolia	I	-	<0.43	-
	Philippines	E	-	(0.06)	-
	Thailand	F	-	1.0	-
		K	-	-	<0.43
	Vietnam	C	7.1	1.9	-
p,p'-DDD	Cambodia	J	-	2.1	-
	Indonesia	D	2.0	-	-
		G	-	2.8	-
	Republic of Korea	B	-	<0.07	<0.1
		H	-	<0.07	<0.1
	Mongolia	I	-	<0.45	-
	Philippines	E	-	<0.07	-
	Thailand	F	-	2.2	-
		K	-	-	<0.45
	Vietnam	C	2.9	2.8	-
o,p'-DDE	Cambodia	J	-	2.0	-
	Indonesia	D	1.6	-	-
		G	-	2.5	-
	Republic of Korea	B	0.4	<0.01	<0.05
		H	-	<0.01	1.3
	Mongolia	I	-	<0.19	-
	Philippines	E	-	0.22	-
	Thailand	F	-	2.7	-
		K	-	-	(0.35)
	Vietnam	C	5.8	8.8	-

Chemicals	Country	sites	2005	2006	2007
p,p'-DDE	Cambodia	J	-	25.0	-
	Indonesia	D	15	-	-
		G	-	95	-
	Republic of Korea	B	2.0	<0.01	1.8
		H	-	<0.02	4.8
	Mongolia	I	-	0.59	-
	Philippines	E	-	0.88	-
	Thailand	F	-	14	-
		K	-	-	1.5
	Vietnam	C	11	14	-
o,p'-DDT	Cambodia	J	-	8.0	-
	Indonesia	D	9.3	-	-
		G	-	24	-
	Republic of Korea	B	<0.03	<0.03	<0.05
		H	-	<0.03	1.6
	Mongolia	I	-	<0.46	-
	Philippines	E	-	0.70	-
	Thailand	F	-	6.9	-
		K	-	-	1.8
	Vietnam	C	35	21	-
p,p'-DDT	Cambodia	J	-	28	-
	Indonesia	D	*13*	-	-
		G	-	41	-
	Republic of Korea	B	-	<0.10	<0.1
		H	-	<0.10	1.5
	Mongolia	I	-	1.7	-
	Philippines	E	-	1.0	-
	Thailand	F	-	22	-
		K	-	-	*3.4*
	Vietnam	C	21	15	-

Italic letter: reference value because surrogate recovery was out of 40 to 120 percent.
Values in parenthesis show that it was within IDL to IQL.
−: no information

Table C.3-5 Air concentrations of Endrin in East Asian Countries

Country	sites	2005	2006	2007
Cambodia	J	-	<0.38	-
Indonesia	D	(1.5)	-	-
	G	-	11	-
Republic of Korea	B	<0.1	<0.1	<0.1
	H	-	<0.1	<0.1
Mongolia	I	-	<0.38	-
Philippines	E	-	<0.1	-
Thailand	F	-	0.94	-
	K	-	-	<0.38
Vietnam	C	n.d.	<0.1	-

n.d.: not detected.
Values in parenthesis show that it was within IDL to IQL.
−: no information

Table C.3-6 Air concentrations of Heptachlor in East Asian Countries

Chemicals	Country	sites	2005	2006	2007
Heptachlor	Cambodia	J	-	0.85	-
	Indonesia	D	6.6	-	-
		G	-	1.4	-
	Republic of Korea	B	<0.03	<0.03	0.4
		H	-	<0.03	0.5
	Mongolia	I	-	<0.52	-
	Philippines	E	-	*1.5*	-
	Thailand	F	-	23	-
		K	-	-	<0.52
	Vietnam	C	0.78	1.1	-
Heptachlorepoxide	Republic of Korea	B	<0.02	<0.02	<0.05
		H	-	1.1	<0.05
cis-Hepachlorepoxide	Cambodia	J	-	(0.32)	-
	Indonesia	D	0.79	-	-
		G	-	0.45	-
	Mongolia	I	-	<0.19	-
	Philippines	E	-	0.34	-
	Thailand	F	-	2.5	-
		K	-	-	<0.19
	Vietnam	C	0.40	0.29	-
trans-Hepachlorepoxide	Cambodia	J	-	<0.19	-
	Indonesia	D	<0.09	-	-
		G	-	<0.05	-
	Mongolia	I	-	0.64	-
	Philippines	E	-	<0.05	-
	Thailand	F	-	<0.05	-
		K	-	-	<0.19
	Vietnam	C	n.d.	<0.05	-

Italic letter: reference value because surrogate recovery was out of 40 to 120 percent.
Values in parenthesis show that it was within IDL to IQL.
−: no information

Table C.3-7 Air concentrations of HCB in East Asian Countries

Country	sites	2005	2006	2007
Cambodia	J	-	n.a.	-
Indonesia	D	110	-	-
	G	-	110	-
Republic of Korea	B	-	*70*	81.5
	H	-	*75*	103.2
Mongolia	I	-	*94*	-
Philippines	E	-	110	-
Thailand	F	-	*330*	-
	K	-	-	87
Vietnam	C	92	330	-

Italic letter: reference value because surrogate recovery was out of 40 to 120 percent.
−: no information

Table C.3-8 Air concentrations of Mirex in East Asian Countries

Country	sites	2005	2006	2007
Cambodia	J	-	<0.41	-
Indonesia	D	0.28	-	-
	G	-	0.29	-
Republic of Korea	B	<0.005	<0.005	<0.05
	H	-	<0.005	<0.05
Mongolia	I	-	*<0.17*	-
Philippines	E	-	0.10	-
Thailand	F	-	1.8	-
	K	-	-	<0.41
Vietnam	C	0.31	0.47	-

Italic letter: reference value because surrogate recovery was out of 40 to 120 percent.
−: no information

Table C.3-9 Air concentrations of Toxaphene in East Asian Countries

Chemicals	Country	sites	2005	2006	2007
Toxaphene	Republic of Korea	B	<10	<10	-
		H	-	<10	-
Toxaphene (Parlar-26)	Cambodia	J	-	<0.86	-
	Indonesia	D	<0.07	-	-
		G	-	17	-
	Republic of Korea	B	-	-	<1
		H	-	-	<1
	Mongolia	I	-	<0.86	-
	Philippines	E	-	<1	-
	Thailand	F	-	<1	-
		K	-	-	<0.86
	Vietnam	C	n.d.	<1	-
Toxaphene (Parlar-50)	Cambodia	J	-	<2.6	-
	Indonesia	D	<0.08	-	-
		G	-	18	-
	Republic of Korea	B	-	-	<1
		H	-	-	<1
	Mongolia	I	-	<2.6	-
	Philippines	E	-	<1	-
	Thailand	F	-	<1	-
		K	-	-	<2.6
	Vietnam	C	n.d.	<1	-
Toxaphene (Parlar-62)	Cambodia	J	-	<6.8	-
	Indonesia	G	-	<16	-
	Republic of Korea	B	-	-	<10
		H	-	-	<10
	Mongolia	I	-	<6.8	-
	Philippines	E	-	<14	-
	Thailand	F	-	<14	-
		K	-	-	<6.8
	Vietnam	C	-	<14	-

n.d.: not detected.
−: no information

C.4 China

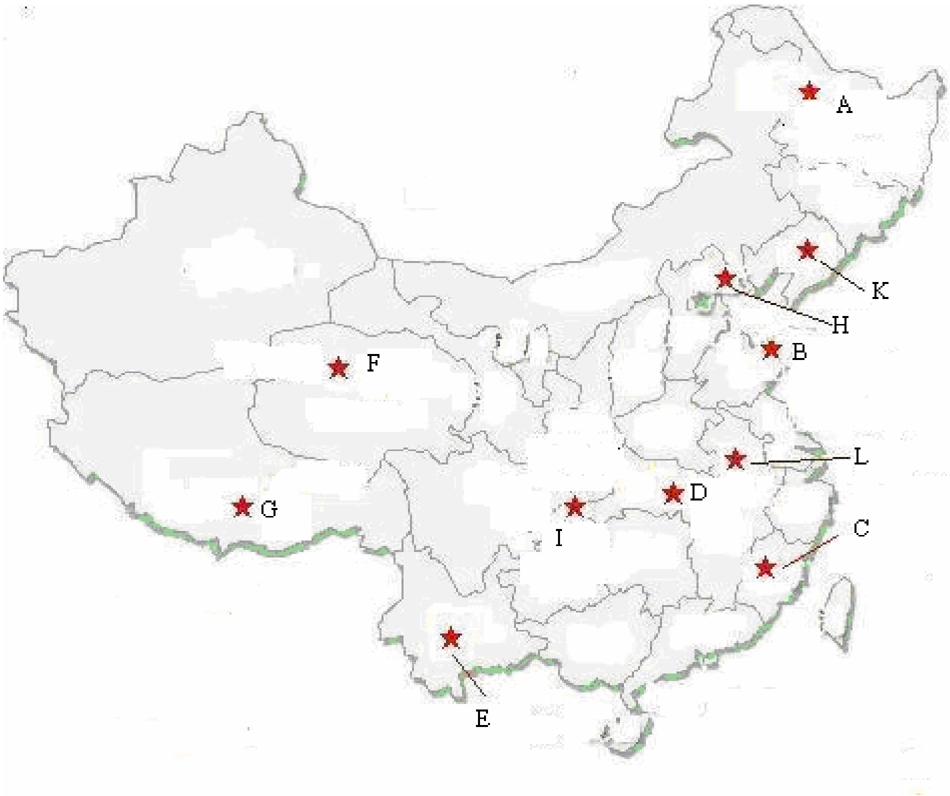


Figure C.4-1 Sampling locations of eleven air background monitoring sites in China.

Table C.4-1 Concentrations of pesticides (pg/m^3) in ambient air in China

	A1	A2	B1	B2	C1	C2	D1	D2	E1	E2	F1	F2
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-Heptachlor epoxides(A)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
oxychlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-Heptachlor epoxides(B)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-chlordane	ND	ND	ND	4.1	ND	1.2	ND	ND	ND	ND	ND	ND
2,4'-DDE	ND	0.07	0.03	0.02	0.73	ND	0.06	2.28	2.11	3.79	1.40	0.14
cis-chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-nonachlor	ND	ND	ND	ND	ND	ND	ND	0.47	ND	ND	ND	ND
4,4'-DDE	0.90	0.57	0.30	0.21	2.07	0.05	0.74	8.99	5.63	9.45	0.59	0.67
dieldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4'-DDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	0.032	ND	ND	ND	ND	ND	0.05	0.29	ND	ND
2,4'-DDT	ND	0.21	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-nonachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	ND	ND	ND	0.12	ND	ND	ND	0.34	0.46	ND	ND	0.25
Mirex	ND	0.02	0.03	0.05	0.11	ND	0.04	0.03	0.02	0.03	0.03	0.01

	G1	G2	H1	H2	I1	I2	K1	K2	L1	L2
Heptachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-Heptachlor epoxides(A)	8.31	ND	ND	ND	ND	ND	ND	ND	ND	ND
oxychlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-Heptachlor epoxides(B)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4'-DDE	ND	0.60	0.38	0.13	1.16	0.04	0.05	0.03	0.78	0.56
cis-chlordane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-nonachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	0.13	2.61	0.60	1.67	3.23	0.35	0.41	0.16	1.74	1.43
dieldrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4'-DDD	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
endrin	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDD	ND	ND	ND	ND	ND	0.05	ND	ND	0.14	0.05
2,4'-DDT	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-nonachlor	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	0.14	0.23	ND	0.32	ND	0.39	0.27	0.12	ND	0.30
Mirex	ND	0.04	ND	0.03	0.02	0.02	0.05	0.03	ND	0.02

ND = not detected: Detection limit for DDT, HCB and Mirex were lower than 0.01pg/m3, detection limit for other POPs were 1pg/m3

Table C.4-2 Concentrations of marker PCBs and HCB in ambient air in China (pg/m^3)

Sample ID	H		A		B		G		I	
	1	2	1	2	1	2	1	2	1	2
PCB-28	5.9	23.8	8.7	12.6	1.9	0.8	0.3	4.9	5.8	3.5
PCB-52	0.9	2.4	2.0	3.8	20.4	55.3	5.2	0.7	1.0	6.8
PCB-101	0.3	0.7	0.4	0.6	1.1	0.7	3.4	0.5	0.8	0.4
PCB-138	0.4	0.3	0.1	0.1	0.03	0.03	0.8	0.2	0.5	0.1
PCB-153	0.5	0.5	0.2	0.3	0.5	0.5	0.7	0.4	0.8	0.3
PCB-180	0.2	0.2	0.1	0.1	0.2	0.1	0.1	0.05	0.1	0.1
HCB	161.0	80.4	60.2	64.4	138.6	54.3	119.8	34.2	597.5	49.2

Sample ID	F		D		C		K		E		L	
	1	2	1	2	1	2	1	2	1	2	1	2
PCB-28	11.0	20.0	10.9	20.3	42.2	NA	7.8	4.0	14.4	8.9	89.9	47.4
PCB-52	1.2	1.3	11.2	2.5	6.3	NA	26.7	17.8	1.1	1.3	4.5	5.5
PCB-101	0.1	0.4	1.4	1.8	1.4	NA	0.7	0.5	0.4	0.6	1.3	0.3
PCB-138	1.3	0.3	0.1	3.7	1.0	NA	0.03	0.1	1.3	1.1	4.2	2.2
PCB-153	1.3	0.6	2.4	4.9	2.1	NA	1.1	1.1	1.9	1.8	8.2	6.4
PCB-180	0.04	0.05	0.3	1.0	0.2	NA	0.1	0.1	0.1	0.1	0.2	0.2
HCB	25.0	37.1	1033.2	316.3	1254.7	NA	1846.5	203.1	222.2	28.4	274.1	52.2

NA = not analyzed

Table C.4-3 Median WHO-TEQ (fg/m^3) for PCBs, PCDD/Fs in air in background levels in China

	PCBs WHO-TEQ	PCDD/Fs WHO-TEQ	Total WHO-TEQ
Lower bound	1.24	8.42	9.77
Middle bound	1.24	14.02	15.52
Upper bound	1.24	18.77	19.88

Lower bound: concentration of not detected analyte = 0;
Middle bound: concentration of not detected analyte =0.5 LOD; Upper bound: concentration of not detected analyte = LOD

C.5 Hong Kong SAR, China

Table C.5-1 Annual averages of PCDD/Fs, PCBs and OC pesticides in ambient air in Hong Kong SAR, China

POPs	Concentration in Ambient Air (pg/m³)										Source of Reference
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	
Aldrin							10.90				Project (AS 05-272)
Chlordane							2.66				
DDT							40.23				
Dieldrin							6.29				
Endrin							15.75				
Heptachlor							68.13				
Hexachlorobenzene (HCB)							15.74				
Mirex							10.65				
Toxaphene											
PCBs	560	870	650	390	500	410	440	490	320	610	EPD Routine TAP monitoring stations
Dioxins / Furans (fg/m³)	1147	2092	1046	1126	1171	1332	1125	1716	1260	1853	
Dioxins / Furans (pg I-TEQ/m³)	0.085	0.120	0.056	0.050	0.060	0.068	0.064	0.076	0.063	0.078	

*Note: For POPs concentrations that are lower than the method detection limit (MDL), one half of the MDL is used in calculating the annual averages.

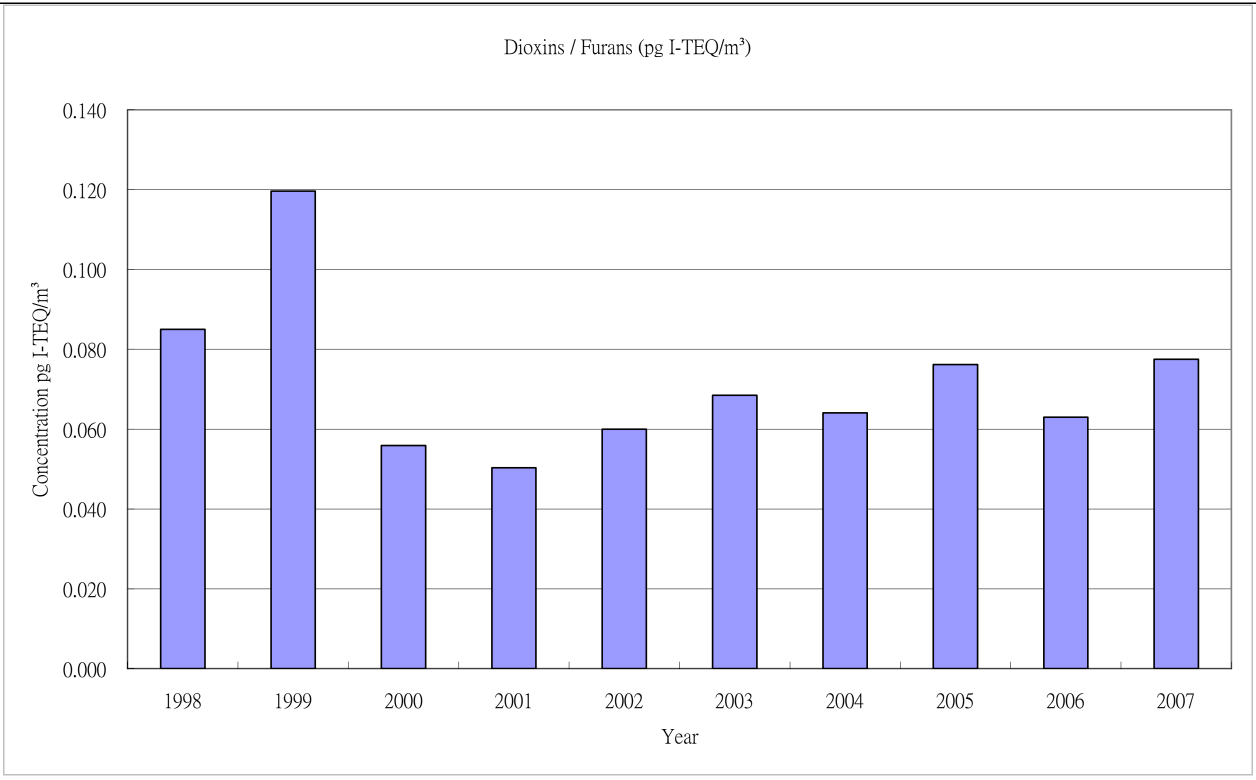


Figure C.5-1 Trend of PCDDs/PCDFs in ambient air of Hong Kong from 1998 to 2007

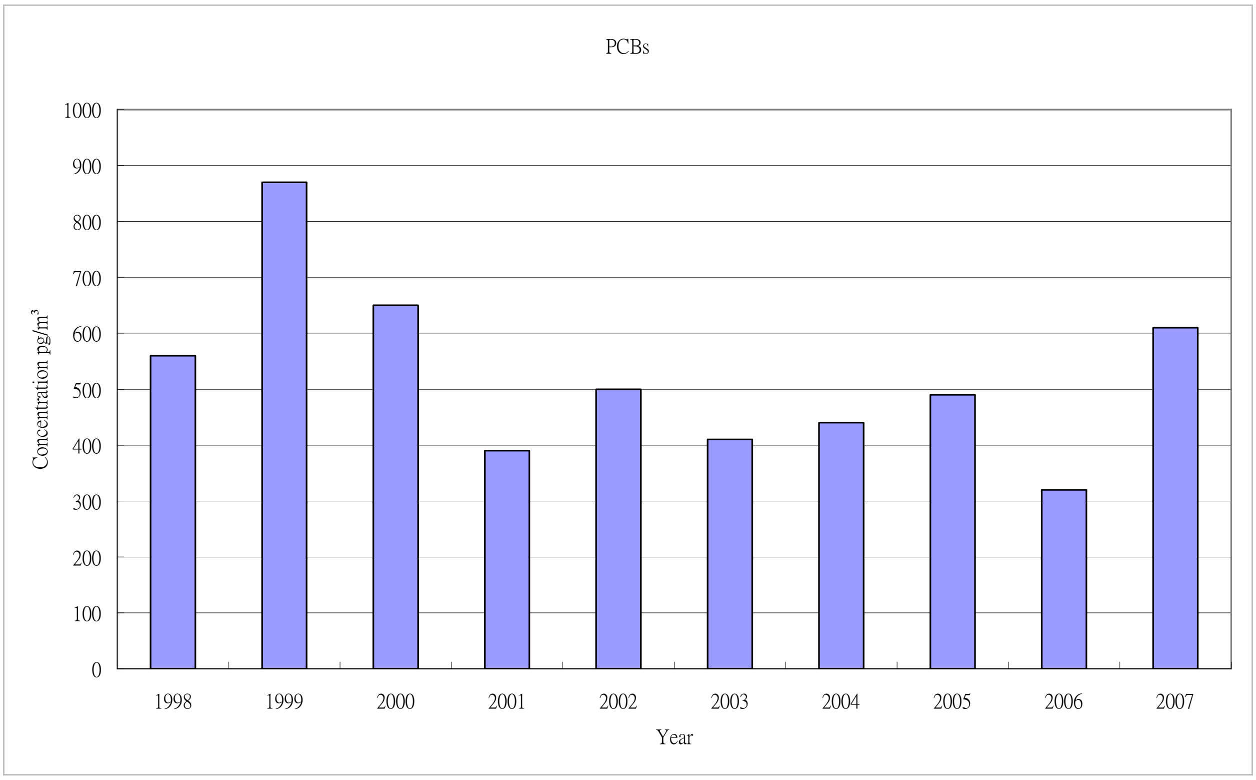


Figure C.5-2 Trend of PCB in ambient air of Hong Kong from 1998 to 2007

Annex D

Detail information on milk concentration in the region

D.1 India

Table D.1-1 DDT in human milk samples in India

City	Year	Number of samples	Whole milk basis (ppm) Total DDT
Ludhiana	1979	75	0.51
Lucknow	1980	25	0.12
Bangalore	1984-85	6	0.05
Kolkata	1984-85	6	0.11
Bombay	1984-85	6	0.22
Delhi	1985-86	60	0.344
Delhi	1994	25	1.27
Ahmedabad	1981-82	50	0.305

Total DDT: no information on which isomers were analyzed

D.2 Japan

Table D.2-1 The result of the POPs monitoring on human milk of primipara in Osaka, Japan

(ng/g fat basis)

Year	Mean age	Number of samples for PCB	PCB Conc.	Number of samples for OCC other than PCB	Total-DDT Conc.	Total-CHL Conc.	HCB Conc.
1972	25	62	1,300	12	2,220	−	−
1973	25	67	1,310	22	2,990	−	−
1974	25	59	1,510	12	3,650	−	−
1975	25	62	1,260	11	2,660	−	−
1976	26	42	1,110	11	4,000	−	−
1977	26	54	1,240	11	2,100	−	−
1978	26	49	1,210	9	2,240	−	−
1979	26	46	1,100	10	2,300	−	−
1980	26	58	1,050	39	2,170	−	64
1981	27	51	1,040	29	2,340	−	79
1982	26	41	900	25	2,620	−	77
1983	26	54	1,130	0	−	−	−
1984	26	50	880	0	−	−	−
1985	27	51	740	0	−	−	−
1986	27	53	734	53	1,270	119	44.8
1987	27	55	619	55	1,090	120	45.7
1988	26	55	538	55	1,138	101	35.4
1989	27	55	524	55	951	88.6	28.4
1990	26	58	429	58	639	68.2	23.3
1991	27	60	367	60	688	69.1	29.3
1992	27	60	343	60	528	61.9	18.0
1993	27	58	284	58	644	96.3	20.2
1994	26	61	301	61	459	88.2	19.4
1995	27	59	312	59	374	72.9	17.1
1996	27	57	340	57	283	65.8	14.3
1997	28	47	260	47	318	70.0	13.6
1998	27	49	200	49	288	84.6	13.6
1999	28	53	263	53	240	75.6	13.8
2000	29	56	203	56	226	68.9	12.0
2001	28	57	178	57	204	51.7	10.4
2002	28	54	169	54	188	54.1	7.80
2003	29	55	151	55	122	59.0	9.42
2004	28	57	132	57	179	54.1	7.11
2005	29	57	142	57	202	74.2	7.23
2006	29	58	97	58	231	61.6	12.81

OCC: organochlorine compounds
Total-DDT: sum of *p,p'*-DDE, *p,p'*-DDD, *p,p'*-DDT, *o,p'*-DDT
Total-CHL: sum of Oxychlordane, *trans*-Nonachlor, *cis*-Nonachlor

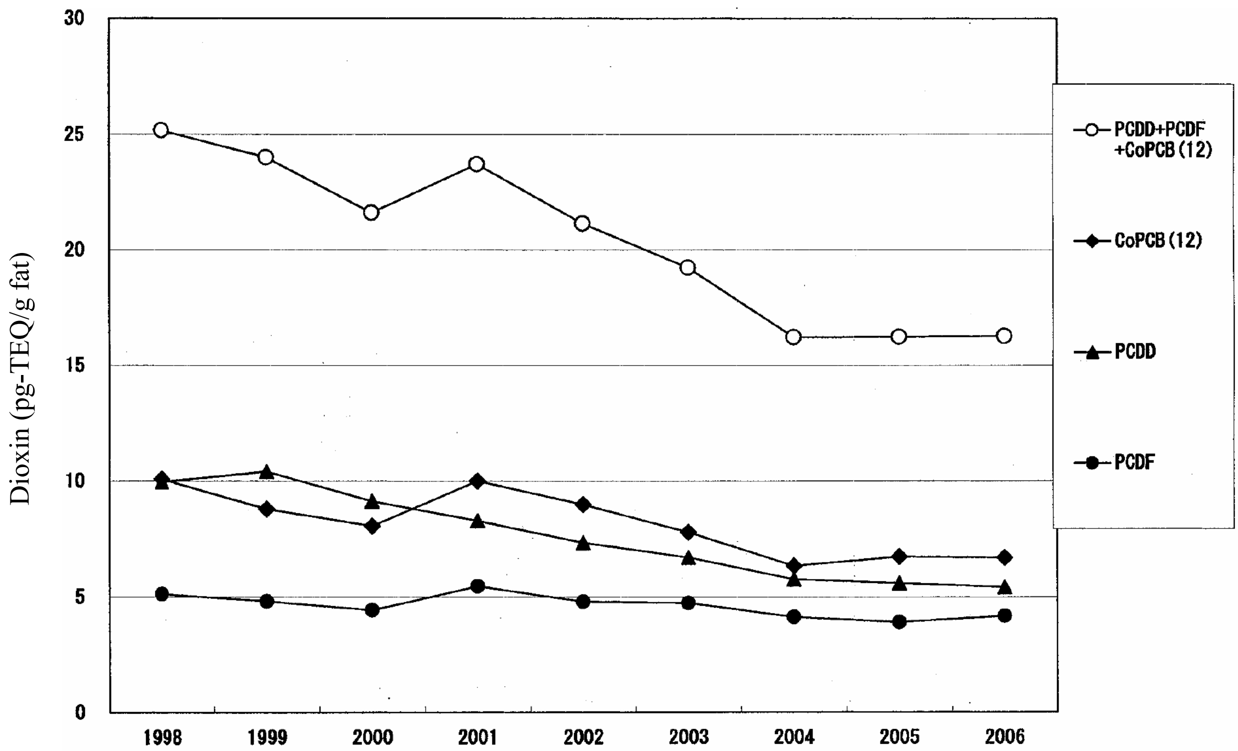


Figure D.2-1 Temporal trends of the dioxins concentration in the human milk in Japan (Iwate, Chiba, Niigata, Ishikawa, Osaka and Shimane prefectures)

Reference: Tada, H. Research for survey on Dioxins pollution in human milk and effect on development of breast-fed infant – Summary Report, FY 2006. Research on Food Safety, March 2007, Health Labour Sciences Research Grant

NOTE: This research will continue by FY 2009.

Table D.2–2 Data on human milk concentration of POPs in Tohoku, Kanto and Koshinetsu regions, Japan

POPs	Human milk (pg/g-fat) in 2004-2005			
	Tohoku region (n=70)		Kanto and Koshinetsu districts (n=25)	
	Range	average (determination limit)	Range	average (determination limit)
PCBs	31,000 - 280,000	100,000 (290)	42,000 - 320,000	100,000 (290)
HCB	6,900 - 37,000	17,000 (87)	5,800 - 27,000	13,000 (87)
Aldrin	nd	nd (75)	nd	nd (75)
Dieldrin	2,100 - 17,000	4,400 (140)	1,600 - 8,000	3,100 (140)
Endrin	nd - 490	nd (330)	nd	nd (330)
DDTs				
p,p' - DDT	2,300 - 19,000	7,900 (200)	4,100 - 36,000	7,400 (200)
p,p' - DDE	32,000 - 330,000	130,000 (79)	48,000 - 400,000	130,000 (79)
p,p' - DDD	100 - 15,000	310 (81)	150 - 1,100	330 (81)
o,p' - DDT	550 - 4,200	1,200 (98)	570 - 3,700	1,200 (98)
o,p' - DDE	180 - 940	400 (71)	200 - 610	330 (71)
o,p' - DDD	nd - 510	tr(55) (74)	tr(31) - 130	tr(56) (74)
Chlordanes				
Cis -chlordane	200 - 3,100	530 (81)	230 - 770	470 (81)
Trans - chlordane	83 - 1,400	190 (74)	91 - 270	150 (74)
Oxychlordane	2,700 - 47,000	11,000 (210)	3,500 - 26,000	11,000 (210)
Cis - nonachlor	860 - 11,000	3,300 (62)	1,700 - 9,000	3,300 (62)
Trans – nonachlor	6,600 - 100,000	23,000 (76)	9,200 - 58,000	22,000 (76)
Heptachlors				
Heptachlor	nd - 370	nd (170)	nd - tr(85)	nd (170)
Cis - heptachloro epoxide	1,800 - 24,000	4,800 (48)	1,700 - 9,800	3,800 (48)
Trans - heptachloro epoxide	nd	nd (130)	nd	nd (130)
Toxaphenes				
Parlar-26	760 - 7,000	2,000 (69)	790 - 3,500	1,400 (69)
Parlar-50	1,300 - 12,000	3,300 (73)	1,300 - 6,100	2,400 (73)
Parlar-62	nd - 820	tr(240) (500)	nd - 660	tr(240) (500)
Parlar-40	nd - 97	tr(22) (50)	nd - 82	nd (50)
Parlar-41	tr(24) - 560	230 (55)	82 - 370	160 (55)
Parlar-44	tr(58) - 640	230 (96)	tr (86) - 410	160 (96)
Mirex	170 - 1,900	740 (77)	350 - 2,600	930 (77)
Dioxins (TEQ)				
PCDD/PCDFs	0.35 - 25	8.5 (0.00016 - 2.0)	1.8 - 28	9.4 (0.00016 - 2.0)
co-PCBs	2.1 - 21	6.8 (0.00005 - 0.10)	2.5 - 16	5.9 (0.00005 - 0.10)
Total dioxins	2.5 - 45	16 (0.00005 - 2.0)	4.3 - 44	16 (0.00005 - 2.0)

Reference: Ministry of the Environment, Japan. Chemicals in the Environment.
http://www.env.go.jp/chemi/kurohon/en/index.html

D.3 WHO Human Milk Survey

(1) 3rd Round Survey

Table D.3-1 Result of 3rd Round WHO Human Milk Survey

	Fiji	Hong Kong SAR	Philippines
WHO-PCDD/PCDF-TEQ (pg/g fat)	3.34	8.25	3.94
WHO-PCB-TEQ (pg/g fat)	1.75	4.67	2.38
Sum indicator PCBs (ng/g fat)	17	45	26

(2) 4th Round Survey

Table D.3-2 Result of 4th Round WHO Human Milk Survey (pesticides, ng/g fat)

	Fiji (rural)	**Fiji (urban)**	**Kiribati**
Aldrin	ND	ND	ND
Chlordane group 1)	1.7	1.7	1.5
cis-chlordane	ND	ND	ND
trans-chlordane	ND	ND	ND
oxy-chlordane	1.7	1.7	1.5
trans-nonachlor	1.6	2.3	2.4
Dieldrin	1.6	2.8	1.6
DDT group 2)	573.5	804.3	188.9
o,p'-DDD	ND	ND	ND
p,p'-DDD	1.3	1.3	0.9
o,p'-DDE	ND	ND	ND
p,p'-DDE	453.1	639.4	140.1
o,p'-DDT	5.5	4.8	5.2
p,p'-DDT	61.3	85	26.5
Endrin group 3)	ND	ND	ND
Endrin	ND	ND	ND
Endrin ketone	ND	ND	ND
Heptachlor group 4)	ND	ND	ND
Heptachlor	ND	ND	ND
Heptachlor-epoxide *cis*	ND	ND	ND
Heptachlor-epoxide *trans*	ND	ND	ND
Hexachlorobenzene	2.4	3.8	3.2
Parlar(toxaphene) group 5)	ND	ND	1.4
Parlar 26	ND	ND	0.5
Parlar 50	ND	ND	0.9
Parlar 62	ND	ND	ND
Mirex	ND	ND	ND

Explanation: ND=Not Detected (<0.5 ng/g fat)
1) sum of *cis*-chlordane, *trans*-chlordane and oxychlordane, calculated as chlordane
2) sum of o,p'-DDT, p,p'-DDT, p,p'-DDE, and p,p'-DDD, calculated as DDT
3) sum of endrin and endrin ketone, calculated as endrin
4) sum of heptachlor and heptachlor-epoxide(*cis*/*trans*), calculated as heptachlor
5) sum of parlar 26, parlar 50 and parlar 62

Table D.3-3 Result of 4th Round WHO Human Milk Survey (PCDD/PCDF, pg/g fat)

	Fiji (rural)	Fiji (urban)	Kiribati
2,3,7,8-substituted PCDD/PCDF-congeners (pg/g fat)			
2,3,7,8-TCDD	0.53	0.8	0.57
1,2,3,7,8-PeCDD	2.14	1.2	1.26
1,2,3,4,7,8-HxCDD	2.42	0.59	0.7
1,2,3,6,7,8-HxCDD	4.19	3.58	3.7
1,2,3,7,8,9-HxCDD	3	3.14	2.9
1,2,3,4,6,7,8-HpCDD	14.1	8.77	16.3
OCDD	**116**	**36.9**	**66.1**
2,3,7,8-TCDF	0.46	0.54	0.64
1,2,3,7,8-PeCDF	0.25	0.14	0.27
2,3,4,7,8-PeCDF	1.07	1.23	1.48
1,2,3,4,7,8-HxCDF	0.47	0.42	0.5
1,2,3,6,7,8-HxCDF	0.35	0.39	0.56
2,3,4,6,7,8-HxCDF	0.2	0.19	0.18
1,2,3,7,8,9-HxCDF	< 0.01	< 0.02	< 0.04
1,2,3,4,6,7,8-HpCDF	1.1	1.37	1.65
1,2,3,4,7,8,9-HpCDF	< 0.01	< 0.01	0.02
OCDF	**0.27**	**0.38**	**0.29**
WHO-PCDD/PCDF-TEQ	**4.5**	**3.6**	**3.7**

Explanation: < = below LOQ (caculation of TEQ including full LOQ)

Table D.3-4 Result of 4th Round WHO Human Milk Survey (PCB)

	Fiji (rural)	Fiji (urban)	Kiribati
Indicator-PCB (ng/g fat)			
PCB 28	0.27	0.41	0.44
PCB 52	0.12	0.18	0.23
PCB 101	0.15	0.39	0.32
PCB 138	2.2	4.1	3.1
PCB 153	3.8	6	4.2
PCB 180	2.1	3.2	1.8
Sum indicator PCBs	**8.6**	**14.4**	**10.1**
Mono-ortho PCB (ng/g fat)			
PCB 105	0.32	0.42	0.72
PCB 114	0.25	0.32	0.2
PCB 118	1.25	2.16	2.48
PCB 123	< 0.1	< 0.2	< 0.12
PCB 156	0.49	0.86	0.52
PCB 157	0.06	0.12	0.1
PCB 167	0.14	0.24	0.22
PCB 189	< 0.1	< 0.2	< 0.1
Non-ortho PCB (pg/g fat)			
PCB 77	5.71	8.18	6.7
PCB 81	< 5	< 7	< 5.5
PCB 126	< 8	10.1	22.4
PCB 169	5.9	7.5	8.1
WHO-mono ortho PCB-TEQ (pg/g fat)	**0.59**	**0.94**	**0.75**
WHO-non ortho PCB-TEQ (pg/g fat)	**0.87**	**1.09**	**2.32**
WHO-PCB-TEQ (pg/g fat)	**1.46**	**2.03**	**3.07**

Explanation: < = below LOQ (caculation of TEQ including full LOQ)

D.4 China

Table D.4-1 Concentration range and median values of POPs in breast milk in China (pg/g fat)

	Urban area Median(range)	**Rural area** Median (range)
PCDD/Fs-WHO TEQ	3.75 (1.7-6.56)	3.29 (1.65-6.67)
Co-PCBs-WHO TEQ	1.65 (0.82-3.36)	1.72 (0.61-2.99)
PCB-28	958 (485-2485)	750 (334-1412)
PCB-52	150 (58-218)	150 (78-254)
PCB-101	187 (42-319)	167 (54-342)
PCB-138	4642 (1276-9614)	3466 (910-6230)
PCB-153	6286 (1947-15847)	5453 (493-10509)
PCB-180	660 (150-1825)	643 (53-1869)
Marker PCBs	4114-28742	2370-20764
HCB	32.3 (18.4-45.7)	33.8 (19.3-56.8)
Heptachlor	1.0 (ND-1.9)	3.7 (ND-17.8)
Aldrin	3.2 (ND-3.8)	5.7 (ND-10.6)
trans-Heptachlor epoxides(A)	0.9 (ND-0.9)	1.1 (ND-1.52)
oxychlordane	2.6 (ND-4.5)	3.2 (ND-7.5)
trans-Heptachlor epoxides(B)	ND	ND
trans-chlordane	ND	22.5 (ND)
2,4'-DDE	3.4 (ND-6.8)	2.6 (ND-5.7)
cis-chlordane	ND	1.1 (ND-1.1)
trans-nonachlor	1.3 (ND-2.7)	1.8 (ND-3.5)
4,4'-DDE	366.2 (1.1-978.8)	301.1 (3.3-1660.4)
dieldrin	ND	ND
2,4'-DDD	1.8 (ND-3.2)	2.0 (ND-5)
endrin	15 (ND-15)	ND
4,4'-DDD	271.9 (2.9-702.9)	189.6 (3.6-518.3)
2,4'-DDT	6.5 (ND-14.6)	7.2 (3.8-25.9)
cis-nonachlor	ND	ND
4,4'-DDT	29.8 (ND-62.2)	38.4 (7.7-110.5)
Mirex	2.7 (ND-6.2)	3.4 (ND-8.1)

Table D.4-2 PCDD/Fs and dl-PCBs in milk from 12 provinces and 6 metropolis in China (TEQ, pg/g fat)

Location	PCDD/Fs	dl-PCBs	Total TEQ
Rural area of I	6.67	2.99	9.66
Urban area of I	6.56	3.36	9.92
Rural area of F	2.32	0.61	2.92
Urban area of F	2.35	0.82	3.17
Rural area of K	2.64	1.24	3.88
Urban area of K	3.32	1.72	5.04
Rural area of G	4.35	2.61	6.95
Urban area of G	5.2	1.76	6.96
Rural area of J	2.85	1.61	4.45
Urban area of J	4.56	2.11	6.67
Rural area of C	3.94	1.88	5.81
Urban area of C	5.56	1.14	6.71
Rural area of H	1.89	2.32	4.2
Urban area of H	3.05	1.33	4.38
Rural area of D	2.59	1.19	3.78
Urban area of D	4.4	1.68	6.08
Rural area of A	1.7	1.01	2.72
Urban area of A	1.7	1.11	2.81
Rural area of B	5.47	2.68	8.15
Urban area of B	2.35	1.49	3.84
Rural area of L	3.46	1.58	5.03
Urban area of L	3.36	2.09	5.45
Rural area of E	1.65	0.93	2.58
Urban area of E	3.98	1.18	5.16
T city	3.16	1.75	4.91
M city	2.88	1.58	4.46
N city	3.99	1.90	5.89
X city	4.06	1.70	5.76
P city	3.26	1.30	4.56
Hong Kong SAR	8.25	4.67	12.92

D.5 Hong Kong SAR, China

Table D.5-1 Mean concentrations of total DDTs and total PCBs (ng/g lipid) in human breast milk in Hong Kong SAR,China

Pool	Age	No. of Samples	Total DDTs	Total PCBs
1	<25	6	1130	34
2	26-28	10	660	13
3	29-30	13	1750	31
4	31-32	17	2240	37
5	33-34	29	2540	26
6	35-36	24	3070	41
7	37-38	10	5610	66
8	>39	6	5140	55
Total No.		115	-	-
Mean Value		-	2683	36

Note: Mean fat content of the milk samples was 2.86 ± 1.24%.

Table D.5-2 Mean concentrations of PCDD/Fs and dioxin-like PCBs (pg WHO-TEQ/g lipid) in human breast milk in Hong Kong SAR,China

Pool	No. of Samples	PCDD/Fs	Dioxin- like PCBs
1	25	7.02	3.53
2	17	8.87	4.82
3	17	9.78	5.37
4	32	8.69	4.69
5	29	10.10	6.58
6	21	6.17	2.80
7	34	7.76	3.85
8	22	7.03	3.87
9	23	8.76	4.73
10	18	9.42	5.59
11	12	5.80	5.51
12	24	7.55	4.42
13	42	8.87	5.17
Total No.	316	-	-
Mean Value	-	8.25	4.67

Annex E

Detail information on blood concentration in the region

E.1 India

Table E.1–1 Levels of DDT in Human Blood sampled in General Population in India

City	Year	Number of samples	Human Blood DDT (ppm)
Delhi	1975	M=103 F= 79	0.177-0.683* 0.166- 0.329**
Lucknow	1982	M=48 F=16	0.028 0.023
Delhi	1982	340	0.71
Delhi	1985	50	0.301
Haridwar	1992	37	0.02
Ahmedabad(Rural)	1992	31	0.048
Ahmedabad(Urban)	1992	M= 10 F=10	0.21 0.17
New Delhi	2005	F=25	0.025

M-Male; F-Female;
* Data as range of mean value lowest in (71-86 year) and highest in (41-50 years)
** Data as range of mean value lowest in (61-70 years) and highest in (31-40 years)

E.2 Japan

Table E.2–1 Data on umbilical and maternal blood concentration of POPs in Tohoku, Kanto and Koshinetsu regions, Japan

POPs	umbilical blood (pg/g-fat)		maternal blood (pg/g-fat)	
	Tohoku region (n=70) in 2004-2005		Tohoku region (n=50) in 2005	
	Range	average (determination limit)	Range	average (determination limit)
PCBs	12,000 - 130,000	42,000 (620)	20,000 - 160,000	76,000 (460)
HCB	6,400 - 40,000	17,000 (180)	5,600 - 40,000	14,000 (140)
Aldrin	nd	nd (120)	nd - 25	nd (25)
Dieldrin	1,400 - 14,000	3,400 (230)	1,400 - 9,800	3,500 (54)
Endrin	nd	nd (540)	nd	nd (49)
DDTs				
p,p' - DDT	560 - 7,300	2,500 (420)	1,100 - 10,000	4,200 (310)
p,p' - DDE	12,000 - 390,000	62,000 (170)	17,000 - 270,000	82,000 (130)
p,p' - DDD	nd - 590	tr (120) (170)	tr (63) - 430	240 (130)
o,p' - DDT	tr (190) - 1,400	450 (210)	200 - 2,100	680 (150)
o,p' - DDE	tr (85) - 600	250 (150)	170 - 730	350 (110)
o,p' - DDD	nd - tr (100)	nd (160)	nd - tr (100)	nd (120)
Chlordanes				
Cis -chlordane	210 - 1,500	440 (130)	220 - 2,100	650 (20)
Trans - chlordane	120 - 770	330 (120)	130 - 490	200 (20)
Oxychlordane	1,300 - 18,000	4,700 (340)	1,500 - 17,000	5,500 (39)
Cis - nonachlor	280 - 2,800	950 (100)	470 - 4,900	1,700 (37)
Trans – nonachlor	1,700 - 26,000	6,900 (130)	3,600 - 52,000	12,000 (26)
Heptachlors				
Heptachlor	nd - tr (170)	nd (350)	nd	nd (260)
Cis - heptachloro epoxide	670 - 13,000	2,500 (81)	730 - 13,000	2,800 (30)
Trans - heptachloro epoxide	nd	nd (220)	nd	nd (71)
Toxaphenes				
Parlar-26	230 - 3,000	680 (160)	300 - 2,500	980 (100)
Parlar-50	280 - 4,100	910 (180)	480 - 4,200	1,500 (110)
Parlar-62	nd - tr (510)	nd (1,300)	nd - tr (360)	nd (790)
Parlar-40	nd - tr (73)	nd (130)	nd - tr (69)	nd (79)
Parlar-41	nd - 240	tr (58) (140)	tr (37) - 220	100 (87)
Parlar-44	nd - 380	tr (72) (200)	nd - 200	tr (77) (110)
Mirex	tr (110) - 1,400	440 (160)	280 - 2,900	1,100 (120)
Dioxins (TEQ)				
PCDD/PCDF	0.26 - 56	2.6 (0.0004 - 3)	2.8 - 26	8.6 (0.00025 - 1.1)
dl-PCB	0.74 - 7.3	2.9 (0.00010 - 0.20)	1.4 - 11	4.7 (0.00006 - 0.04)
Total dioxins	1.1 - 59	6.2 (0.00010 - 3)	4.8 - 33	13 (0.00006 - 1.1)

Reference: Ministry of the Environment, Japan. Chemicals in the Environment.
http://www.env.go.jp/chemi/kurohon/en/index.html

Table E.2–2 Human blood concentration of PCDD/PCDF and *dl*-PCB in Japan (pg TEQ/g fat)

Survey Year		2002	2003	2004	2005	2006
Region/District		5 regions/ 14 district	5 regions/ 15 district	5 regions/ 15 district	5 regions/ 15 district	5 regions/ 15 district
No. of donor		259	272	264	288	291
Age	Average	44.4	41.7	45.2	44.3	43
	range	16-72	15-69	15-70	15-70	15-72
PCDD+PCDF	Median	14	13	13	12	10
	Range	0.61-56	2.6-51	0.76-56	0.39-58	0.78-63
Co-PCB	Median	8.8	7.1	7.4	8.3	6.4
	Range	0.33-72	0.27-63	0.31-47	0.55-50	0.087-40
PCDD+PCDF +Co-PCBs	Median	23	21	20	20	17
	Range	1.6-110	3.1-110	1.1-90	1.7-85	0.98-77

Note 1: TEQ is calculated with WHO-TEF 1998.

2: Calculated as 0 for the data below the quantification limit

Annex F

Detail information on concentration in other media in the region

F.1 Water

Table F.1–1 Level of total PCBs at Various Locations of River Yamuna, India

Locations	Total PCBs Concentration (ng/l)	
	May 1999	November 2002
Palla	0.51	6.21
Old Yamuna Bridge	0.19	ND
Nizamuddin	1.29	ND
Okhla	1.93	18.78
Majhawli	0.50	2.67

Table F.1–2 Water concentrations of POPs in Japan

		median (range) (pg/l)			
		2002	2003	2004	2005
PCB		330 (60-11000)	450 (230-3100)	540 (140-4400)	370 140-7800)
HCB		28 (9.8-1400)	24 (11-340)	tr(29) (tr(11)-180)	17 (6-210)
Aldrin		0.9 (nd-18)	0.9 (nd-3.8)	tr(1.8) (nd-13)	tr(0.7) (nd-5.7)
Dieldrin		41 (3.3-940)	57 (9.7-510)	51 (9-430)	49 (4.5-630)
Endrin		5.5 (nd-31)	6 (0.7-78)	7 (tr(0.7)-100)	4.5 (nd-120)
DDT	*p,p'*-DDT	11 (tr(0.25)-440)	12 (tr(2.8)-740)	14 (nd-310)	9 (1-110)
	p,p'-DDE	26 (1.3-760)	22 (5-380)	34 (tr(6)-680)	24 (4-410)
	p,p'-DDD	18 (0.57-190)	18 (4-410)	18 (tr(2.4)-740)	16 (tr(1.8)-130)
	o,p'-DDT	4.6 (0.19-77)	5 (tr(1.5)-100)	5 (nd-85)	3 (nd-39)
	o,p'-DDE	2.1 (nd-680)	2 (tr(0.42)-170)	2 (tr(0.6)-170)	2.1 (0.4-410)
	o,p'-DDD	6 (nd-110)	5 (1.1-160)	5 (tr(0.7)-81)	5.4 (tr(0.5)-51)
Chlordane	*cis*-Chlordane	32 (2.5-880)	51 (12-920)	87 (10-1900)	54 (6-510)
	trans-Chlordane	24 (3.1-780)	30 (6-410)	26 (5-1200)	21 (3-200)
	Oxychlordane	3.5 (nd-41)	2 (tr(0.6)-39)	2.9 (tr(0.7)-47)	2.1 (nd-19)
	cis-Nonachlor	6.7 (0.23-250)	7 (1.3-130)	6.3 (0.8-340)	5.9 (0.9-43)
	trans-Nonachlor	24 (1.8-780)	20 (4-450)	19 (tr(3)-8100)	17 (2.6-150)
Heptachlor	Heptachlor	1 (nd-25)	tr(1.6) (tr(1.0)-7)	nd (nd-29)	tr(1) (nd-54)
	cis-Heptachloro epoxide	-	11 (1.2-170)	10 (2-77)	6.6 (1-59)
	trans-Heptachloro epoxide	-	nd (nd-2)	nd	nd
Toxaphene	Parlar-26	-	nd	nd	nd
	Parlar-50	-	nd	nd	nd
	Parlar-62	-	nd	nd	nd
Mirex		-	tr(0.12) (nd-0.88)	nd (nd-1.1)	nd (nd-1)

Reference: Ministry of the Environment, Japan. Chemicals in the Environment.
http://www.env.go.jp/chemi/kurohon/en/index.html

Table F.1–3 Water concentrations of PCDD/PCDF and *dl*-PCBs in Japan

FY	1998	1999	2000	2001	2002	2003	2004	2005	2006
average	0.50	0.24	0.31	0.25	0.24	0.24	0.22	0.21	0.21
range	0.065-13	0.054-14	0.012-48	0.0028-27	0.010-2.7	0.020-11	0.0069-4.6	0.0070-5.6	0.014-3.2
(number of sites)	(204)	(568)	(2,116)	(2,213)	(2,207)	(2,126)	(2,057)	(1,912)	(1,870)

Note 1 unit: pg-TEQ/L. WHO-TEF(1998) is used for the calculation of toxicity equivalent.
Note 2 The toxicity equivalent is calculated by using the value of 1/2 of the detection limit, when the measured value of each isomer is below the detection limit.
Reference: Ministry of the Environment, Japan. Environmental Survey of Dioxins.
http://www.env.go.jp/en/headline/headline.php?serial=652

Table F.1–4 Surface water concentrations of POPs in Aleppo at Al Safira channel, Syria

Pesticide	Concentration (mg/l)	Detection Limit (mg/l)	MRL in tap water (mg/l)		
			WHO	EU	Syria
Heptachlor	n.d	0.001	0.03	0.1	
Aldrin	n.d	0.001	0.03	0.1	0.03
Heptachlor epoxide	n.d	0.001	0.03	0.1	
DDE + Arclor 1254	n.d	0.0005			
Dieldrin	n.d	0.001	0.03	0.1	0.03
Endrin + TDE (DDD)	n.d	0.0005		0.1	
DDT	n.d	0.001	2	0.1	1

n.d = not detected (below the detection level).
Reference: Information submitted from Syria

Table F.1–5 Surface water concentrations of POPs in Aleppo, Syria

Pesticide	Concentration (mg/l)			Detection Limit (mg/l)	MRL in tap water (mg/l)		
	Al Safira	Al Assad Dam	17 April Dam		WHO	EU	Syria
Heptachlor	0.00224	n.d	n.d	0.001	0.03	0.1	
Aldrin	0.00263	n.d	n.d	0.001	0.03	0.1	0.03
Heptachlor epoxide	n.d	n.d	n.d	0.001	0.03	0.1	
DDE + Arclor 1254	0.0024	n.d	n.d	0.0005			
Dieldrin	n.d	n.d	n.d	0.001	0.03	0.1	0.03
Endrin + TDE (DDD)	0.00077	n.d	n.d	0.0005		0.1	
DDT	0.00215	n.d	n.d	0.001	2	0.1	1

n.d = not detected (below the detection level).
Reference: Information submitted from Syria

Table F.1–6 Drinking water concentrations of POPs in Al Swida province, Syria

Pesticide	Concentration (mg/l)								
	Alroom Dam		Almoshnif Dam		Jabal Alarab Dam		Houbron Dam		Alghaita Dam
	Input	Output	Input	Output	Input	Output	Input	Output	Barrage
Heptachlor	0.007	0.02	n.d	n.d	0.004	0.003	n.d	0.002	n.d
Aldrin	0.004	0.003	n.d	n.d	n.d	n.d	n.d	n.d	n.d
Heptachlor epoxide	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d
DDE	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d
Dieldrin	0.006	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d
TDE (DDD)	0.008	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d
Endrin	0.005	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d
DDT	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d	n.d

n.d = not detected (below the detection level).
Reference: Information submitted from Syria

Table F.1–7 Drinking water concentrations of POPs in Euphrates River, Syria

Pesticide	Concentration (mg/l)	Detection Limit (mg/l)	MRL in tap water (mg/l)
Lindane	n.d	0.001	2
Heptachlor	0.004	0.002	0.1
Aldrin	n.d	0.002	0.03
DDE	n.d	0.001	NA
Dieldrin	n.d	0.002	0.03
DDD	n.d	0.001	NA
Endrin	n.d	0.001	0.1
DDT	n.d	0.002	1

n.d = not detected (below the detection level).
Reference: Information submitted from Syria

F.2 Ground- and underground-water

Table F.2–1 Ground water concentrations of PCDDs/PCDFs and *dl*-PCBs in Japan

FY	1998	1999	2000	2001	2002	2003	2004	2005	2006
average	0.17	0.096	0.092	0.074	0.066	0.059	0.063	0.047	0.056
range	0.046-5.5	0.062-0.55	0.00081-0.89	0.00020-0.92	0.011-2.0	0.00032-0.67	0.0079-3.2	0.0088-0.72	0.013-2.2
(number of sites)	(188)	(296)	(1,479)	(1,473)	(1,310)	(1,200)	(1,101)	(922)	(878)

Note 1 unit: pg-TEQ/L. WHO-TEF(1998) is used for the calculation of toxicity equivalent.
Note 2 The toxicity equivalent is calculated by using the value of 1/2 of the detection limit, when the measured value of each isomer is below the detection limit.
Note 3 Survey sites for each year are not the same.
Reference: Ministry of the Environment, Japan. Environmental Survey of Dioxins. http://www.env.go.jp/en/headline/headline.php?serial=652

Table F.2–2 Ground water concentrations of POPs in India

Duration	Location	Commodity	Pesticide	Residue by GC (μg/l)
April, 2007	Chawla Camp, Delhi	Ground water	*p,p'* - DDE	0.083
	Dahoi, Ghaziabad	Ground water	*p,p'* - DDE	0.108
May, 2007	All Locations	Ground water	N.D.	BDL
June, 2007	All Locations	Ground water	N.D.	BDL
July, 2007	All Locations	Ground water	N.D.	BDL
August, 2007	All Locations	Ground water	N.D.	BDL
September, 2007	All Locations	Ground water	N.D.	BDL
October, 2007	Ghewara-Narela	Ground water	Heptachlor	0.144*
	Bawana	Ground water	Heptachlor	0.188*
November, 2007	Narela Road	Ground water	*p,p'* -DDD	0.080
	Bawana		*p,p'* -DDE	0.035
December, 2007	All Locations	Ground water	N.D.	BDL
January, 2008	I.T.O.-1	Ground water	pp' -DDT	0.028
	Jalalabad Kheda		Heptachlor	0.049
February, 2008	Faridabad-5	Ground water	Heptachlor	0.049
	I.T.O.-2	Ground water	*p,p'* -DDD	0.057
		Ground water	*p,p'*-DDT	0.067
	Noida-4	Ground water	*p,p'*-DDD	0.017
March, 2008	Under analysis			

ND: Pesticides Not Detected; BDL: Below Detection Limit; * not confirmed by GC-MS
Reference: Monitoring of Pesticide Residue at National Level in Ground Water in NCR Region in and around Delhi under IARI Project. Central Pollution Control Board, Delhi.

Table F.2–3 Ground water concentrations of Aldrin and DDT in Syria

Province	Sample no. \ Name of pesticide	Aldrin	2.4 – DDT	4.4 – DDT	2.4 – DDD	4.4 – DDD	4.4 – DDE
Tartous	1	n.d	0.0047	n.d	n.d	0.0400	n.d
	2	n.d	n.d	n.d	n.d	0.0516	n.d
	3	n.d	n.d	n.d	n.d	0.0705	n.d
	4	n.d	n.d	n.d	n.d	0.0473	0.0085
Lattakia	1	n.d	0.0018	n.d	n.d	n.d	n.d
	2	n.d	n.d	n.d	n.d	0.0663	n.d
	3	n.d	n.d	n.d	n.d	0.0515	0.0072
	4	n.d	0.0057	n.d	n.d	0.0076	0.0084
Detection limit (mg/kg)		0.0020	0.0053	0.0042	0.0048	0.0052	0.0031

1 and 2 are Non IPM samples; 3 and 4 are IPM samples
Reference: Information submitted from Syria

F.3 Bottom sediment in water

Table F.3–1 Level of total PCBs at Various Locations of River Yamuna, India

Locations	Total PCBs Concentration (ng/g)	
	May 1999	November 2002
Palla	8.93	0.55
Old Yamuna Bridge	1.14	ND
Nizamuddin	1.91	8.70
Okhla	0.64	ND
Majhawli	0.62	3.60

Table F.3–2 Sediment concentrations of POPs in Japan

		median (range) (pg/ g dry)			
		2002	2003	2004	2005
PCBs		11000 (39-630000)	9500 (39-5600000)	7600 (38-1300000)	7100 (42-690000)
HCB		200 (7.6-19000)	120 (5-42000)	100 (tr(6)-25000)	130 (13-22000)
Aldrin		12 (nd-570)	18 (nd-1000)	10 (nd-390)	7.1 (nd-500)
Deldrin		51 (4-2300)	56 (nd-9100)	62 (tr(1.9)-3700)	55 (tr(2)-4200)
Endrin		10 (nd-19000)	11 (nd-29000)	13 (nd-6900)	11 (nd-19000)
DDT	*p,p'*-DDT	240 (tr(5)-97000)	220 (3-55000)	230 (7-98000)	230 (5.1-1700000)
	p,p'-DDE	630 (8.4-23000)	780 (9.5-80000)	700 (8-39000)	730 (8.4-64000)
	p,p'-DDD	690 (tr(2.2)-51000)	580 (3.7-32000)	550 (4-75000)	570 (5.2-210000)
	o,p'-DDT	47 (nd-27000)	43 (nd-3200)	50 (tr(1.1)-17000)	46 (0.8-160000)
	o,p'-DDE	37 (nd-16000)	39 (tr(0.5)-24000)	34 (nd-28000)	32 (nd-31000)
	o,p'-DDD	150 (nd-14000)	130 (tr(1.0)-8800)	120 (tr(0.7)-16000)	110 (tr(0.8)-32000)
Chlordane	*cis*-Chlordane	98 (1.8-18000)	140 (tr(3.6)-19000)	97 (4-36000)	100 (3.3-44000)
	trans-Chlordane	110 (2.1-16000)	100 (tr(2.4)-13000)	80 (3-26000)	81 (3.4-32000)
	Oxychlordane	1.7 (nd-120)	2 (nd-85)	tr(1.3) (nd-140)	tr(1.9) (nd-160)
	cis-Nonachlor	65 (nd-7800)	50 (nd-6500)	34 (tr(0.8)-9400)	42 (tr(1.1)-9900)
	trans-Nonachlor	83 (3.1-13000)	78 (2-11000)	63 (3-23000)	72 (2.4-24000)
Heptachlor	Heptachlor	3.2 (nd-120)	tr(2.2) (nd-160)	tr(2.3) (nd-170)	2.8 (nd-200)
	cis-Heptachloro epoxide		3 (nd-160)	tr(3.0) (nd-230)	tr(3) (nd-140)
	trans-Heptachloro epoxide		nd	nd (nd-tr(2.5))	nd
Toxaphene	Parlar-26		nd	nd	nd
	Parlar-50		nd	nd	nd
	Parlar-62		nd	nd	nd
Mirex		-	tr(1.6) (nd-1500)	tr(1.6) (nd-220)	1.2 (nd-5300)

Reference: Ministry of the Environment, Japan. Chemicals in the Environment.
http://www.env.go.jp/chemi/kurohon/en/index.html

Table F.3–3 Sediment concentrations of PCDDs/PCDFs and *dl*-PCBs in Japan

FY	1998	1999	2000	2001	2002	2003	2004	2005	2006
average	8.3	5.4	9.6	8.5	9.8	7.4	7.5	6.4	6.7
range	0.10-260	0.066-230	0.0011-1,400	0.012-540	0.0087-640	0.057-420	0.050-1300	0.045-510	0.056-750
(number of sites)	(205)	(542)	(1,836)	(1,813)	(1,784)	(1,825)	(1,740)	(1,623)	(1,548)

Note 1 unit: pg TEQ/g dry. WHO-TEF (1998) is used for the calculation of toxicity equivalent.
Note 2 The toxicity equivalent is calculated by using the value of 1/2 of the detection limit, when the measured value of each isomer is below the detection limit.
Reference: Ministry of the Environment, Japan. Environmental Survey of Dioxins.
http://www.env.go.jp/en/headline/headline.php?serial=652

F.4 Soil

Table F.4–1 Soil concentrations of PCDDs/PCDFs and *dl*-PCB in Japan

FY	1998	2000	2001	2002	2003	2004	2005	2006
average	6.5	6.9	6.2	3.8	4.4	3.1	5.9	2.6
range	0.0015-61	0-1,200	0-4,600	0-250	0-1,400	0-250	0-2,800	0-330
(number of sites)	(286)	(3,031)	(3,735)	(3,300)	(3,059)	(2,618)	(1,782)	(1,505)

Note 1 unit: pg TEQ/g dry. WHO-TEF(1998) is used for the calculation of toxicity equivalent.
Note 2 The toxicity equivalent is calculated as zero, when the measured value of each isomer is below the minimum determination limit.
Note 3 Survey sites for each year are not the same.
Reference: Ministry of the Environment, Japan. Environmental Survey of Dioxins.
http://www.env.go.jp/en/headline/headline.php?serial=652

Table F.4–2 Soil concentrations of Aldrin and DDT in Syria

Province	Sample no. / Name of pesticide	Aldrin	2.4 – DDT	4.4 – DDT	2.4 – DDD	4.4 – DDD	4.4 – DDE
Tartous	1	n.d	3.02	2.72	1.23	10.02	11.92
	2	n.d	4.44	3.08	2.06	14.37	8.28
	3	n.d	4.56	2.24	1.44	4.84	10.29
	4	n.d	2.94	2.22	0.87	8.55	14.06
Lattakia	1	n.d	5.04	8.94	3.42	7.25	28.62
	2	n.d	3.18	5.34	4.28	3.81	12.34
	3	n.d	5.28	6.97	3.47	7.70	14.17
	4	n.d	5.24	12.38	3.42	9.90	26.64
Detection limit (mg/kg)		0.147	0.400	0.694	0.288	0.246	0.276

1 and 2 are Non IPM samples; 3 and 4 are IPM samples
Reference: Information submitted from Syria

F.5 Biota

Table F.5–1 Concentration (pg/g wet) of POPs in seabass in Tokyo Bay, Japan

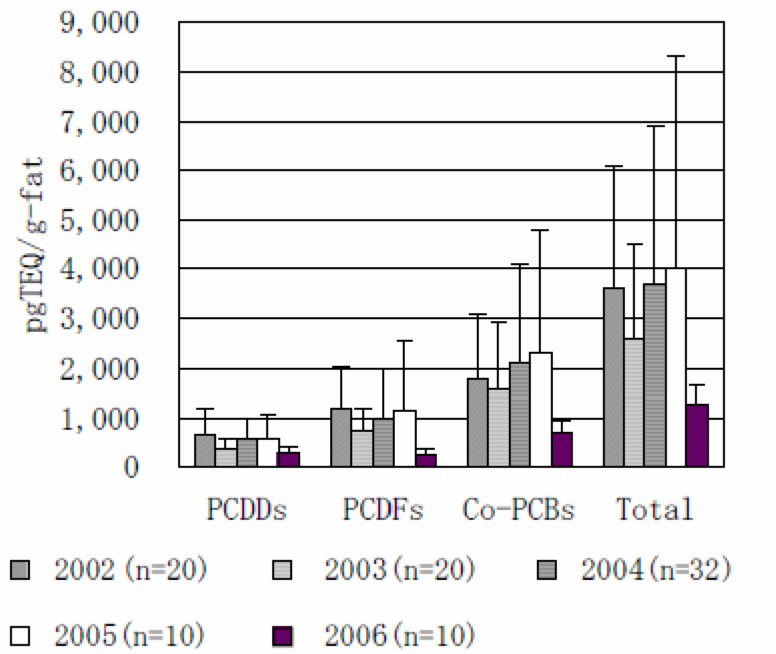
POPs		1993	1994	1995	1997	1998	1999	2000	2001
PCBs		460,000	340,000	120,000	310,000	190,000	200,000	100,000	400,000
HCB		1,400	1,400	770	750	840	890	440	500
Aldrin		tr(3.4)	1.4	nd	1.9	2.2	2.6	nd	nd
Dieldrin		4,100	2,100	1,300	2,200	1,500	1,300	630	800
Endrin		220	100	93	140	130	110	640	40
DDTs	*p,p'*-DDT	1,800	1,400	670	1,500	1,000	720	700	2,400
	p,p'-DDE	48,000	24,000	9,100	28,000	15,000	18,000	8,300	30,000
	p,p'-DDD	7,700	6,400	2,400	4,800	3,200	2,700	2,000	6,400
	o,p'-DDT	360	360	110	240	160	130	170	610
	o,p'-DDE	12,000	4,000	790	4,200	1,500	4,000	940	3,400
	o,p'-DDD	1,700	1,700	350	820	490	570	440	1,400
Chlordanes	*cis*-chlordane	9,200	8,800	5,000	6,700	5,000	3,600	2,200	5,900
	trans-chlordane	3,900	3,000	1,500	2,200	1,700	1,300	640	1,600
	Oxychlordane	920	890	630	730	630	580	270	740
	cis-nonachlor	4,600	5,000	2,500	3,800	3,100	2,000	1,500	5,500
	trans-nonachlor	11,000	11,000	5,600	8,200	6,400	4,200	3,100	11,000
Heptachlors	Heptachlor	24	9.4	6.7	6.8	5.6	5.5	2.1	3.2
	cis-Heptachlor epoxide	460	270	170	250	260	170	92	89
	trans-Heptachlor epoxide	tr (12)	5	nd	nd	nd	nd	nd	nd
Toxaphenes	Parlar-26	49	-	-	-	-	-	-	-
	Parlar-50	85	-	-	-	-	-	-	-
	Parlar-62	nd	-	-	-	-	-	-	-
Mirex		31	-	-	-	-	-	-	-

nd: Not Detected. tr: Trace (concentration above detection limit and below determination limit)
Reference: Ministry of the Environment, Japan. Chemicals in the Environment. http://www.env.go.jp/chemi/kurohon/en/index.html

Table F.5–2 Concentration (pg/g wet) of POPs in seabass in Osaka Bay, Japan

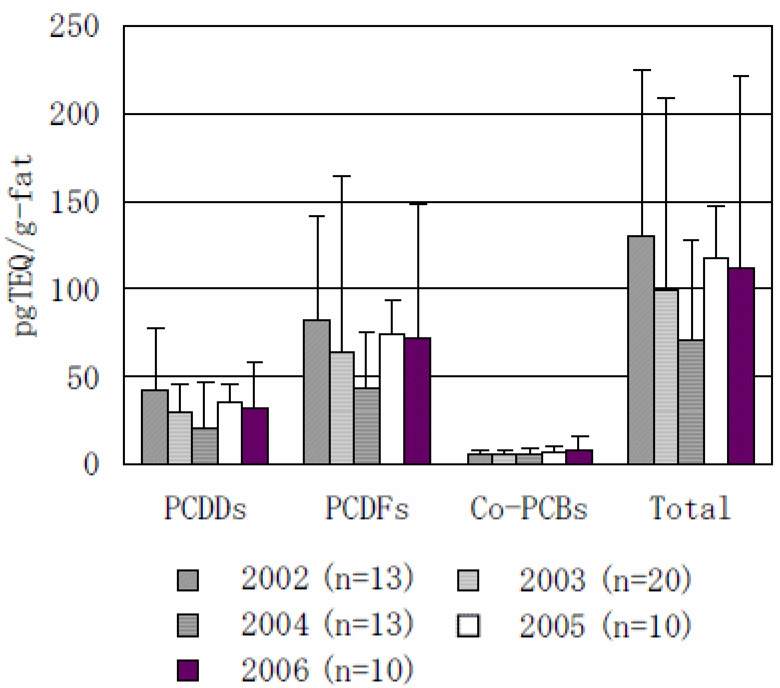
POPs		1993	1994	1995	1996	1997	1998	1999	2000	2001
PCBs		680,000	340,000	490,000	490,000	330,000	670,000	660,000	270,000	150,000
HCB		1,300	1,000	690	740	490	1,200	770	390	260
Aldrin		4.7	1.5	tr(1.7)	5.9	tr(1.9)	3.8	tr(2.6)	tr(1.8)	nd
Dieldrin		4,700	1,700	2,800	8,000	1,400	2,100	2,500	1,200	1,500
Endrin		200	62	150	170	110	110	160	74	37
DDTs	*p,p'*-DDT	2,000	1,500	37,000	5,400	1,600	3,800	1,300	1,200	1,300
	p,p'-DDE	17,000	13,000	15,000	19,000	9,600	17,000	15,000	11,000	6,100
	p,p'-DDD	6,900	5,300	9,500	8,200	3,000	7,000	4,200	3,400	2,100
	o,p'-DDT	570	390	11,000	1,800	410	1,100	350	350	360
	o,p'-DDE	700	380	450	690	360	620	480	360	320
	o,p'-DDD	2,500	1,900	3,000	2,500	880	3,000	1,500	850	870
Chlordanes	*cis*-chlordane	16,000	8,500	8,400	19,000	3,900	8,100	8,000	5,200	4,000
	trans-chlordane	6,800	300	3,800	7,500	1,600	3,300	3,400	2,000	1,700
	Oxychlordane	1,500	1,400	650	1,700	660	1,100	840	630	400
	cis-nonachlor	7,000	4,400	3,800	7,400	2,400	5,100	4,500	3,200	1,900
	trans-nonachlor	21,000	12,000	9,900	19,000	5,300	11,000	11,000	7,800	5,000
Heptachlors	Heptachlor	44	8.9	29	50	8.8	11	20	tr(5.6)	5.2
	cis-Heptachlor epoxide	380	160	290	360	150	230	310	130	79
	trans-Heptachlor epoxide	nd	nd	nd	Nd	nd	nd	nd	nd	nd
Toxaphenes	Parlar-26	tr(44)	-	tr(19)	tr(27)	tr(22)	tr(18)	tr(21)	tr(21)	-
	Parlar-50	59	-	tr(24)	tr(29)	tr(21)	tr(23)	tr(30)	tr(23)	-
	Parlar-62	nd.	-	nd	Nd	nd	nd	nd	nd	-
Mirex		10	-	17	56	28	110	76	14	-

nd: Not Detected. tr: Trace (concentration above detection limit and below determination limit)
Reference: Ministry of the Environment, Japan. Chemicals in the Environment. http://www.env.go.jp/chemi/kurohon/en/index.html



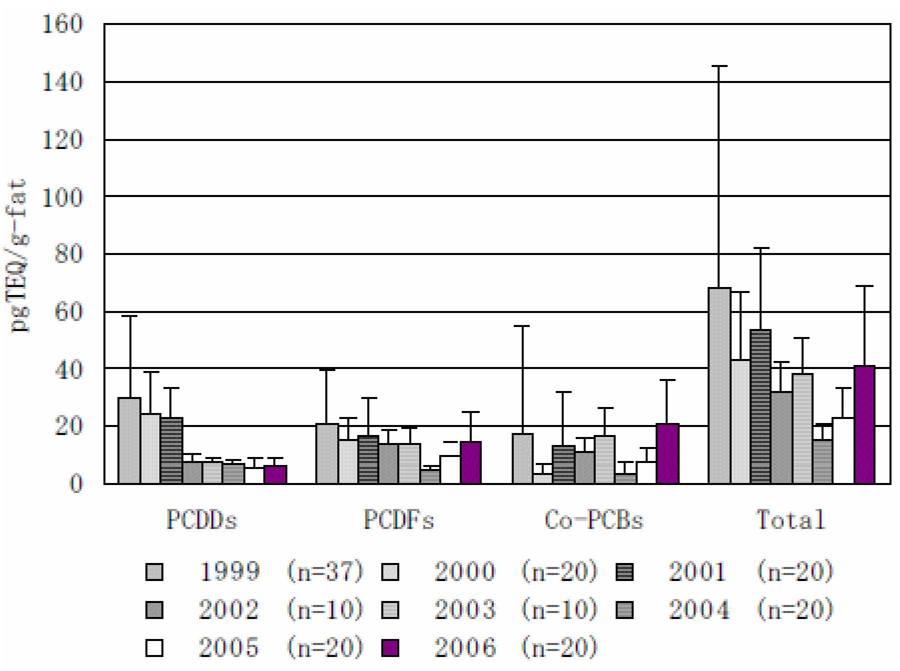
NOTE 1: TEQ is calculated with WHO-TEF 1998.
NOTE 2: Calculated as 1/2 LOD for the data below the detection limit
NOTE 3: Average concentration + SD
NOTE 4: PCDD – 7 congeners; PCDF – 10 congeners; *dl*-PCB – 12 congeners.

Figure F.5–1 PCDD/PCDF and *dl*-PCB in liver of common cormorant



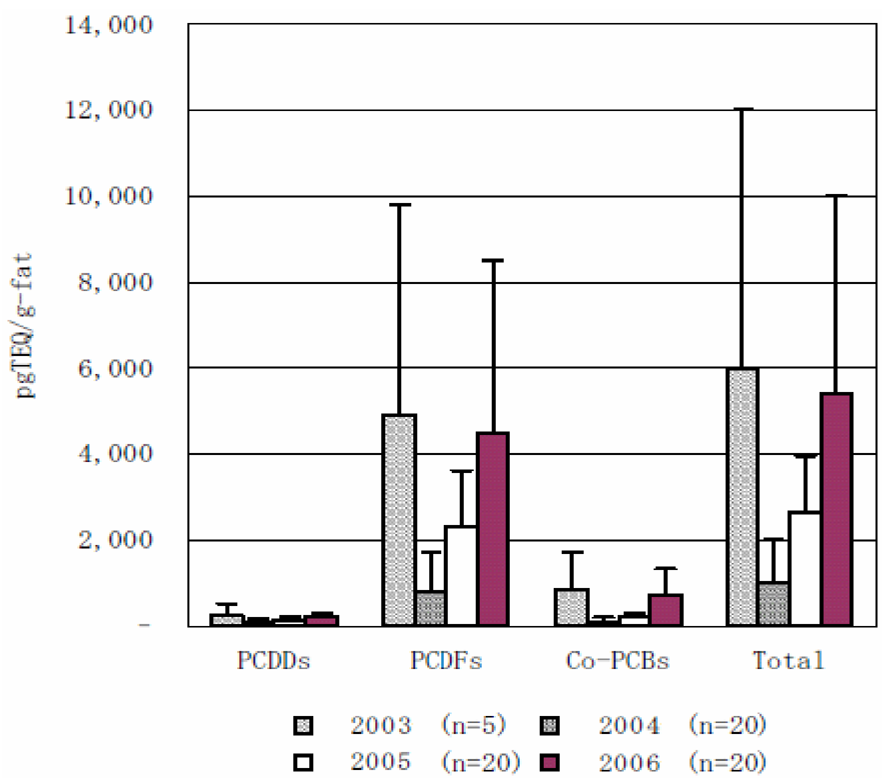
NOTE 1: TEQ is calculated with WHO-TEF 1998.
NOTE 2: Calculated as 1/2 LOD for the data below the detection limit
NOTE 3: Average concentration + SD
NOTE 4: PCDD – 7 congeners; PCDF – 10 congeners; *dl*-PCB – 12 congeners.

Figure F.5–2 PCDD/PCDF and *dl*-PCB in liver of jungle crow



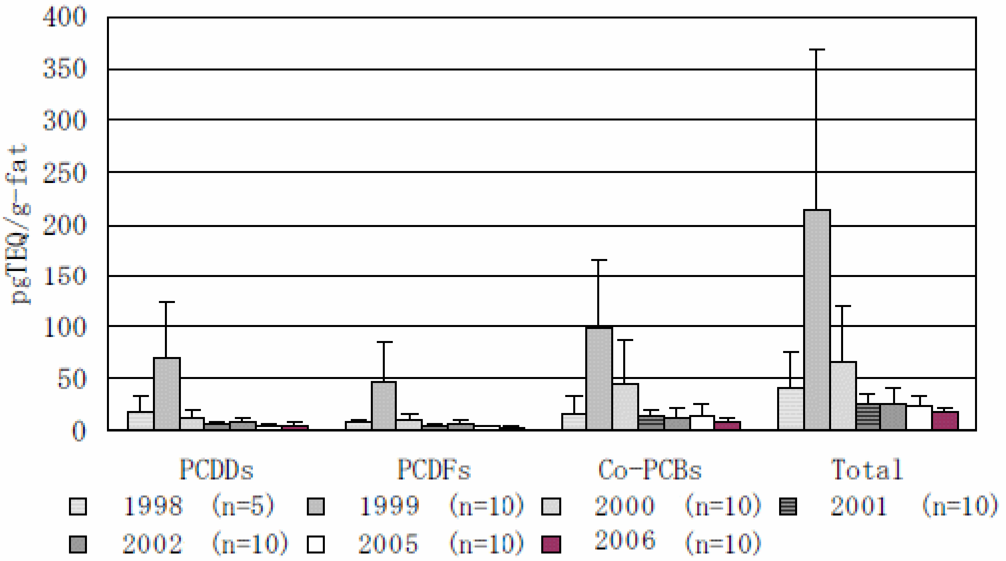
NOTE 1: TEQ is calculated with WHO-TEF 1998.
NOTE 2: Calculated as 1/2 LOD for the data below the detection limit
NOTE 3: Average concentration + SD
NOTE 4: PCDD – 7 congeners; PCDF – 10 congeners; *dl*-PCB – 12 congeners.

Figure F.5–3 PCDD/PCDF and *dl*-PCB in body of large Japanese field mouse



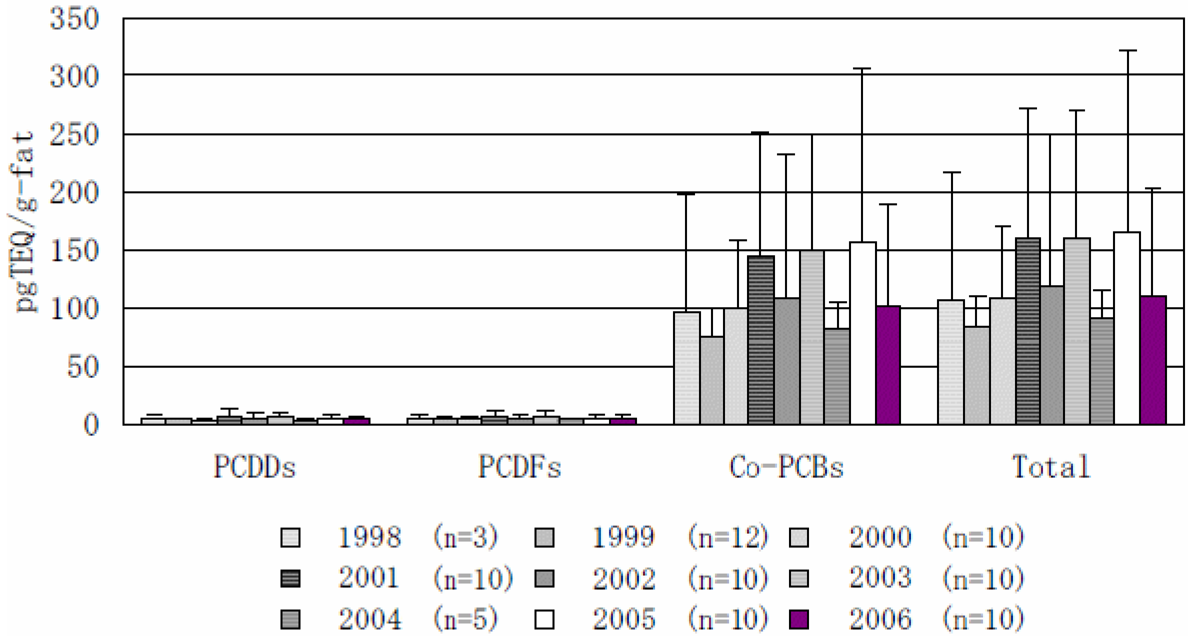
NOTE 1: TEQ is calculated with WHO-TEF 1998.
NOTE 2: Calculated as 1/2 LOD for the data below the detection limit
NOTE 3: Average concentration + SD
NOTE 4: PCDD – 7 congeners; PCDF – 10 congeners; *dl*-PCB – 12 congeners.

Figure F.5–4 PCDD/PCDF and *dl*-PCB in liver of large Japanese field mouse



NOTE 1: TEQ is calculated with WHO-TEF 1998.
NOTE 2: Calculated as 1/2 LOD for the data below the detection limit
NOTE 3: Average concentration + SD
NOTE 4: PCDD – 7 congeners; PCDF – 10 congeners; *dl*-PCB – 12 congeners.

Figure F.5–5 PCDD/PCDF and *dl*-PCB in blubber of raccoon dog



NOTE 1: TEQ is calculated with WHO-TEF 1998.
NOTE 2: Calculated as 1/2 LOD for the data below the detection limit
NOTE 3: Average concentration + SD
NOTE 4: PCDD – 7 congeners; PCDF – 10 congeners; *dl*-PCB – 12 congeners.

Figure F.5–6 PCDD/PCDF and *dl*-PCB in blubber of finless porpoise

Table F.5–3 Concentration (pg/g wet) of POPs in biota, India

Location (year)	Tissue Sample	DDT ng/g range	Other POPs ng/g range	Reference
Ganges (1992-96)	Dolphin	750 – 64000	Chlordane: 1.9 – 240 HCB: 0.4 – 19 PCBs: 180 – 13000	Senthilkumar 1999
Ganges (1993-96)	Fish	60 – 3700	Chlordane: 0.8 – 18 PCBs: 65 – 270 HCB: 0.07 – 0.5	Senthilkumar 1999
Ganges (1993-96)	Benthic Invertebrates	250 – 740	Chlordane: 3 – 30 PCBs: 34 – 47 HCB: 1 – 21	Senthilkumar 1999
Ganges (1996)	Dolphin	171.9 – 13700	Aldrin: 4.0 – 9.2	Kumari 2002
Ganga, Patna (1997)	Fish	13.6 – 1665.9		Kumari 2001
Gang Canal – Near Delhi (1997)	Benthic	501.22 – 2786.67	Dieldrin: 0 – 308.73	Sharma 2001
North India (NA)	Dolphin	–	Dioxin: 0.015 – 0.22 Furan: 0.011 – 0.42 PCBs: 8.4 – 123.48	Senthilkumar 2001
	Fish	–	Dioxin: 0.04 – 0.082 Furan: 0.017 – 0.048 PCBs: 16.01 – 32.63	
South India (NA)	Fish	–	Dioxin: 0.009–0.033 Furan: 0.002-0.004 PCBs: 2.18 – 4.12	Senthilkumar 2001

Reference: Devakumar, C. et al. An Empirical Baseline Data on POPs Situation in Indian Environment (1998-2007). Division of Agricultural Chemicals, Indian Agricultural Research Institute, New Delhi. (Submitted from India)

F.6 Food

Table F.6–1 National average for the daily intake of dioxins in 2002 to 2006, Japan

FY	2002	2003	2004	2005	2006
Daily intake (pg TEQ/day)	74.45 (28.42-169.82)	66.51 (28.95-152.41)	70.47 (23.83-146.60)	60.16 (23.40-178.15)	52.23 (23.40-178.15)
Daily intake per body weight (pg TEQ/kg bw/day)	1.49 (0.57-3.40)	1.33 (0.58-3.05)	1.41 (0.48-2.93)	1.20 (0.47-3.56)	1.04 (0.38-1.94)

NOTE 1 From seven regions in Japan, about 120 food items each were bought. After that, these items were either cooked or not cooked, and divided into 13 groups. Samples were homogeneous mixture of these items and drinking water (14 food groups), and estimated the daily intake of dioxins from average Japanese diet.

NOTE 2 Analytes: seven PCDD congeners; 10 PCDF congeners; 12 Co-PCB congeners

NOTE 3 Values are average, and ones in parenthesis are the range. Daily intake per body weight is calculated by using 50 kg for average Japanese body weight. TEQ is calculated by using WHO-1997 TEF.

Reference: Sasaki, K., Studies on dioxin levels in foods, FY 2006. Research on Food Safety, Health Labour Sciences Research Grant

Table F.6–2 dioxins in the diet of Japanese in 2002 to 2006, Japan (pg-TEQ/g)

Year		2002	2003	2004	2005	2006
Samples		75	75	75	75	75
PCDD+PCDF	median	0.098	0.014	0.0083	0.0079	0.0053
	range	0.0011-0.049	0.0016-0.081	0.0013-0.032	0.0014-0.084	0.0011-0.022
dl-PCB	median	0.011	0.012	0.01	0.0079	0.0064
	range	0.0013-0.13	0.00099-0.090	0.0016-0.095	0.0013-0.095	0.00096-0.037
PCDD+PCDF +*dl*-PCB	median	0.022	0.028	0.021	0.016	0.012
	range	0.0024-0.18	0.0044-0.15	0.0033-0.13	0.0030-0.12	0.0027-0.053

NOTE 1: TEQ is calculated with WHO-TEF 1998.
NOTE 2: Calculated as 1/2 LOD for the data below the detection limit
NOTE 3: PCDD – 7 congeners; PCDF – 10 congeners; *dl*-PCB – 12 congeners.

Annex G

Information on long-range transport

G..1 Trajectory Analysis

(1) Trajectory analysis for Environmental Monitoring of Persistent Organic Pollutants in East Asian Countries

As a one of the project for Environmental Monitoring of Persistent Organic Pollutants in East Asian Countries, trajectory analysis is observed using the air monitoring data at Hateruma Island, Japan[6].

To speculate the source of POPs in the collected air, trajectory analysis of the collected air was performed using the METEX programs[7]. NCEP reanalysis dataset and 3D-wind model in METEX programs were used for the trajectory analysis. With reference to vertical coordinate in the 3D-wind model, the sigma coordinate was used for trajectory calculation in both forward and backward mode. A part of the results of analysis showed in Figure G.1–1.

These results of back and forward trajectory analyses indicated the possibilities of the long-rage transportation of POPs. When the height data was high, the transport speed of POPs in the air was relatively fast and long-range or trans-border transportation of POPs were possibly assumed at back trajectory mode and affected to far distant leeward. The less reliability of more than 3 days before or after the trajectory data should be noticed.

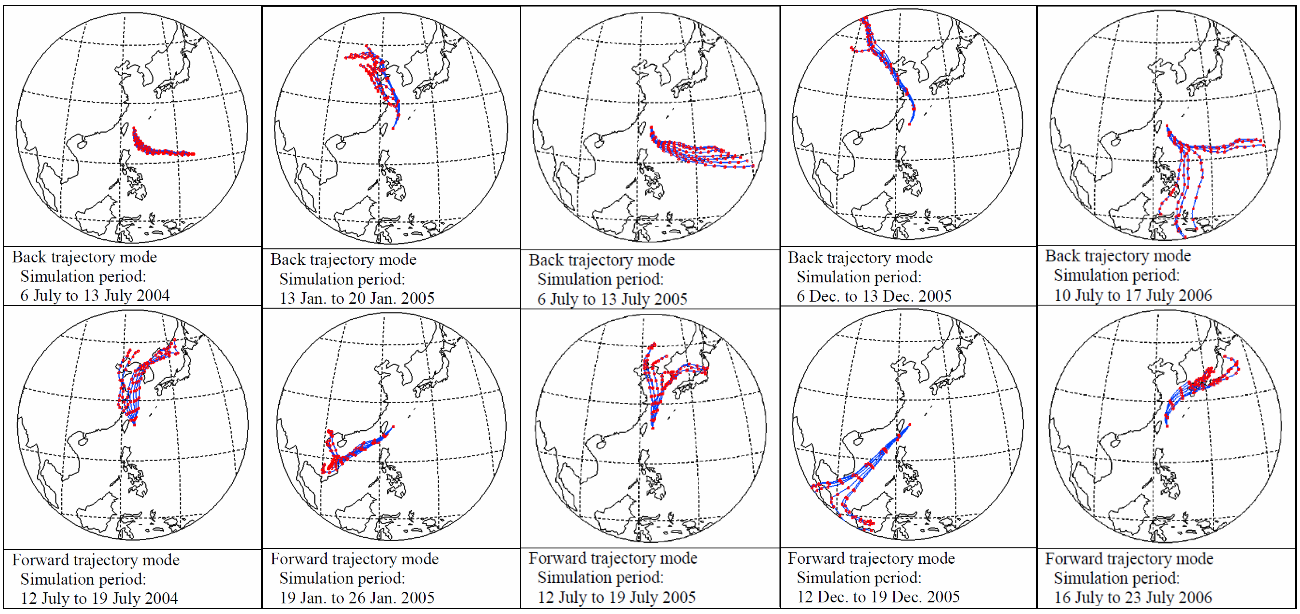


Figure G.1–1 The results of trajectory analysis for the winter (December to January) and summer (July)

6 Reference: POPs Monitoring Project in East Asian Countries (2007) Background Air Monitoring of Persistent Organic Pollutants in East Asian Countries 2004-2007 (http://www.env.go.jp/en/chemi/pops/eaws/background04-07.pdf)

7 The Meteorological Data Explorer (METEX), developed by Jiye Zeng at the Centre for Global Environmental Research (CGER), includes programs for calculating air trajectory, for extracting meteorological data in various binary formats, and for plotting trajectory results and meteorological data. http://db.cger.nies.go.jp/metex/(accessed Mar 2008)

G..2 Regional- / global-scale models

(1) Contribution of PCB emission from Asia to the global contamination using global multimedia fate model

National Institute for Environmental Studies, Japan, is trying to expand the G-CIEMS multimedia model[8], regional model, to global level, and studying on the implication to the East-Asian regional contribution to the global contamination[9].

Figure G.2-1 is the estimated PCBs air concentration assuming global emission, and Figure G.2-2 is the estimated PCBs air concentration assuming emission from East Asia (including Southeast Asia and India). This showed that G-CIEMS model can be used for the global fate of the PCB, and PCB originated from East Asia contribute to the PCB pollution in higher region, such as in Alaska.

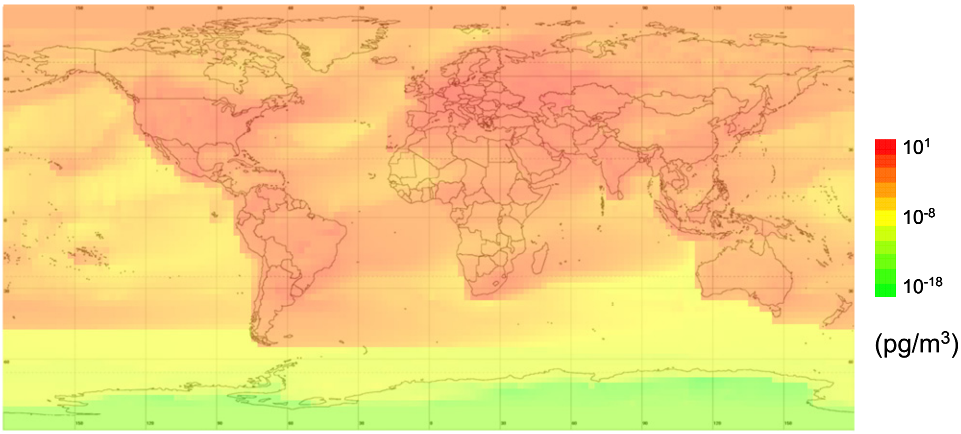


Figure G.2–1 Estimated concentration of PCB in air

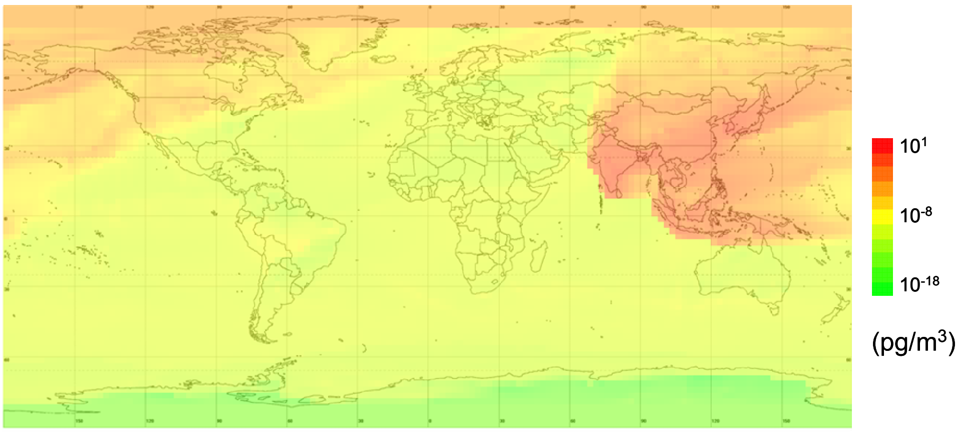


Figure G.2–2 Estimated concentration of PCBs in the air assuming the emission from East Asia

8 This model gives predicted fate of trace component in the multimedia GIS objects by analyzing the transportaion between media and in the media.

9 Reference: Suzuki, N. et al. (2007) Global fate analysis of PCB using global multimedia fate model and implication of East-Asia region to the global contamination. 16th Symposium on Environmental Chemistry abstract, Kitakyushu City, 2007 (in Japanese)

Annex H

List of articles of POPs monitoring in Antarctic

Aono, S. et al. (1997). Persistent Organochlorines in Minke Whale (Balaenoptera Acutorostrata) and their Prey Species from the Antarctic and the North Pacific. *Environmental Pollution* **98**, 81-89

Bustnes, J.O. et al. (2006). Organochlorines in Antarctic and Arctic Avian Top Predators: A Comparison between the South Polar Skua and Two Species of Northern Hemisphere Gulls. *Environ. Sci. Technol.* **40**, 2826-2831

Chiuchiolo, A.L. et al. (2004). Persistent Organic Pollutants at the Base of the Antarctic Marine Food Web. *Environ. Sci. Technol.* **38**, 3551-3557

Corsolini, S. et al. (2002). Polychloronaphthalenes and Other Dioxin-like Compounds in Arctic and Antarctic Marine Food Webs. *Environ. Sci. Technol.* **36**, 3490-3496

Dickhut, R.M. et al. (2005). Atmospheric Concentrations and Air - Water Flux of Organochlorine Pesticides along the Western Antarctic Peninsula. *Environ. Sci. Technol.* **39**, 465-470

Gambaro, A. et al. (2005). Atmospheric PCB Concentrations at Terra Nova Bay, Antarctica. *Environmental Pollution* **39**, 9406-9411

Guruge, K.S. et al. (2001). Accumulation status of persistent organochlorines in albatrosses from the North Pacific and the Southern Ocean. *Environmental Pollution* **114**, 389-398

Lohmann,R. W. et al. (2001). Atmospheric Distribution of Polychlorinated Dibenzo-p-dioxins, Dibenzofurans (PCDD/Fs), and Non-Ortho Biphenyls (PCBs) along a North-South Atlantic Transect. *Environ. Sci. Technol.* **35**, 4046-4053

Lugar, R.M. et al. (1996). Results of Monitoring for Polychlorinated Dibenzo-p-dioxins and Dibenzofurans in Ambient Air at McMurdo Station, Antarctica. *Environ. Sci. Technol.* **30**, 555-561

Miranda-Filho, K.C. et al. (2007). Residues of Persistent Organochlorine Contaminants in Southern Elephant Seals (Mirounga leonina) from Elephant Island, Antarctica. *Environ. Sci. Technol.* **41**, 3829-3835

Pozo, K. et al. (2004). Passive-Sampler Derived Air Concentrations of Persistent Organic Pollutants on a North-South Transect in Chile. *Environ. Sci. Technol.* **38**, 6529-6537

Tanabe, S. et al. (2004). PCDDs, PCDFs, and Coplanar PCBs in Albatross from the North Pacific and Southern Oceans: Levels, Patterns, and Toxicological Implications. *Environ. Sci. Technol.* **38**, 403-413

Vetter, W. et al. (2003). Indication of Geographic Variations of Organochlorine Concentrations in the Blubber of Antarctic Weddell Seals (Leptonychotes Weddelli). *Environ. Sci. Technol.* **37**, 840-844

Appendix1
Questionnaire for ROG member to request additional information

►Environmental concentration – **Air, Water, Sediment, Soil** – Case Only[10]

1. Information on National Focal Point

Name :

Position : Institution :

Address : Country :

Tel : Fax :

Email : Date :

Signature :

2. Project/programme name: ____________________

3. Common Name of POPs: ____________________ CAS No. : __________

4. Environmental Media : ☐ Air ☐ Water ☐ Sediment ☐ Soil

----

5. Period of sampling: ___/___/____to ___/___/____(dd/mm/yyyy)

6. Frequency of sampling: ☐ Once ☐ daily ☐ weekly ☐ monthly ☐ annually ☐ other______

7. Location : Country; ________________

Map reference; longitude _______/latitude _____

Area code; __________

Place-name; __________

Additional information of sampling site;

[10] If there is more than one case (e.g. for each project/programme, substance, location and period of sampling etc.), please make a copy of this questionnaire format for each case, OR please give us information for each case at each relevant item (such as in table format).

9. Sample type and condition:

Air: ☐ ambient ☐ dry deposition ☐ wet deposition ☐ flux
☐ background[11] ☐ hot spot

Water: ☐ river ☐ lake ☐ marine (coastal) ☐ marine (oceanic) ☐ estuarine
☐ ground water
☐ fresh ☐ brackish (___% salinity) ☐ saline
☐ harbor
☐ drinking water ☐ wastewater ☐ hot spot

Sediment ☐ river ☐ lake ☐ marine ☐ estuarine
☐ bottom sediment ☐ suspension; water flow___m^3/s

Soil ☐ clay ☐ silt ☐ soil ☐ sand ☐ highly organic soil
☐ forest ☐ farmland ☐ road ☐ residential ☐ city ☐ other______
☐ waste/litter ☐ hot spot

10. Sampling method:

Method; ☐ passive ☐ active ☐ low volume ☐ high volume ☐ other method____________
Sampling volume; ____________
Sorbent; ☐ XAD ☐ PUF ☐ other____________
Sampler; ☐ Trained personnel for operation and maintenance of the sampler
Additional information of sampling method;

11. Analytical method:

Laboratory instrumentation level[12]; ☐ 3 ☐ 2 ☐ 1

GC detector[13]; ☐ Capillary GC - with Electron Capture Detection (GC-ECD)
☐ Quadrupole Mass Spectrometry in Electron Ionization (EI) mode
☐ Quadrupole Mass Spectrometry in Electron Capture Negative Ionization (ECNIMS) mode
☐ Ion Trap Mass Spectrometry using MS/MS mode
☐ High resolution Magnetic Sector Mass Spectrometry in Electron Ionization (EI) mode

Additional information of analytical method;

11 The sites need to be sufficiently remote from sources of POPs at least 100km radius.

12 Guidance on the Global Monitoring Plan for Persistent Organic Pollutants. Preliminary version, February 2007 (Amended in May 2007). Table 5.1, p.81

13 Guidance on the Global Monitoring Plan for Persistent Organic Pollutants. Preliminary version, February 2007 (Amended in May 2007). Table 5.2, p.83

12. Concentration unit:

Air: ☐ ambient[14]; ☐ ng/m^3 ☐ pg/m^3 ☐ fg/m^3
☐ deposition; ☐ μg/m^2/d ☐ ng/m^2/d ☐ pg/m^2/d ☐ fg/m^2/d
☐ flux; ☐ μg /m/s ☐ ng/m/s ☐ pg/m/s
☐ TEQ basis, TEF assigned by____________

Water: ☐ mg/L ☐ μg /L ☐ ng/L ☐ TEQ basis, TEF assigned by____________

Sediment / Soil: ☐ g/kg ☐ mg/kg ☐ ng/kg ☐ pg/kg
☐ dry weight basis ☐ wet weight basis
☐ TEQ basis, TEF assigned by____________

13. Aggregate concentration:

Congeners or Isomers*	Number of samples	Minimum	Maximum	Arithmetic mean	Geometric mean	Median	Standard deviation	Standard error	Confidence interval

* Fill-out when sums of congeners or isomers concentration are derived.

Limit of quantification (LOQ)*	limit of detection (LOD)*

* Generally, LOD should be three times of signal noise and LOQ should be around three times of the value of LOD.

Computational handling of concentrations below LOD / LOQ to derive mean value
☐ eliminate from the population number of samples;
☐ assumption; ☐ equal to LOD ☐ equal to LOQ ☐ equal to zero
☐ assuming ___% of LOD ☐ assuming ___% of LOQ
☐ substitution by extrapolation from regression of concentration above LOD/LOQ

Additional information of data handling;

[14] Units recommended in the Guidance are "pg/m^3" for POPs except for PCDD/PCDF and "fg/m^3" for PCDD/PCDF.

14. Quality assurance and quality control:

Sampling:
- ☐ unknown
- ☐ known;
  - ☐ existing monitoring program; _______________
  - ☐ existing sampling protocol / procedure; _______________
  - ☐ other procedure;
    - ☐ field blank
    - ☐ travel blank
    - ☐ storage at ____ degrees centigrade

Laboratory:
- ☐ unknown
- ☐ known;
  - ☐ existing monitoring program; _______________
  - ☐ existing analytical protocol / method; _______________
  - ☐ other procedure;
    - ☐ operational blank test
    - ☐ internal standard
    - ☐ inter-laboratory calibration
    - ☐ intra-laboratory calibration
    - ☐ ring test
    - ☐ laboratory performance testing scheme
    - ☐ accreditation of laboratory; _______________
    - ☐ round robin test

15. Comments:

►Environmental concentration - **Human (breast milk, blood)** -Case Only[15]

1. Information on National Focal Point
   Name :
   Position : Institution :
   Address : Country :
   Tel : Fax :
   Email : Date :
   Signature :

2. Common Name of POPs: __________________________ CAS No.: __________

3. Environmental Media: ☐ human blood ☐ breast milk

----

4. Period of sampling: ___/___/____to ___/___/____(dd/mm/yyyy)

5. Frequency of Sampling: ☐ Once ☐ daily ☐ weekly ☐ monthly ☐ annually ☐ other______

6. Location: Country: ________________
   Area code: __________
   Administrative district: _____________
   Additional information of location;

7. Sample Type: Blood; ☐ blood plasma ☐ serum
   ☐ maternal blood ☐ cord blood
   Milk; ☐ breast milk
   ☐ other ____________
   Additional information of sample;

8. Human Characteristics: Age; ☐ <1 ☐ 1-10 ☐ 11-50 ☐ >50
   Height; ☐ <1m ☐ 1-1.5m ☐ >1.5m
   Sex; ☐ male ☐ female
   Generation; ☐ adults ☐ youth ☐ school children ☐ infants
   Reproductive history;
   Blood; gestation period; ☐ < 20 weeks ☐ ≥ 20 weeks
   ☐ no experience ☐ 1 birth ☐ more than 2 births
   Milk; ☐ 1st birth ☐ 2nd births or more
   ☐ prenatal
   postnatal; ☐ < 2 weeks ☐ 2-4 weeks ☐ > 4 weeks

15 If there is more than one case (e.g. for each project/programme, substance, location and period of sampling etc.), please make a copy of this questionnaire format for each case, OR please give us information for each case at each relevant item (such as in table format).

9. Exposure : Occupational; ☐ industrial ☐ agricultural
Residence; ☐ urban ☐ rural ☐ indoor ☐ industrial
☐ smoker ☐ non smoker
Additional information of exposure;

10. Dietary Characteristics: ☐ vegetation
☐ fish/fish products ☐ aquatic mammals ☐ other seafood
☐ meat, poultry and derived products
☐ eggs
☐ mixed
Diet; ☐ current diet ☐ previous diet

11. Sampling Method:
Sampling volume; _________ml and _________ml for pooling
Additional information of sampling;

12. Analytical Method:
Laboratory instrumentation level[16]; ☐ 3 ☐ 2 ☐ 1
GC detector[17]; ☐ Capillary GC - with Electron Capture Detection (GC-ECD)
☐ Quadrupole Mass Spectrometry in Electron Ionization (EI) mode
☐ Quadrupole Mass Spectrometry in Electron Capture Negative Ionization (ECNIMS) mode
☐ Ion Trap Mass Spectrometry using MS/MS mode
☐ High resolution Magnetic Sector Mass Spectrometry in Electron Ionization (EI) mode
Additional information of analytical method;

13. Concentration unit: ☐ wet weight basis ☐ fat weight basis ☐ dry weight basis
☐ TEQ basis, TEF assigned by____________
☐ mg/kg ☐ μg /kg ☐ ng/kg ☐ pg/kg

[16] Guidance on the Global Monitoring Plan for Persistent Organic Pollutants. Preliminary version, February 2007 (Amended in May 2007). Table 5.1, p.81

[17] Guidance on the Global Monitoring Plan for Persistent Organic Pollutants. Preliminary version, February 2007 (Amended in May 2007). Table 5.2, p.83

14. Aggregate concentration:

Congeners or Isomers*	Number of samples	Minimum	Maximum	Arithmetic mean	Geometric mean	Median	Standard deviation	Standard error	Confidence interval

* Fill-out when sums of congeners or isomers concentration are derived.

Limit of quantification (LOQ)	limit of detection (LOD)

* Generally, LOD should be three times of signal noise and LOQ should be around three times of the value of LOD.

Computational handling of concentrations below LOD / LOQ to derive mean value

☐ eliminate from the population number of samples;
☐ assumption; ☐ equal to LOD ☐ equal to LOQ ☐ equal to zero
☐ assuming ___% of LOD ☐ assuming ___% of LOQ
☐ substitution by extrapolation from regression of concentration above LOD/LOQ

15. Quality Assurance and Quality Control:

Sampling: ☐ unknown
☐ known; ☐ existing monitoring program; _______________
☐ existing sampling protocol / procedure; _______________
☐ other procedure; ☐ sampling blank test
☐ store at ____ degrees centigrade / add potassium dichromate during sampling
☐ pool at ____ degrees centigrade after sampling

Laboratory: ☐ unknown
☐ known; ☐ existing monitoring program; _______________
☐ existing analytical protocol / method; _______________
☐ other procedure; ☐ operational blank test
☐ internal standard
☐ inter-laboratory calibration
☐ intra-laboratory calibration
☐ ring test
☐ laboratory performance testing scheme
☐ accreditation of laboratory; _______________
☐ round robin test

16. Comments:

Appendix 2
Monitoring Programmes in Asia and Pacific Region
(Modified UNEP/POPS/COP.3/INF/15)

Countries of Asian and Pacific States

A. Pacific Islands	B. South and Eastern Asia	C. Western Asia
(1) American Samoa	(1) Afghanistan	(1) Bahrain
(2) Cook Islands	(2) Bangladesh	(2) Cyprus
(3) Fiji	(3) Bhutan	(3) Iran (Islamic Republic of)
(4) French Polynesia	(4) Brunei Darussalam	(4) Iraq
(5) Guam	(5) Cambodia	(5) Jordan
(6) Kiribati	(6) China	(6) Kuwait
(7) Micronesia (Federal States of)	(7) India	(7) Lebanon
(8) Marshall Islands	(8) Indonesia	(8) Oman
(9) Nauru	(9) Japan	(9) Palestine
(10) New Caledonia	(10) Kazakhstan	(10) Qatar
(11) Niue	(11) Korea (DPRK)	(11) Saudi Arabia
(12) N. Mariana Islands	(12) Korea (Republic of)	(12) Syrian Arab Republic
(13) Palau (Republic of)	(13) Kyrgyz Republic	(13) United Arab Emirates
(14) Papua New Guinea	(14) Lao People’s Republic	(14) Yemen
(15) Pitcairn Islands	(15) Malaysia	
(16) Samoa	(16) Maldives	
(17) Solomon Islands	(17) Mongolia	
(18) Tokelau	(18) Myanmar	
(19) Tonga	(19) Nepal	
(20) Tuvalu	(20) Pakistan	
(21) Vanuatu	(21) Philippines	
(22) Wallis And Futuna	(22) Singapore	
	(23) Sri Lanka	
	(24) Tajikistan	
	(25) Thailand	
	(26) Turkmenistan	
	(27) Uzbekistan	
	(28) Vietnam	

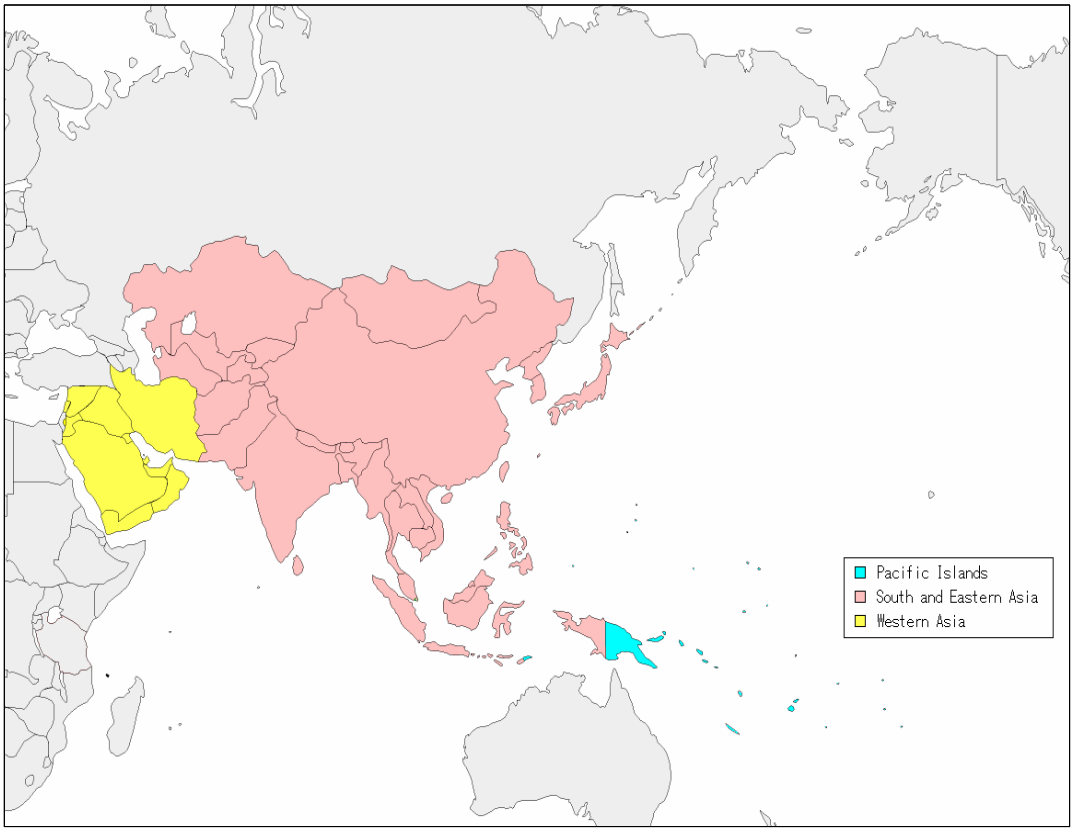


Fig.1 Area of Asia and Pacific States for the Effective Evaluation of Stockholm Convention

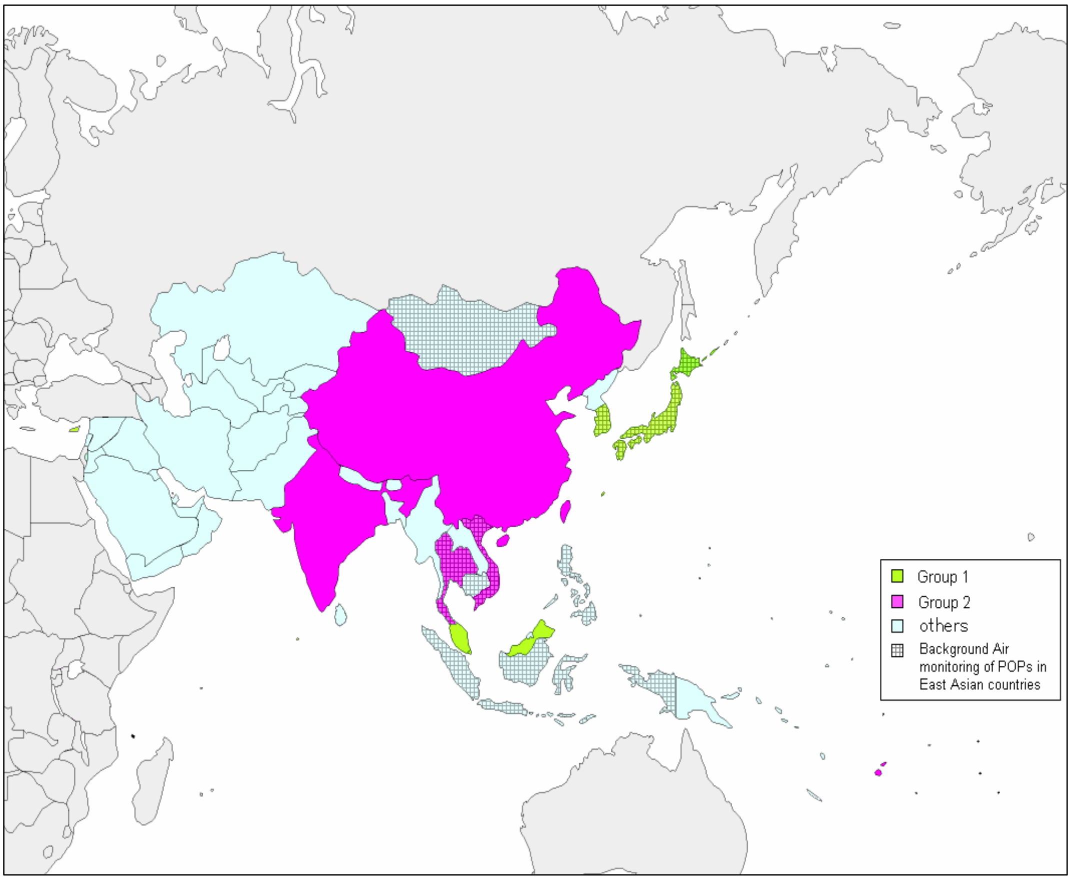


Fig.2 Countries with Group1 and 2 programmes in Asia and Pacific States

Glossary of terms used in the inventory

Group-1	Programmes/activities which can immediately provide information for the monitoring reports to be prepared for the first evaluation
Group-2	Programmes/activities that, with identified capacity enhancement, can provide information coverage in areas that would otherwise be inadequately represented in the first monitoring evaluation reports
I L-1	Instrumentation level[18] capable to analyze PCDD/PCDF and dioxin-like PCB at ultra-trace concentrations (high-resolution mass spectrometer in combination with a capillary column)
I L-2	Instrumentation level capable to analyze all POPs (capillary column and a mass-selective detector)
I L-3	Instrumentation level capable to analyze all POPs without PCDD/PCDF and dioxin like PCB (capillary column and an electron capture detector)
I L-4	Instrumentation level not capable to do congener specific PCBs analysis (no capillary column, no electron capture detector)
Intercalibration	Participation in national and international intercalibration activities
Limited capacity enhancement	"Limited" means that institutionally-organised personnel, and basic infrastructure are already in place and available for capacity enhancement for the first assessment
Phase I	Activities to support the Article 16 effectiveness evaluation that will be conducted by the Conference of the Parties at its fourth meeting, information collected between 2000 and 2007 (also termed as first evaluation)
Phase II	Activities to support the Article 16 effectiveness evaluation after 2009 (also termed as subsequent evaluations)
QA/QC	Quality assurance and quality control regimes
UNEP/GEF project pilot laboratory	project pilot laboratory for "Assessment of Existing Capacity and Capacity-building Needs to Analyse Persistent Organic Pollutants in Developing Countries." （9 laboratories in 7 countries） The project focuses on country needs relative to POP laboratory analyses, in order to comply with the Stockholm Convention in a sustainable way.

List of abbreviations used in the inventory

FAPAS	food analysis performance assessment scheme at Central Science Laboratory in England.
FIOH	Finnish Institute of Occupational Health
GAPS	Global Atmospheric Passive Sampling survey
I L-	Instrumentation level
IP/RP	International/regional programmes
WHO/GEMS/Food	WHO Global Environmental Monitoring System – Food Contamination Monitoring and Assessment Programme

EPA methods

EPA 1613	Dioxins & Furans - HRGC/HRMS
EPA 1668(A)	Chlorinated biphenyl congeners by HRGC/HRMS
EPA 8081(A)	Organochlorine Pesticides by Cap Column GC
EPA 8081(B)	Organochlorine Pesticides by GC Organochlorine pesticides by GC with ECD or ELCD
EPA 8082(A)	PCBs by GC
EPA 8270 (C)	Semivolatile Organic Compounds by GC/MS Cap Col
EPA 8270 (D)	Semivolatile Organic Compounds by GC/MS
EPA 8280(A)	PCDD and PCDF by HRGC/LRMS

Others

EN ISO/IEC 17025	standard which establishes requirements for a laboratory management system that combines quality management system requirements with technical requirements
EN 1948-1	Stationary source emissions -Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs - Part 1: Sampling of PCDDs/PCDFs

[18] In this document, the term **Instrumentation level** is replacing the term **Tiers,** used in UNEP/POPS/COP.2/INF/10

Inventory of POPs monitoring programmes in Asia and Pacific States (UNEP/POPS/COP.3/INF/15; partly added and altered)

Country, Region	Monitoring activity, Laboratory	POPs monitored											Matrix				Geographical coverage	Time frame	QA/QC	Inter-calibration	Standards	Note
		aldrin	chlordane	dieldrin	endrin	DDT	heptachlor	mirex	toxaphene	HCB	PCB	PCDD/PCDF	Core media: ambient air	Core media: mother's milk	Core media: human blood	Others						
Group 1																						
International / Regional Programmes																						
East Asia	Background Air Monitoring of POPs in East Asian Countries	O	O	O	O	O	O	O	O	O	O		O				Cambodia, Indonesia, Korea (Republic of), Japan, Mongolia, Philippine, Thailand, Vietnam	Phase I; Phase II	requesting analytical laboratories to do regular reporting on QA/QC	participation to existing international programs	revised guidance in 2006 "Monitoring Manual for POPs and their Related Substances" 2006	Published as "Background Air Monitoring of POPs in East Asian Countries 2004-2006"; http://www.env.go.jp/en/chemi/pops/eaws/background04-06.pdf
GAPS	Global Atmospheric Passive Sampling Study	O	O	O	O	O	O	O	O	O	O	O	O				Several sites in Africa (5), South East Asia, Australia (6), Antarctica (1), Central and South America (11), Europe (9), and North America (1)	Phase I; Phase II (not decided yet)	PCN and NIST SRM	international PCN intercalibration	Accepted methodologies for air sample collection for POPs	GAPS data are published periodically (on papers)
WHO /GEMS/ FOOD	Global environment monitoring system for food, including human milk, compiles data from national participating institutions and organizes studies.	O		O		O				O	O			O		Food	Global; Over 80 countries participate in GEMS/Food with around 30 involved in human milk monitoring of POPs Data on human milk monitoring of POPs in Asia and Pacific states is reported for Japan and Iran.	Phase I; Phase II	proficiency studies and reference materials	proficiency studies and reference materials	Protocol for human milk	Pesticide POPs data goes back to 1974. Data on dioxins in human milk from 1987. Time trends available from European countries. Data are accessible through http://sight.who.int/newsearch.asp?cid=131&user=GEMSuser&pass=GEMSu
		8 pesticide POPs & marker PCBs																				
	WHO human milk survey for POPs	O	O	O	O	O	O	O	O	O	O	O		O			Global (31 countries) In Asia and Pacific states, Cook Islands, Cyprus, Fiji, India, and Philippines are participating in this project.					

Country, Region	Monitoring activity, Laboratory	POPs monitored											Matrix				Geographical coverage	Time frame	QA/QC	Inter-calibration	Standards	Note
		aldrin	chlordane	dieldrin	endrin	DDT	heptachlor	mirex	toxaphene	HCB	PCB	PCDD/PCDF	Core media: ambient air	mother's milk	human blood	Others						
B. South and Eastern Asia																						
Japan	POPs Monitoring in Japan	O	O	O	O	O	O	O	O	O	O		O			bivalves, Fish, water, sediments	National	Phase I; Phase II	use of reference materials, quality charts and guidelines for sampling and analysis	existing satisfied standards	revised guidance in 2006	http://www.env.go.jp/en/chemi/pops
Japan	Environmental Survey and Monitoring of Chemicals	O	O	O	O	O	O	O	O	O	O		O	O	O	bivalves, Birds eggs, Fish, water, sediments, food	National	Phase I; Phase II	development of guidelines, organizing seminars, distribution of standard reference materials and requesting analytical laboratories to do regular reporting	for laboratories of local government, participation to Round Robin Test conducted by MOE; for laboratories of private sector, participation of existing international programs	revised guidance in 2006	Annual report of "Chemicals in the Environment"; http://www.env.go.jp/chemi/kurohon/en/http2005e/index.html
Japan	Environmental Survey of Dioxins										O	O	O			water, soil, sediments	National	Phase I; Phase II	Guidelines on QA/QC for the Environmental Measurement of Dioxins			
Korea (Republic of)	National Marine Environment Monitoring (1997-ongoing)																	1997-ongoing	At some laboratories, yes.	At some laboratories, yes.		http://ncis.nier.go.kr (only in Korean)
	Preliminary Environmental survey on POPs (1998) monitoring of POPs in the coastal area of Korea (1999-2001)																	1999-2001	At some laboratories, yes.	At some laboratories, yes.		Conducted by Ministry of Maritime Affairs and Fisheries
	National Research Project on Endocrine Disrupters including POPs (1999-2008)																	1999-2008	At some laboratories, yes.	At some laboratories, yes.		The Ministry of Environment has been carrying out monitoring of EDCs including POPs since 1999.
Malaysia	The Development of National Programme to Control POPs																		At some laboratories, yes.	At some laboratories, yes.		Developing capability to analyse for PCDD/PCDF.
Singapore	Monitoring of dioxins and furans in ambient air											O	O				National	Phase I; Phase II	Singapore - Laboratory Accreditation Scheme	none	USEPA methods	Not accessible
C. Western Asia																						
Cyprus	Food of animal origin (PCDD/PCDF)											O		O		Foods		2000-2007; will continue beyond 2008	EN ISO/IEC 17025		sampling using EN 1948-1	information will not be available for evaluation by 2007.

Country, Region	Monitoring activity, Laboratory	POPs monitored											Matrix				Geographical coverage	Time frame	QA/QC	Inter-calibration	Standards	Note
													Core media									
		aldrin	chlordane	dieldrin	endrin	DDT	heptachlor	mirex	toxaphene	HCB	PCB	PCDD/PCDF	ambient air	mother's milk	human blood	Others						
Group 2																						
B. South and Eastern Asia																						
China	National POPs monitoring proposal of China for first effectiveness evaluation under the Stockholm Convention					O				O	O	O	O	O			P.R. China excluding Hong Kong Special Administrative Region and Macau Special Administrative Region	2006-2007; continue beyond 2008	according to GMP guidance; intercalibration studies	The CAS lab has participated in international intercalibration studies for ten times on food and several environmental media, however, the local labs are not very experienced in this.	sampling and analysis procedure according to the GMP Guidance and some analytical methods adopted by USEPA methods.	Few institutes involved in the programme are qualified to conduct GMP activities in China, so technical and financial support are highly needed in order to make the programme implemented smoothly. information not available for evaluation by 2007
India	- Extensive nationwide monitoring of agricultural produce, vegetables, water and animal produce is carried out at 16 centres under an All India Coordinated Research Project (AICRP). - Extensive monitoring for DDT and HCH																					
	- Environmental monitoring of the combustion byproducts PCDD/Fs has been initiated.																India, Kuwait, Bahrain, United Arab Emirates *					Data is limited. *
Thailand	- Monitoring Programme for organochlorine pesticides and polychlorinated biphenyls (PCBs) (routine activities) - National Inventory of Sources of Dioxins and Furans Emissions in Thailand (1998-2000)																					Some monitoring data on several PTS are available in the Agricultural Department of Thailand annual reports. Developing capability to analyze for PCDD/PCDF.
Vietnam	POPs monitoring has not yet been put into the national environmental monitoring networks although a few small scale monitoring programs have been implemented in frame of international cooperative projects, which have produced some POPs data, e.g. DDTs residues at Balat estuary between 1990-2004.																					Capable of conducting trace analysis of OCPs and PCBs in water and sediments, but not air and biological samples. More than dozen laboratories have capability of analyzing POPs at various levels.

* www.chem.unep.ch/pts/regreports/IndianOcean.pdf

Country, Region	Monitoring activity, Laboratory	POPs monitored											Matrix				Geographical coverage	Time frame	QA/QC	Inter-calibration	Standards	Note
													Core media									
		aldrin	chlordane	dieldrin	endrin	DDT	heptachlor	mirex	toxaphene	HCB	PCB	PCDD/PCDF	ambient air	mother's milk	human blood	Others						
Group 2 UNEP/GEF project pilot laboratory																						
A. Pacific Islands																						
Fiji	Institute of Applied Science, University of South Pacific	O	O		O	O	O	O		O	O					soil, food			Yes	yes, coordinated by FAPAS	EPA 8082 (A) EPA 8081 (A) (B)	I L-3
		O											O			bivalves, Fish						
B. South and Eastern Asia																						
China	RCEES – Dioxin Laboratory, Research Center for EcoEnvironmental Sciences, Chinese Academy of Sciences	O		O	O	O	O	O			O	O	O	O	O	Birds eggs, bivalves, Fish, Marine mammals, food, soil, sediments, vegetation, water			Yes	yes, coordinated by FIOH, INTERCAL	EPA 1668 (A) EPA 1613 EPA 8081 (A) (B)	
										O						food, soil, sediments, vegetation, water						
Vietnam	Laboratory of Analytical Chemistry, Vietnam-Russian Tropical Center					O				O	O	O	O			bivalves, food, soil, water			Yes	Yes	EPA 8270 (C) (D) EPA 8081 (A) (B) EPA 8280 (A)	