



**UNITED NATIONS
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Final Project Report for the APN Project

**Capacity Development
Training for**

***Monitoring of POPs
in the East Asian
Hydrosphere***

UNU Centre, Tokyo
1-5 September, 2003

Supported by:

APN
Asia-Pacific Network for Global Change Research

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Project Title: **Capacity Development Training for Monitoring of POPs
in the East Asian Hydrosphere**
(Reference: 2003-13)

Abstract: Persistent Organic Pollutants (POPs) are chemical substances that persist in the environment, bioaccumulate through the food web, and pose a risk of causing adverse effects to human population and the environment. There has been a realization that these pollutants, upon exposure of human population, can cause serious health effects ranging from increased incidence of cancers to disruption of the hormonal system. These effects have also been observed and recorded for various animal species. Developing countries are particularly vulnerable due to the often indiscriminate use and disposal of POPs.

The purpose of this workshop was to address key issues in the interpretation of the threats posed by environmental levels of POPs through the examination of existing standards, guidelines and toxicity assessments for POPs in the environment. The workshop also targeted to build the capacity in the East Asian region to undertake monitoring of POPs through a monitoring network that has been set up by UNU. This network has been collecting data in the region for a number of years.

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Amount of APN Funding awarded: US\$ 41,000

Duration: 1 year

List of collaborating APN approved countries:
Australia, China, Indonesia, Japan, Korea, Malaysia, Philippines,
Thailand, Viet Nam

Introduction:

Background information:

This workshop was the second in a series of UNU capacity development activities focused on water pollution by persistent organic pollutants (or POPs) and their monitoring. It was a part of the ongoing activities of the UNU Project on Environmental Monitoring and Governance in the East Asian Hydrosphere — Monitoring of POPs in the East Asian Region. This project is supported through a generous grant from the Shimadzu Corporation (Japan) and funding from UNU. Further information about this project and its activities is available from the project website at <http://landbase.hq.unu.edu>

Scientific significance:

Some limited regional assessments of environmental levels of POPs have already been attempted by researchers through the analysis of biomarkers, such as mussels and fish, most notably within the Asian Mussel Watch Programme, which is coordinated by UNU. Published regional overviews have concentrated on marine organisms, and have drawn comparisons based on measurements taken from different parts of the region at various different times (Iwata et al., 1994; Kannan et al. 1995; Monirith et al., 2000; Tanabe et al., 2000).

The UNU network in East Asia has been conducting environmental monitoring activities, including POPs monitoring, for more than four years. The regional sampling programme is the only one of its type existing for the analysis of water and sediments across the region. This workshop was a valuable opportunity to continue discussions amongst the scientists in the UNU network, regarding the potential for harmonization of monitoring activities and threat assessment in the region, and the use of the common method for sample preparation and analysis that has already been supplied to all participating laboratories by UNU.

The workshop was a step in the direction of being able to fully understand the extent and severity of POPs pollution in the Asia Pacific region. At the same time, it initiated a policy dialogue on ways to ameliorate the situation through the use of data-based early-warning mechanisms for identifying and reacting to severe POPs threats in the region.

An important aspect of the first two days of this workshop was the strengthened emphasis laid on the importance of the interpretation of the data collected in environmental monitoring – i.e. significance to human and ecosystem health, and comparison with existing guidance on acceptable levels of POPs in the environment.

The training session that took place during the final three days of the workshop was intended to improve the skills of laboratory technicians who are involved in the analysis of water and sediment samples. An inter-laboratory calibration exercise was initiated during the training session in order to test the results gained from the different laboratories. The results from a previous similar exercise were also examined.

Objectives:

- Development of knowledge and capacity of laboratory staff in developing countries to carry out environmental monitoring activities
- Development of guidelines for environmental quality standards for pollution
- Development of a regional early-warning system to cope with extreme pollution cases

Development and justification of the project:

The project was developed based on the needs and potential of the UNU network. Many of the issues selected for discussion during the workshop were raised in a previous international workshop on 'Regional Environmental Quality in the East Asian Coastal Hydrosphere: Environmental Quality Guidelines and Capacity Development' held on January 26-31, 2003, in Kwangju, Korea and Hadano, Japan. Information about this event and a copy of the Summary of the discussion of the development of regional guidelines for environmental quality can be found on the UNU project website at:

<http://landbase.hq.unu.edu/Workshops/KwangjuJan2003/report.htm>

Activities Conducted:

During the first two days of the workshop, 1-2 September, 2003, a programme of presentations and discussions was held at UNU Center, Tokyo, focusing on development of guidelines for environmental quality standards for pollution in coastal and inland waters (Please see the workshop programme provided in Appendix 1 to this report).

On the first day, presentations introduced a range of existing systems of guidelines and standards for POPs in the environment, at both regional and national levels. On the second day, presentations considered progress made in monitoring the presence of POPs in the East Asian environment, interpretation of the levels found, and relation to the existing standards systems. On both days the discussions focused on the need for harmonization of data interpretation systems, raising a number of practical issues and suggestions.

The second part of the workshop consisted of a three-day training on analytical techniques, held in Hadano, Tokyo, at the facilities of Shimadzu Corporation, Japanese specialist manufacturers of scientific instruments. The training included practical support and instruction on the use of GCMS and other scientific equipment necessary for the analysis of environmental samples. The manual used for the training is available on the UNU project website at:

<http://landbase.hq.unu.edu/Workshops/TokyoSept2003/2003Manualtext.htm>

Outcomes:

Detailed results of the project: Please see attached **Workshop Report** in Appendix 3, summarising the results of the first two days of the workshop. The report includes a list of findings and recommendations by the workshop participants in response to the proposal of the creation of harmonized environmental quality guidelines for POPs in East Asia, and a clear conclusion on the next steps to be taken in this direction.

Progress was made on all of the objectives for the workshop as follows:

Objective: Development of knowledge and capacity of laboratory staff in developing countries to carry out environmental monitoring: This objective was achieved on a practical level through the 3-day hands-on training session, held from 3-5 September, 2003 at the laboratories of the Shimadzu Corporation. Laboratory technicians from the 8 participating countries received training that will improve their analytical capacities. The organization and discussion of the inter-laboratory calibration exercises were also useful in highlighting possible problems and improvements in the analytical techniques of the participants. The capacity of the laboratory staff to handle and discuss the results from the environmental monitoring was developed during the first two days of the workshop through consideration of the presentations and discussions with international experts.

Objective: Development of Guidelines for Environmental Quality Standards for Pollution: During the workshop information and insights were shared amongst the participants concerning the use of currently available standards for POPs in the environment. The participants produced a number of recommendations, which have been listed in the workshop report in Appendix 3.

In particular, the workshop identified a process through which guidelines should be developed, based on a database of toxicity data. Issues that should be considered in the formation of these guidelines were raised, and discussions concluded that a panel of experts would be needed to address these issues.

Objective: Development of a Regional Early-warning System to Cope with Extreme Pollution Cases:

A clear idea of what the nature of an Early-warning System should be emerged from the workshop. Available software and the potential for development were considered. An excellent example was found in the approach taken in the development of the Australia and New Zealand Guidelines for Fresh and Marine Water Quality. The potential to join the Australia and New Zealand Guidelines' toxicity database to the existing regional monitoring database was identified as the basis for an Early-warning system. This undertaking would require careful consideration of a range of issues identified in the workshop report.

Products:

- Statement of consensus points by workshop participants and workshop report (*please see Appendix 3. to this report*)
- Proceedings book containing papers and abstracts of the workshop presentations and summary report
- Comprehensive policy summary paper under development by UNU
- UNU website containing abstracts, presentation and summary of the workshop
- Special issue of 'East Asia Monitor' UNU project's quarterly electronic newsletter. September/October 2003 issue contains reflections on the workshop, abstracts, presentations and photographs
- A series of proposed revisions to the current design of UNUs web-based data interface on POPs pollution in East Asia under development at UNU

Conclusions:

The conclusion of the workshop was that the development of a harmonized regional database on toxic effect levels of POPs in the environment could provide the basis for the increased coordination and eventual development of guidelines for environmental levels of POPs in the East Asian Region.

Practical indications of how a harmonized regional database and system for guidance on environmental quality for POPs could be

created during the workshop discussions and presentations. The Australia and New Zealand Water Quality Guidelines are based on a database of screened scientific data which could conceivably provide a model for a database to include research on toxicity testing from East Asian countries, as well as elsewhere. The recommendations of the workshop participants included consideration of the necessary refinements to this approach, including appropriate screening procedures to ensure the quality of toxicity data to be used as a basis for effect level guideline curves. In addition to this, the participants agreed that the same procedures should be used to ensure the quality and comparability of environmental monitoring data to be collected in the region as UNU continues to develop its regional POPs monitoring programme in East Asia.

Future Directions:

The laboratory technicians who attended the workshop will be able to conduct monitoring and analysis for selected POPs in sediments, based on the training that they received. These monitoring activities will be coordinated by UNU as part of its regional monitoring programme over the next two years. Results will also be collected from a round robin test that was initiated at the workshop to test the quality of results from each laboratory.

The workshop recommendation of a harmonized regional database and system for guidance on environmental quality for POPs will require the input of a number of expert scientists during the database design process. This activity should be coordinated by UNU. The resulting database should be developed in a form that will work with the UNU database on environmental monitoring, and other regional datasets.

Appendix 1. Workshop Programme

1 September, 2003

08:30-09:00 Registration and document delivery

Opening Session

09:00-09:20 Welcome Speech

Prof. Keiichiro Fuwa, UNU

09:20-09:40 Opening Remarks

Mr. Sombo Yamamura, APN

09:40-10:00 Overview of the UNU Project and Introduction to the Workshop

Dr. Zafar Adeel, UNU INWEH

10:00-10:20 Examples from the UNU Environmental Monitoring Results

Ms. Caroline King, UNU

10:20-10:40 Coffee Break

Working Session 1 – Regional Guidelines for POPs in Water

Chair: Prof. K. Fuwa and Mr Sombo Yamamura

10:40-11:00 Harmonization of Environmental Quality Standards for POPs in East Asia

Dr. Zafar Adeel, UNU-INWEH

11:00-11:20 POPs in European Waters

Prof. Bo Jansson, Stockholm Univ.

11:20-11:40 Derivation of Water Quality Guidelines for Persistent Organic Pollutants In Australia and New Zealand

Dr. Michael Warne, NSW EPA

11:40-12:00 POPS Guidelines in Japan and their Trend in the Environment

Dr. Masatoshi Morita, NIES

12:00-14:30 Lunch

Working Session 2 - Formulation of National Water Quality Standards for POPs in East Asia

Chair: Dr. Masatoshi Morita and Dr. Michael Warne

14:30-14:50 Brief Introduction on the Formulation of Environmental Quality Standards in China

Dr. Xianbing Liu, EPA China

14:50-15:10 Singapore's Water Guidelines: A Brief Overview

Prof. Hian Kee Lee, NUS

15:10-15:30 Environmental Quality Standards Relating to POPs in Indonesia

Ms. Halimah Syafrul, EMC

15:30-15:50 Environmental Standards of Korea

Dr. Jae Ryoung Oh, KORDI

15:50-16:10 Environmental Quality Standards in Vietnam

Prof. Nguyen Duc Hue, Vietnam National Univ.

16:10-16:40 Coffee Break

16:40-17:00 Towards a Development of the UNU Water Quality Screening Standards

Dr. Evangeline Santiago, Univ. of the Philippines

- 17:00-17:40 **Discussion session**
Chair: Dr Zafar Adeel and Dr. Evangeline Santiago
- 17:40-18:00 Environmental Monitoring: Standardization of Methods and Comparison of Results
Prof. Keiichiro Fuwa, UNU

2 September, 2003

Venue: Rose Hall, 5F, UN House, Tokyo

- 08:30-11:00 **Closed Session**
(UNU Project meeting)
- 11:00-11:30 Coffee Break

Working Session 3 - Status and Implementation of Water Quality Standards in East Asia

Chair: Prof. Bo Jansson and Prof. Hian Kee Lee

- 11:30-11:50 National Water Quality Standards and Status in Malaysia
Dr. Mustafa Ali Mohd, University of Malaya
- 11:50-12:10 Monitoring of Persistent Organic Pollutants in the Coastal Hydrosphere of Thailand
Ms Sukanya Boonchalermkit, ERTC Thailand
- 12:10-14:30 Lunch
- 14:30-14:50 Water Quality Standards and POPs Pollution in China
Dr. Honghai Tian, China-Japan Friendship Center for Environmental Protection
- 14:50-15:10 Occurrence of Persistent Chlorinated Pesticides in Lakes and Rivers in Vietnam: Levels, Fate, Trends and Environmental Implications
Mr. Nguyen Pham Chau, Viet Nam National Univ.

Working Session 4 – Regional Strategies and Recommendations for Control of POPs in East Asia

Chair: Dr. Mustafa Ali Mohd and Dr. Honghai Tian

- 15:10-15:30 Japanese activity to support regional POPs monitoring in East Asian countries
Dr. Yasuyuki Shibata, NIES
- 15:30-15:50 Persistent Organic Pollutants (POPs) in Asian Countries: Contamination and Implications for Environmental and Human Health
Dr. Tu Binh Minh, Ehime Univ.
- 15:50-16:10 Human Exposure to Persistent Organic Pollutants (POPs) in Asian Developing Countries
Dr. Annamalai Subramanian, Ehime Univ.
- 16:10-16:40 Coffee Break
- 16:40-17:40 **Discussion session**
Chair: Dr. Zafar Adeel and Prof. Bo Jansson
- 17:40-18:00 Concluding Session (formulation of recommendations)
- 18:00-18:15 **Closing Ceremony**
- 18:30-20:30 Reception

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Appendix 3. Workshop Report

Introduction

This workshop, supported by the Asia Pacific Network for Global Change Research (APN), was held as part of a series of capacity development training events on monitoring Persistent Organic Pollutants (POPs) by the UNU Project: Environmental Monitoring and Governance in the East Asian Hydrosphere - Monitoring of POPs in the East Asian Region. During the two-day workshop, a number of presentations were made followed by interactive discussions. The focus of discussion was on development of guidelines for environmental quality standards for pollution in coastal and inland waters. Presentations during the first day introduced a range of existing systems of guidelines and standards for POPs pollutions in the environment, at both regional and national levels. The progress made in monitoring the presence of POPs in the East Asian environment was presented on the second day, including interpretation of the levels found, and relation to the existing quality standards. The discussions focused on the need for harmonization of data interpretation systems, raising a number of practical issues and developing appropriate suggestions. A brief summary of the presentations on tools for assessing the threat of POPs in the environment, and on East Asian standards systems is provided in this report. This is followed by a short summary of the workshop discussions, and a list of recommendations developed by the workshop participants.

Current Tools for the Assessment of the Significance of Environmental Levels of POPs

Dr. Bo Jansson of the Institute of Applied Environmental Research, Stockholm University introduced the approaches to managing POPs pollution that have been developed under the Stockholm Convention, the UN-ECE LRTAP POPs Protocol, Marine Conventions such as the Oslo and Paris Convention for the Protection of the Marine Environment of the North-East Atlantic and the Baltic Marine Environment Protection Commission, EU Water Framework Directive and the new chemicals policy currently under discussion in the EU. For these measures, he outlined the lists of substances under consideration, the processes of prioritization, and, in the case of the OSPAR Convention, the use of “Background/Reference Concentrations (BRCs)” and “Ecotoxicological Assessment Criteria (EAC)” for the assessment of chemicals in the marine environment. During the discussion sessions, Dr. Jansson also highlighted the importance of the use of identified toxicological effect levels for chemicals in the environment in the context of the dialogue on environmental quality guidelines for POPs being undertaken at UNU.

The framework for assessing the ecotoxicological risk of chemicals in the environment under the Australia and New Zealand Water Quality Guidelines was presented by Dr. Michael Warne, NSW EPA. The method on which this framework is based involves a modification of the Canadian (CCME 1991) assessment factor method and a new statistical distribution method called the Burr Type III method. The collection and screening of acute, chronic, laboratory, field, mesocosm and microcosm toxicity data for POPs for use within the framework was described in the presentation. Acute to chronic ratios were used within the framework to provide estimates of chronic toxicity when there were only acute toxicity data available. The environmentally safe levels of POPs

identified through this method are termed Trigger Values (TVs). Three levels of ecosystem protection were developed (ie. high conservation value ecosystems; slightly to moderately disturbed ecosystems; and highly disturbed ecosystems) and different TV values applied to each. Dr Warne highlighted the remaining point that the toxicity of mixtures of pollutants is not addressed in this approach.

The method for the development of quality standards for POPs for various environmental compartments in Japan was presented by Dr. Masatoshi Morita. The basis for the calculation of these standards is either, Acceptable Daily Intake (ADI), Tolerable Daily Intake (TDI) or Virtually Safe Dose (VSD). For humans, these depend on body weight. The presentation described the derivation of the TDI and the resulting environmental quality standards for PCDD/PCDF from the starting point of the Non-Observable Effect Level (Body Burden).

Mr. Nguyen Pham Chau, National University of Viet Nam drew on the Canadian Probable Effect Level, referred to by. The Canadian standards system was also used as a point of reference by Dr. Tu Binh Minh, Ehime University.

Dr. Evangeline Santiago, University of the Philippines, examined the water quality standards used by the Environmental Management Commission of the State of North Carolina, USA, for which the calculations are based on chronic toxicity to aquatic species and considerations of Reference Dose for non-carcinogens, and a Safe Human Dose for carcinogens from consumption of fish and shellfish.

National Systems of Environmental Quality Standards for POPs in East Asia

Several presentations focused on the existing environmental quality standards for POPs in China, Singapore, Indonesia, Korea, Viet Nam, Philippines, Malaysia and Thailand. These were followed by a series of presentations comparing the standards to existing levels of POPs in the environment that have been identified during monitoring activities in this region.

Many gaps concerning POPs were identified in the existing quality standards regimes. Whilst a number of East Asian countries include POPs in their national drinking water standards, there is relatively little information on these pollutants in surface and seawater standards. However, China, Thailand and Malaysia have standards for some POPs in surface waters. For seawater, the Philippines has standards for a number of POPs and China has specified levels for DDT. Overall in this region there have been a greater number of provisions made concerning acceptable levels of DDT than for the other twelve POPs that are listed in the Stockholm Convention.

For some countries, quality standards have not been elaborated for POPs chemicals because their production, use and application have already been banned. UNU's environmental monitoring in the region, which featured in a number of presentations, has already shown the presence of many of these chemicals in the East Asian environment. Examples from UNU's monitoring results were presented by Ms Caroline King, UNU, Mr Nguyen Pham Chau, Viet Nam National University, Hanoi, presented monitoring results, showing high levels of, DDTs despite a ban on this chemical in Viet

Nam. Examples of the presence of POPs in the environment in various Asian countries were presented by Dr. Tu Binh Minh, Ehime University. Dr. Annamalai Subramanian, Ehime University presented strikingly high results of POPs found in breast-milk, originating from environmental exposures in a number of Asian countries. Lower levels of POPs were identified by Ms Sukanya Boonchalermkit, ERTC Thailand and Dr. Honghai Tian, China-Japan Friendship Center for Environmental Protection.

Many of the workshop participants identified the need to update the available quality standards and to fill gaps in guidance regarding POPs, together with the development of corresponding human and laboratory capacity for implementation. Prof. Hue called for collaboration with other countries in the region in order to ensure integrated approaches to management of trans-boundary pollution.

In his consideration of the Chinese Standards system, Mr Xianbing Liu identified both scientific and non-scientific issues arising in the formulation of environmental quality standards. These issues include consideration of human health, economic pressures for development, and limits on government capacity to monitor and enforce laws. Dr. Evangeline Santiago, University of the Philippines also identified "other" non-scientific considerations in the setting of standards in developing countries as social, economic and technological issues relating to the in-country capacity for enforcement.

In many cases, the derivation of Environmental Quality Standards in East Asian countries has been based on the systems in use in other countries and in the case of drinking water standards, on guidance from WHO, rather than original scientific research. Prof. Hian Kee Lee, National University of Singapore pointed out that in Singapore the approach has been to avoid 'reinventing the wheel', which has led to the direct adoption of the US EPA system in Singapore. Other countries have also passed their own legislation, based on standards from developed countries that were identified at the time of drafting. These standards are not updated as regularly as those in the developed countries. This has resulted in use of quality standards in East Asia that is based on borrowed and often outdated information. In general, this approach has been adopted due to the perceived scarcity of resources and scientific capacity available within the developing countries.

Workshop Discussion Sessions: Harmonization of Methods for Assessment of POPs in the Environment

The workshop included two discussion sessions, focusing on the possible harmonization of methods for assessment of POPs in the environment as proposed during the workshop by Dr. Zafar Adeel, UNU. The aim of these discussions was not to replace national standards systems, since this would be a decision to be taken within the governments of each country. However, the development of recommendations for a non-mandatory system of guidelines could provide a useful tool for the interpretation of environmental levels of POPs.

Mr. Xianbing Liu observed that national standards systems in East Asia use various systems for classification of water types. Mr. Liu argued that these systems should not be harmonized, but standards for POPs should be added to each of them. Concerns were

raised by participants observing that quality standards themselves could be misleading where they oversimplify the pollution risk and give a false sense of security. Dr. Jian Yang, Chinese Academy of Sciences gave the example of his research on fisheries that were suffering impacts from pollution levels in a Chinese lake, whilst local residents were not alarmed because the lake was believed to comply with the Chinese quality standards. Dr. Bo Jansson remarked that rather than focusing on developing quality standards, this group of scientists might find it more useful to consider guidelines concerning effect levels. Dr. Michael Warne pointed out that effect levels can be described as curves, demonstrating varied effects at different levels. Dr. Zafar Adeel, UNU indicated that this was a more effective approach than the use of flat threshold levels. Dr Annamalai Subramanian and a number of other participants referred to the importance of setting guidelines for levels of POPs in bioindicators in addition to water and sediments.

Some discussion time was devoted to whether it is possible to assume that similar effect levels can apply to areas of different climate and species populations. The suitability of selecting data from temperate regions, and then using it to make prescriptions for tropical countries was questioned. Dr. Michael Warne answered that in the case of the Australia and New Zealand guidelines method, one of the key assumptions that had to be made was to allow generalized levels of toxicity across all species, since there was not sufficient data to identify differences amongst species and climactic variations. However it would be possible to adjust the calculations for a specific target species or location if desired. In order to address the issue of regional climactic differences, Australia is now working to identify differences between Australian and North European species' sensitivity to heavy metals.

There was some discussion during the workshop regarding whether or not it is necessary to include both human and animal species in guidelines for environmental levels of POPs. Dr. Bo Jansson pointed out that all exposure routes should be taken into account. Dr. Tu Binh Minh remarked that Environment Canada has withdrawn its guideline for DDT in water because exposure is considered to be through soils, sediments and biota. Participants registered some concern at this apparent assumption and resolved to look into it. Consideration of human health may also imply factors of regional difference. Dr. Zafar Adeel observed that average body weights are known to vary amongst regions. If these are included in the calculations of safe environmental levels of POPs, then they would need to be adjusted accordingly.

Dr. Michael Warne underlined the need for international collaboration in the provision of scientific data. He argued that although East Asian countries might not have sufficient existing data and research capacity to create their own guidelines on POPs in the environment, they should not be discouraged by this – since developed countries had also pooled their toxicity data for developing standards or threshold values. In the Australian case, toxicity data was collected from many different countries. Each country could contribute to a regional or international database, whilst continuing to progressively develop their toxicity testing capacity. Dr. Mustafa Ali Mohd, University of Malaya, emphasized the importance of validation of data.

The discussion also focused on the correlation between environmental or drinking water quality standards based on the identifiable toxic effect levels and the analytical capacity of laboratories in the region. The point was whether standards should be set at levels lower than the detection capability currently available. Dr. Evangeline Santiago drew attention to the difficulties of adopting guidelines that are below national analytical capabilities. However, Dr. Bo Jansson argued that it would be wrong to set quality criteria to match the detection limits currently posed by analytical chemistry. Dr. Warne mentioned that Australia and New Zealand had included some guideline levels that were below the existing analytical capacity at the time of adoption.

The workshop discussions held some clear implications for regional monitoring efforts since harmonization of data interpretation must be preceded by harmonized methods of data collection. The UNU project already has uniform equipment and a common method for sample preparation and analysis. However, sample collection methods and the design of sampling programmes vary between countries. Many participating scientists highlighted the importance of continuing regional harmonization of scientific methods. The extension of harmonization within regional monitoring programmes to include more uniform design of sampling activities was discussed, although there are currently many practical limitations on this undertaking. A number of monitoring centres, such as the Environmental Research and Training Center, Thailand and the Korean Ocean Research Institute currently follow nationally adopted sampling programmes.

Additional reasons for regional collaboration were suggested by participants, including the ‘grasshopper effect’ of the migration of chemicals from tropical to temperate areas, as highlighted by Mr. Hoong, University of Malaysia. Dr. Bo Jansson raised the example of levels of toxaphene found in Swedish lakes, although this chemical is not used at all in Sweden. Based on this, he argued that global harmonization of efforts was needed as much as regional harmonization of standards.

Findings and Recommendations by the Workshop Participants

- Environmental standards for POPs in most countries in East Asia do not currently offer comprehensive guidance on the risks of POPs pollution in the environment. Developing such a regional guidance is important because widespread presence of these pollutants is reported despite the present bans on import, production or use of POPs.
- The tendency of POPs to migrate long distances and across borders to pollute pristine areas makes international cooperation on POPs management all the more necessary. Harmonization of quality standards becomes an important tool to manage transboundary movement of POPs pollution.
- Harmonization of quality standards and data interpretation must also be preceded by harmonized methods of data collection and laboratory analysis.

- Regional collaboration and exchanges amongst scientists play an important role in capacity development in the East Asian region. This effort should be continued.
- Risk assessment of environmental pollution levels, toxicity testing and environmental monitoring capacity should be developed simultaneously. Varying levels of protection may be necessary for the health of human (child/adult) populations as well as conservation of different wildlife species. For highly polluted areas, this could lead to development of environmental quality ‘objectives’ that are more feasible and realistic than rigidly-defined standards.
- The interpretation of environmental levels of POPs should be based on consideration of screened and reliable toxicity data. Existing toxicity data should be compiled, assessed and used by scientists in East Asia and elsewhere – there is no need to ‘reinvent the wheel’. In this respect, both chronic and acute toxicity data should be considered.
- Borrowing from existing guidance systems in other regions is useful for East Asian countries, providing that the underlying assumptions in the supporting data are understood. If necessary, regional differences should be factored in.

Conclusions

The development of a harmonized regional database on toxic effect levels of POPs in the environment could provide the basis for the increased coordination and eventual development of guidelines for environmental levels of POPs in the East Asian Region.

The Australia and New Zealand Water Quality Guidelines are based on a database of screened scientific data which could conceivably provide a model for a database to include research on toxicity testing from East Asian countries, as well as elsewhere.

Appropriate screening procedures should ensure the quality of toxicity data to be used as a basis for effect level guideline curves. The same procedures should be used to ensure the quality and comparability of environmental monitoring data to be collected in the region as UNU continues to develop its regional POPs monitoring programme in East Asia.

Appendix 4. Funding Sources outwith APN

Item	Institution bearing costs	Estimated Cost
Administrative overheads	UNU	US\$2,000.00
Staffing costs for one full-time assistant for three months	UNU	US\$2,000.00
Workshop facilities	UNU/Shimadzu	US\$8,000.00
Local speakers costs	UNU/Shimadzu	US\$1,000.00

NOTE: The workshop is one of a series of activities, currently being undertaken by UNU within its work on Environmental Monitoring and Governance in the East Asian Coastal Hydrosphere. This forms part of the umbrella project entitled 'Coastal Hydrosphere' at UNU. Further information on this work is available at <http://landbase.hq.unu.edu> and in this application in the section entitled 'Related Research Work'. Funding sources for this umbrella project and its activities already include UNU Core funding, SPC funding from UNESCO, and an agreement of cooperation between the United Nations University and Shimadzu Corporation.

Appendix 5. Glossary of Terms

Acceptable Daily Intake (ADI) or Tolerable Daily Intake (TDI)

The measure of the quantity of a particular chemical that can be consumed on a daily basis over a lifetime without causing harm to either humans or animals.

Acute Toxicity

An adverse effect on a living organism caused by a single exposure to a chemical; symptoms develop rapidly to reach a crisis.

Aldrin

An organochlorine pesticide, listed as a Persistent Organic Pollutant under the Stockholm Convention. It is banned in many East Asian countries.

Bioaccumulate

Some pollutants, such as POPs and heavy metals, collect in the bodies of living organisms. They are absorbed into the tissue without the adequate capacity to break down or remove them. Therefore, over time they build up or accumulate within the body.

Biomarker

A biological demonstration of a response to an environmental chemical. Biomarkers can demonstrate the build-up of pollutants in organisms, offering a measure of exposure and sometimes also of toxic effects. Popular species for use as biomarkers in POPs monitoring include frogs and mussels.

Capacity Development

It is the building of capacity of people and institutions, particularly in developing countries, through activities aimed at enhancing human potential, providing technological know-how and strengthening institutional resilience.

Carcinogenic

Chemicals or agents that cause cancers in animals or humans.

Chronic Toxicity

Adverse effect on a living organism caused by exposure to a chemical over time.

DDT

Dichlorodiphenyl trichloroethane (DDT) is a, organochlorine pesticide. It has been banned for agricultural use in most East Asian countries, but continues to be produced for use in vector control. The breakdown products of DDT are DDD and DDE. DDT is believed to be an Endocrine Disruptor and carcinogenic.

Dieldrin

An organochlorine pesticide, listed as a Persistent Organic Pollutant under the Stockholm Convention. It is banned in many East Asian countries.

Endocrine Disruptor

A substance that causes an effect on hormonal system of animals by mimicking or disrupting the behaviour of hormones in their growth and functioning.

Endrin

An insecticide used on field crops and for rodent and bird control.

Environmental Quality Standards

Regulations set at the national or sub-national level to specify the maximum permissible concentration of a potentially hazardous chemical in an environmental sample, e.g. air, water or sediment.

Environmental Quality Guidelines

An advisory indication of safe or unsafe levels of pollutants in the environment. They are often set at the regional or international level, e.g. WHO Guidelines for Drinking Water Quality.

Persistent Organic Pollutants (POPs)

Chemicals that remain in the environment for long periods of time. They bioaccumulate and travel up through the food chain. They are toxic at low doses, and effects can include carcinogenicity and disruption to the endocrine system. POPs can evaporate under tropical conditions and migrate over long distances in the environment.

Stockholm Convention

Encourages member states to eliminate the production and import/export of POPs. 12 chemicals are listed: Aldrin, Dieldrin, Endrin, DDT, Chlordane, Heptachlor, Hexachlorobenzene, PCBs, Toxaphene, Mirex, Dioxin, Furans

Trigger Value (TV)

Level of pollutants in the environment beyond which remediation may be necessary (ANZECC & ARMCANZ, 2000).

United Nations University (UNU)

An international community of scholars whose role is to build a bridge between the United Nations and the international academic community. It provides a think-tank for the United Nations system and builds capacities, particularly in developing countries

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For full lists of references used in each of the workshop papers, please see the workshop proceedings book.