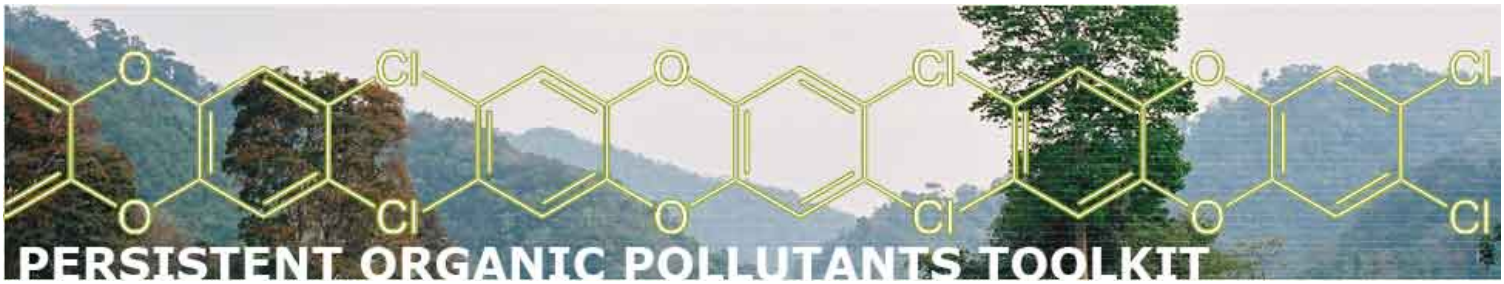
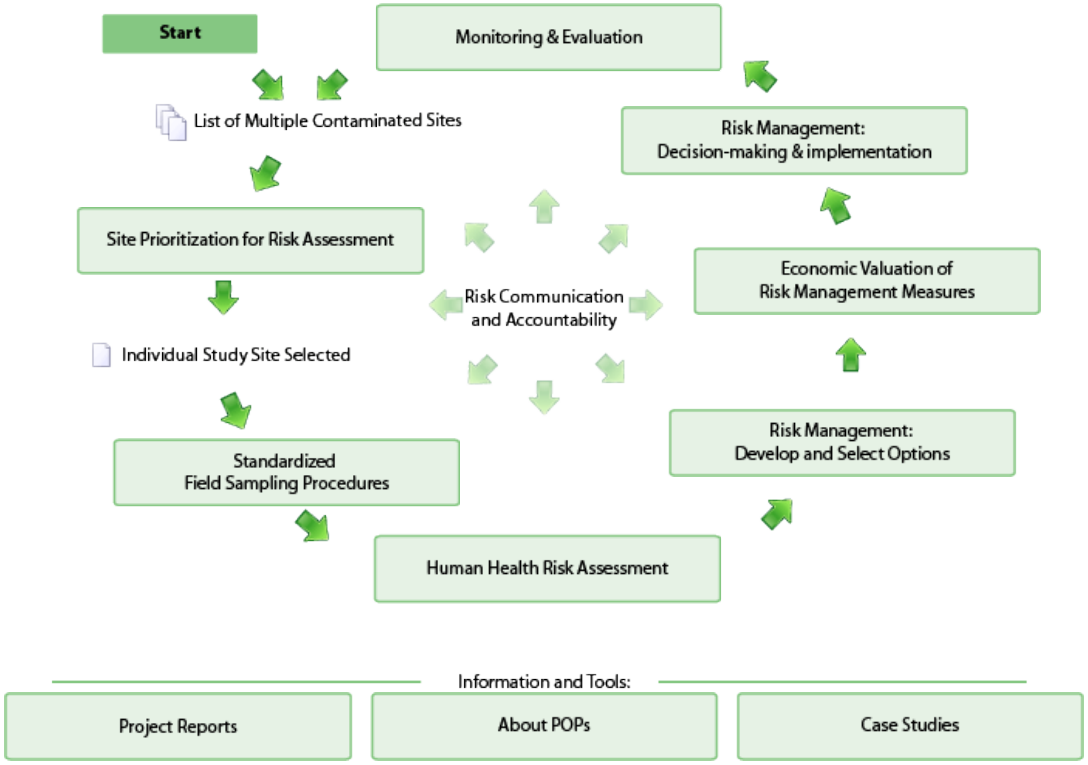


The Persistent Organic Pollutants (POPs) Toolkit provides training modules and interactive tools that enable officials to use risk-based approaches to prioritize and manage POP and other hazardous substance contaminated sites. (more about the toolkit; summary of contents)

The POPs Toolkit Process for Managing Contaminated Sites:



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About Persistent Organic Pollutants

About Persistent Organic Pollutants

Discarded chemical storage containers
(click to enlarge)

Over the past 50 years **the chemical revolution has benefited the human population in countless ways but has also resulted in great harm.** Chemicals have raised farming yields by killing crop pests and have allowed for the development of useful products including plastics. Our lives have been made more productive and comfortable because of chemicals but when stored, used or disposed of improperly, some chemicals can **cause toxic reactions, persist in the environment for years, travel thousands of kilometers** from where they originate, threaten long-term health, and **have ecological and human health consequences** that were never anticipated or intended.

One class of chemicals called **persistent organic pollutants (POPs)** has aroused a lot of concern. Many POPs pose such a significant threat to health and the environment that in 2001, the world's governments met in Sweden and adopted **the Stockholm Convention created to restrict and ultimately eliminate the production, use, release and storage of POP**s.

Read more about POPs:

The concern about POPs

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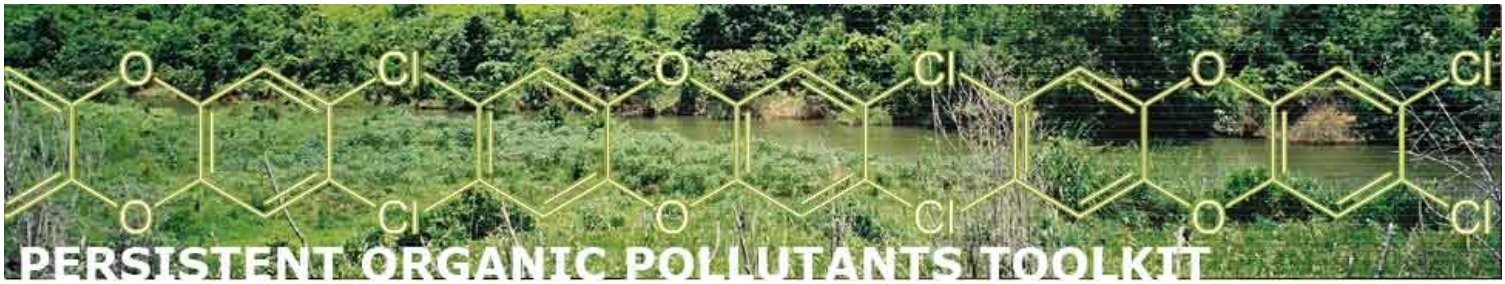

Site Prioritization for Risk Assessment

One of the primary goals of the POPs toolkit is to provide countries with the capacity to perform simple Human Health Risk Assessments. When it comes to cleaning up multiple sites in a country the questions arise: where to begin? Which sites should be a priority for a risk assessment?

In this section, two semi-quantitative tools are presented that allow the user to determine which sites should be assessed and then to prioritize sites based on their potential for causing unacceptable risks to humans and/or the natural environment.

The purpose of the site prioritization is to classify contaminated sites based on their need for further action. Further action usually means risk assessment. The tools provided ask the user a series of questions regarding: contaminant characteristics, off-site migration potential, exposure and socio-economic factors. Then, based on the answers provided, calculates a total score for that site.

POPs Toolkit users who are looking to prioritize and manage their pesticide stockpiles should view more information about the FAO's obsolete pesticide programme.

The purpose of Site Prioritization is to classify contaminated sites based on their need for further action

Source: Hatfield Consultants

(click to enlarge)

Site Prioritization Tools

- start with pre-screening questions
- Start with prioritization questions

References:

The site prioritization tools are based on principals derived from the Canadian National Classification Tool for contaminated sites (CCME 2008). While the tools are applicable to any contaminated site, a greater emphasis has been put on POP's related contaminant issues.

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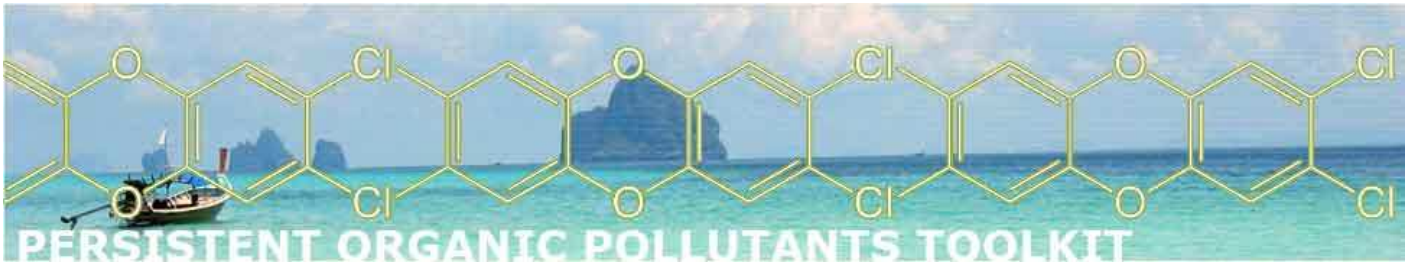

Pre-Screening Tool

Question #1 of 4

Site Pre-Screening

Does the site have a history of industrial activity or are there other reasons to believe that contaminants have been present at the site?

Why is this question important? (show)

Yes

No

Note: submitted information is stored in cookies on your web browser. No information is stored on the server.

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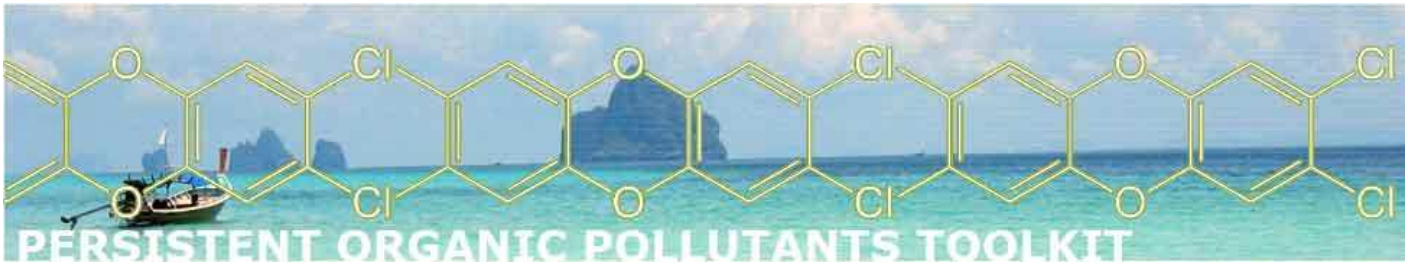

Site Prioritization Tool

Question #1 of 46

Contaminant Characteristics

Over what period of time were chemical contaminants used at the site?

Why is this question important? (show)

for over 10 years

1 - 10 years

for less than 1 year

Do Not Know

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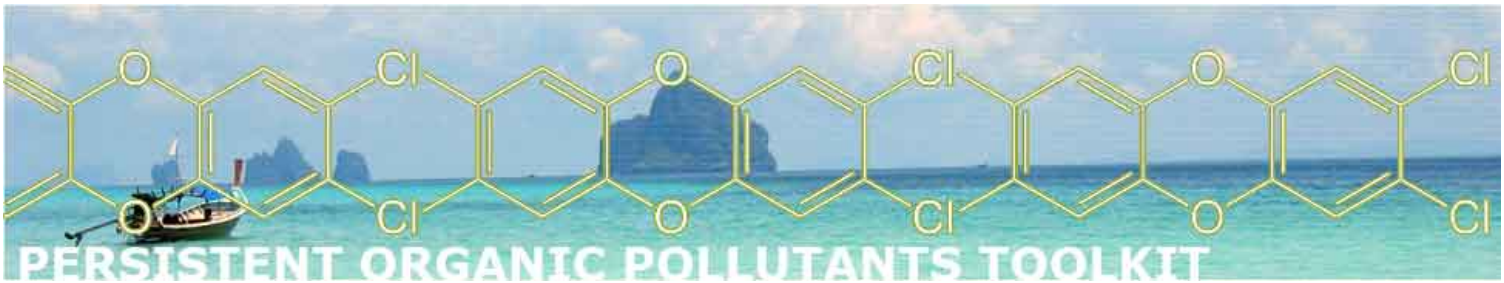

Field Sampling Procedures

Field Sampling Procedures

The following Standard Field Sampling Procedures were developed to help ensure that sampling and analysis are done in a consistent and coordinated manner, and promote quality and comparability of the laboratory analytical results.

Standardized procedures ensure that sampling and analysis are done in a consistent and coordinated manner
Source: Hatfield Consultants
(click to enlarge)

Follow through the Field Sampling Procedures

➪ Objectives of SOPs and General Principles

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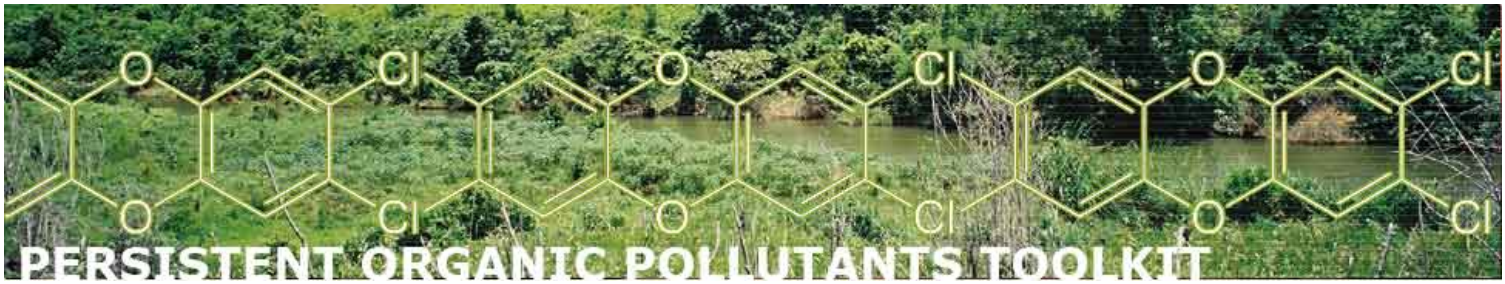

Human Health Risk Assessment

Risk assessment is an **iterative process leading to the quantification of potential risk**. For the POPs Toolkit, the **emphasis is on assessing health risks to humans resulting from exposure to persistent organic chemicals.** However, contaminated sites can also result in unacceptable risks to the **natural environment**. Risk Assessments that assess unacceptable risks to the natural environment are called **Environmental Risk Assessments**.

This section of the POPs Toolkit provides an introduction to Human Health Risk Assessment as well as several interactive tools:

- **Problem Formulation Tool**
- **Risk Calculation Tools**

POPs Toolkit users who are looking to prioritize and manage their pesticide stockpiles should view more information about the FAO's obsolete pesticide programme.

Pesticides can be hazardous to human health
(click to enlarge)

Next Steps

start the Human Health Risk Assessment Training Module

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Risk Assessment Problem Formulation Worksheet Tool

The purpose of this worksheet is to help the risk assessor identify the components of the risk assessment. Use this worksheet to think through all parts of the problem formulation (see the problem formulation training module). A filled-in version of this worksheet should be included in your Risk Assessment report.

Potential land uses of the site

In this section, briefly describe the past, current and planned future land use of the site. Several categories are provided because some sites may have had more than one land use. Having this background information will help identify the types of chemical hazards possibly present at the site, the potential receptors and the pathways linking the chemical hazards with the receptors.

	Potential?	*Explanation*
Agricultural		
Residential/urban parkland		
Commercial		
Industrial - indoors		
Industrial - outdoors		
Recreational		
Other		

Humans receptors and pathways

Use this section to identify and describe the receptors (human and non-human) and pathways possibly present at the site.

Human receptor group

	On Site?	*Explanation*
General public or resident		
Employees		
School Children		
Other		

Human receptor ages

	On Site?	*Explanation*
Infant		
Toddler		

Child		
Teen		
Adult		
Other		

Human exposure pathways

	On Site?	*Explanation*
Accidental ingestion of soil		
Inhalation of soil particles		
Inhalation of indoor contaminant vapours		
Inhalation of outdoor contaminant vapours		
Ingestion of drinking water		
Dermal contact with soil		
Dermal contact with water		
Ingestion of contaminated food		

Non-human receptors and pathways

Non-human receptors

	On Site?	*Explanation*
Aquatic Animals		
Terrestrial Animals		
Plants		

Non-human exposure pathways

	On Site?	*Explanation*
Aquatic organism exposed via water		
Aquatic organism exposed via food		
Aquatic organism exposed via sediments		

	On Site?	*Explanation*
Terrestrial organism exposed via water		
Terrestrial organism exposed via food		
Terrestrial organism exposed via soil		

	On Site?	*Explanation*

Plants exposed via surface water or groundwater	
Plants exposed via soils	

Contaminant concentrations (highest measured concentrations)

To fill-in this section:

- *replace the column header "Chemical A, Chemical B, Chemical C..etc.", with a chemical contaminant name.*
- *enter the maximum concentration of that contaminant measured in the applicable row. Note that the concentration units of the concentration entered must match those shown in the first column.*
- *The maximum contaminant concentration can then be compared to environmental quality guidelines. If the measured maximum concentration exceeds the guidelines, then the contaminant is a Contaminant of Concern.*

add column

	Chemical A	**Chemical B**	**Chemical C**	**Chemical D**
Soil (*mg/kg*)				
Groundwater - source (*mg/L*)				
Drinking water (*mg/L*)				
Bathing/swimming water (*mg/L*)				
Outdoor air - particulate (*mg/m*^{3})				
Root vegetables (*mg/kg wet weight*)				
Other vegetables (*mg/kg wet weight*)				
Fish (*mg/kg wet weight*)				
Wild game (*mg/kg wet weight*)				

Print this worksheet

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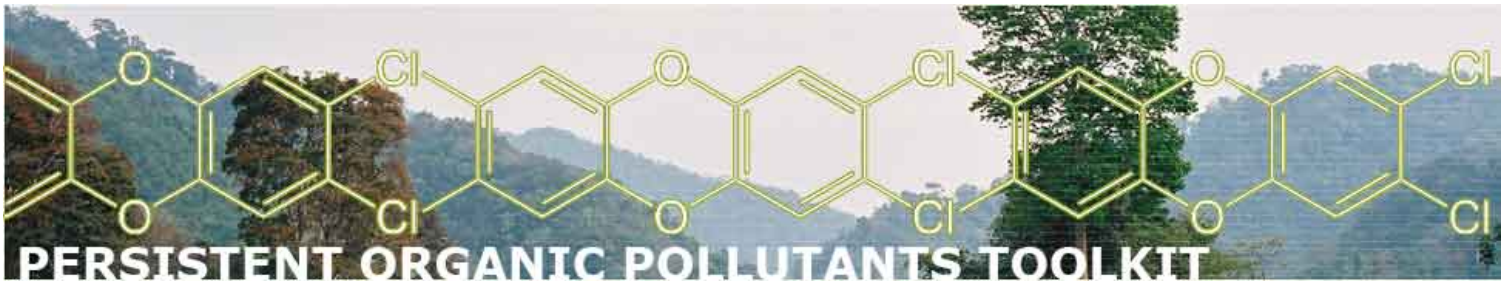

Human Health Risk Assessment

Risk Calculation Tools

Several risk tools that use a simple model, have been provided to estimate Human Health Risks. The tool calculates exposure (i.e., dose) via ingestion, inhalation and dermal contact. Calculated doses are then used to calculate expressions of human health risk:

- Hazard Quotients (HQs) for non-carcinogens
- Incremental Lifetime Cancer Risk (ILCRs) for carcinogens

Start Risk Calculation Tools

- Hazard Quotients (HQs) for non-carcinogens
- Incremental Lifetime Cancer Risk (ILCRs) for carcinogens

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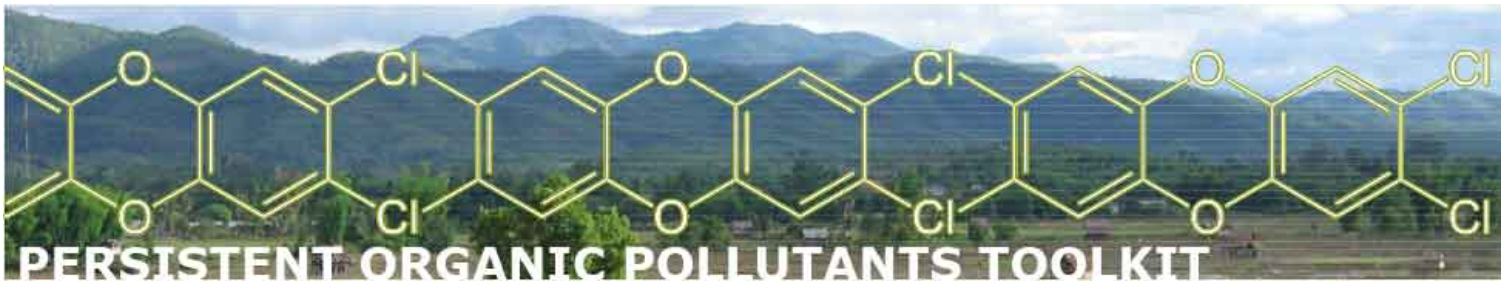

Risk Management

Risk Management


(click to enlarge)

Risk Management of contaminated sites is the **application of technology or policy leading to the reduction of contamination-related human health or ecological risks**.

The selection of the best approach can be complicated and may depend on numerous factors (i.e., scientific, economic, social, political etc). **Information required for the risk management comes largely from the human health risk assessment, but also considers cost, effectiveness and acceptability**.

In this section, we describe an effective process for choosing the best risk management approaches, and interactive tools are provided to aid the user through the process.

- Training Module
- Management Options Evaluation Tools
- Risk Management Technologies

POPs Toolkit users who are looking to prioritize and manage their pesticide stockpiles should view more information about the FAO's obsolete pesticide programme.

Next Steps

start the Risk Management Training Module

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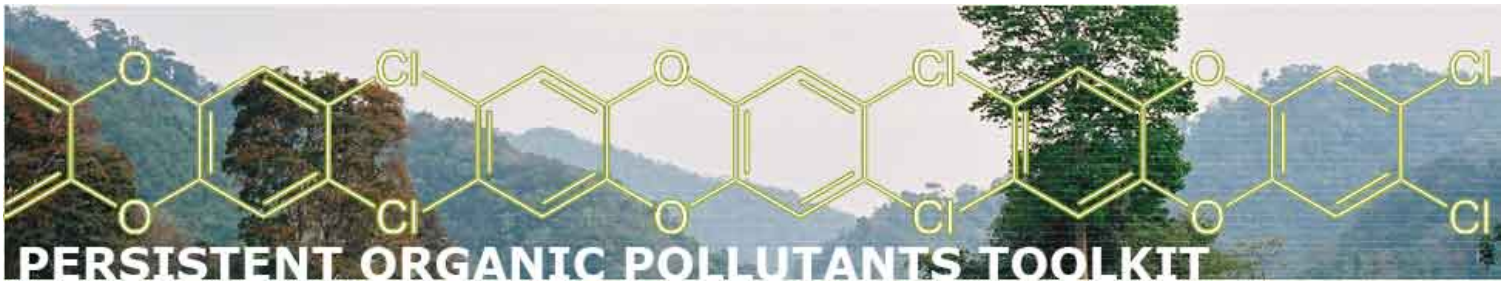

Economic Valuation of Risk Management Measures

In order to provide guidance on managing contaminated sites, it is useful to provide a cost-benefit analysis of these management efforts.

Items for sale in Lao PDR
Source: Hatfield Consultants
(click to enlarge)

Conducting an economic analysis of the impact of POPs (or other hazardous substance) contaminants **is a challenging process.** While common sense suggests that there may be **many benefits from a remediation effort**, the **cause–effect relationships** that link the removal of POPs contaminants to the ensuing human health and environmental benefits are not scientifically established. D**ata, especially site-specific information, tend to be scarce.** Nonetheless, the application of a**ccepted economic practices** and the **use of professional judgment** enables us to make rough estimates and draw valuable conclusions in the limited data setting of the project.

Modifications to the standard Cost-Benefit Analysis process were necessary to overcome the data limitations. A modified approach was developed which calculates the minimum health benefits required to cover the cost of implementing proposed risk management scenarios for POPs hotspots.

This modified approach is presented in both the training manual and the cost-benefit analysis tool.

Note that in Canada and the USA that economic valuation of contaminated sites are not normally done. In these countries, decisions to remediate a site are done solely on the basis of contaminants being above acceptable environmental standards.

Next Steps

- Training Module
- Economic Valuation Tool

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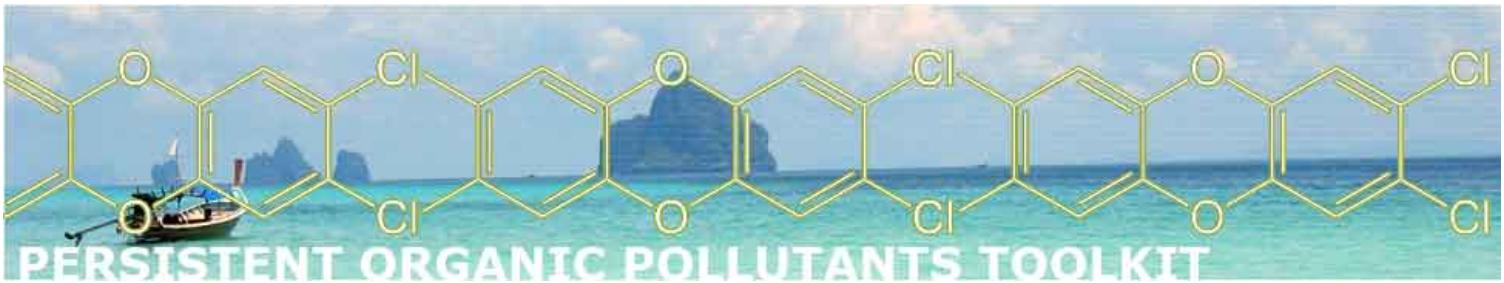

Case Studies

Case studies have been prepared for POP hot spots in 4 south-east Asian countries. These case studies present the results of human health risk assessment and risk management techniques applied to each hot spot.

All data and results have been collected through the 2008 *Regional Capacity Building Program for Health Risk Management of Persistent Organic Pollutants (POPs) in South East Asia* Program.

- Cambodia
- Lao PDR
- Malaysia
- Thailand

Mountains in Lao PDR
Source: Hatfield Consultants
(click to enlarge)

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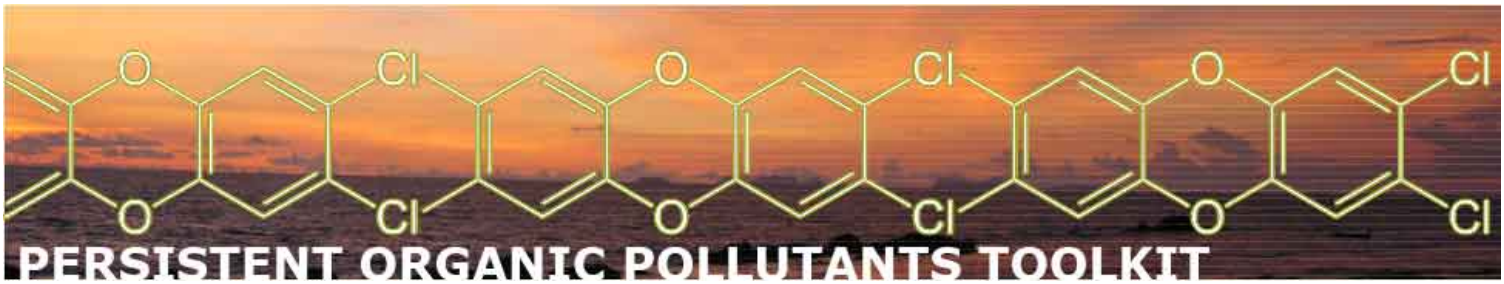

POPs Project Reports

The following reports, along with the POPs Toolkit have been created as part of the World Bank Regional Capacity Building Program for Health Risk Management of Persistent Organic Pollutants (POPs) in South East Asia Project.

Hatfield Consultants has been commissioned by the World Bank to implement the technical components of the Project.

Field Crew, Malaysia
Source: Hatfield Consultants

Final Project Reports

- Project Implementation Plan - April 2008 (PDF, 1MB)
- Launch Workshop Report - April 2008 (PDF, 4.2 MB)
- Progress Report 1 - July 2008 (PDF, 5 MB)
- Progress Report 2 - April 2009:
  - Main report (PDF, 1MB)
  - Appendix A1.1 First Field Sampling Program Report May 2008 (PDF, 4MB)
  - Appendix A1.2 Second Field Sampling Program Report July-Aug 2008 (PDF, 2MB)
  - Appendix A2 List of Samples Collected (PDF, 69KB)
  - Appendix A3 Sample Analysis Results (PDF, 3MB)
  - Appendix A4-1 Final Risk Assessment Report - Cambodia (available in Case Studies)
  - Appendix A4-2 Final Risk Assessment Report - Lao PDR (available in Case Studies)
  - Appendix A4-3 Final Risk Assessment Report - Malaysia (available in Case Studies)
  - Appendix A4-4 Final Risk Assessment Report - Thailand (available in Case Studies)
  - Appendix A5 Final National Training Program (PDF, 339KB)
  - Appendix A6-1 National Training Workshop Report - Cambodia (PDF, 7MB)
  - Appendix A6-2 National Training Workshop Report - Lao PDR (PDF, 5MB)
  - Appendix A6-3 National Training Workshop Report - Malaysia (PDF, 8MB)
  - Appendix A6-4 National Training Workshop Report - Thailand (PDF, 5.6 MB)
- Economic Valuation Reports (June 2009):
  - Final Economic Valuation Report for Sambour EDC Warehouse Site, Cambodia (available in Case Studies)
  - Final Economic Valuation Report for Sok Pa Loung EDL Workshop Site, Lao PDR (available in Case Studies)
  - Final Economic Valuation Report for Air Hitam Sanitary Landfill Case Study Site in Puchong, Selangor, Malaysia (available in Case Studies)
  - Final Economic Valuation Report for MEA Facility Case Study Site in Samut Prakan, Thailand (available in Case Studies)
- Final Regional Workshop Report (August 2009) - *to come*
- Final Report (August 2009) - *to come*

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