UNITED NATIONS
ENVIRONMENT PROGRAMME

Chemicals

UNEP

PROCEEDINGS

of the UNEP Chemicals / Caribbean Industrial Research Institute (CARIRI)

Sub-Regional Workshop on National Inventory of Dioxin and Furan Releases in the Context of the Stockholm Convention
Port of Spain, Trinidad and Tobago
19-22 May 2003

Patrick Dyke, 2003

IOMC

INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS
A cooperative agreement among UNEP, ILO, FAO, WHO, UNIDO, UNITAR and OECD

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UNEP Chemicals
and
Canada POPs Fund

This publication is produced within the framework of the Inter-Organization Programme for the Sound Management of Chemicals (IOMC).

The **Inter-Organization Programme for the Sound Management of Chemicals (IOMC)** was established in 1995 by UNEP, ILO, FAO, WHO, UNIDO and OECD (Participating Organizations), following recommendations made by the 1992 UN Conference on Environment and Development to strengthen cooperation and increase coordination in the field of chemical safety. In January 1998, UNITAR formally joined the IOMC as a Participating Organization. The purpose of the IOMC is to promote coordination of the policies and activities pursued by the Participating Organizations, jointly or separately, to achieve the sound management of chemicals in relation to human health and the environment.

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TABLE OF CONTENTS

TABLE OF CONTENTS

WELCOME REMARKS

Mr Liaquat Ali Shah

Chief Executive Officer of CARIRI

Welcome to Head Table:

Mr. Peter Campbell	-	Representative of the Minister of Public Utilities
Andreas Arlt	-	UNEP -Chemicals
Mr. Stefan Moss	-	Participant, The Bahamas

Dr. Heather-ann Okuns Workshop Project Leader, Participants, Members of Staff of CARIRI, Members of the Media a special Welcome to all. I am pleased to see so many familiar faces.

As you are no doubt aware the Basel Convention Regional Centre has been established by the Government of Trinidad and Tobago at CARIRI. The initial request to prepare a proposal for the Centre was received in 1995. At present the final legal framework between the Secretariat of the Basel Convention and the Government of Trinidad and Tobago has been prepared.

Through, the support of the Secretariat of the Basel Convention CARIRI has been able to mount a number of training programmes and symposiums beginning in 1998 with a training programme on development of legal and policy frameworks to deal with asbestos containing materials and practical management of asbestos containing materials. In 2002 cooperation with UNEP-Chemicals in mounting several programmes related to the Stockholm Convention gave the Centre the opportunity to examine the issues related to the management of waste pesticides and other persistent organic chemicals.

This workshop on the use of the Toolkit for Identification and Quantification of Dioxin and Furan Releases is another step in creating the national capability to implement the Stockholm Convention. It is timely, following on the Training Programme on the Conduct of National Inventories of Hazardous Wastes the Caribbean Regional Centre mounted in November of 2002 aimed at developing national capabilities to implement the Basel Convention.

While the Centre has been active in such training programmes other parallel activity has been ongoing to address the management of other hazardous materials and wastes. After the Symposium *on* ***Prevention of Degradation of Quality of Inland Water Systems and of the Marine Environment from the Adverse Effect of the Generation of Hazardous Waste*** held

in 1999, the participants identified used oil and waste lead as the two hazardous wastes to be given highest priority for development of region project activity. These two priorities were included in the 2003-2004 Business Plan for the activities of the Regional Centre.

I am pleased to announce that on the basis of project proposals prepared and submitted to a meeting of the Parties to the Basel Convention at the end of April this year, funding has been confirmed for these regional projects to address management of used lead acid batteries and used oil.

The Used Lead Acid Batteries Project will be executed jointly with the Basel Convention Regional Centre at CARIRI for the Caribbean and in El Salvador for Central American and Mexico as well as with the governments of Venezuela and Columbia. This project is concerned with development of mechanisms to facilitate trade to ensure used lead acid battery wastes are removed from the environments where no facilities for safe recycling exist.

Used oil is a topic of particular concern due to the requirements of the MARPOL Convention that all signatories must establish used oil reception facilities. Until countries of the region have signed the MARPOL Convention and created the receiving facilities, the Caribbean Sea cannot be declared a Special Area. This declaration is which is necessary to protect the sea's fragile marine environment and the ecosystems it contains.

The Centre will also be conducting a regional study on behalf of UNEP-Chemicals and the Basel Convention to determine the stockpiles of waste pesticides that exist in countries in this region and to recommend possible options for disposal. This activity will be closely linked to the activities in each country to implement the Stockholm Convention by preparing the National Implementation Programme or NIP.

The Centre will continue to seek opportunities to assist the countries of this region to implement Multi-lateral Environmental Agreements and looks forward to receiving your comments and concerns.

CARIRI maintains an accredited laboratory facility and environmental consulting services that are available for regional support.

Using the most comprehensive and up-to-date analytical instruments available, CARIRI offers services in sampling and testing of solid, liquid and gaseous environmental samples with respect to selected Chlorinated Pesticides including DDT, and Phosphorous containing Pesticides including Parathion, as well as PCB's, Dioxins and Furans.

At CARIRI, Dioxin and Furan analyses are performed using Gas Chromatography/Mass Spectrometry (GC/MS) using United States Environmental Protection Agency methodologies. Sampling is carried out in accordance with stringent sampling protocols to assure quality control in both sampling and analysis.

Environmental monitoring services available from CARIRI include:

- Stack emissions monitoring
- Sampling and analysis of residues from combustion plants and landfill sites
- Surface water and groundwater monitoring
- Soil monitoring
- Air quality monitoring
- Effluent monitoring

As the requirements for organizations to meet the standards established by environmental legislation have become the norm so has the requirement for use of cost efficient, high quality monitoring services. CARIRI is offering a range of monitoring services to measure compliance with the standards and guidelines of published in national legislation, as well as from the US-EPA, WHO and the European Union. These services are also used by Government Ministries, industry and public bodies in the implementation of environmental management systems

CARIRI has recently established a Toxicology Testing Laboratory and presently, the 96-hour Toxicology assays are being undertaken to determine lethal concentration levels using mycid shrimps.

Future plans to extent this suite of services include:

- The introduction of the Microtox based assays
- The assessment of toxicity sources associated with sediments and soils
- On-site bioassays - used to verify specific toxicity hot spots.

Ladies and Gentlemen I look forward to your keen participation in this workshop and future collaboration as we all seek to contribute to the management of our environment to ensure the best possible future for the children of the Caribbean.

OPENING REMARKS

Andreas Arlt – UNEP-Chemicals

Mr. Peter Campbell, representative of the Minister of Public Utilities and Environment, participants, colleagues.

It is a pleasure for me to welcome you on behalf of UNEP Chemicals to this "Sub-regional workshop on Dioxin and Furan Inventory Training" here in Port of Spain in Trinidad and Tobago in the context of the Stockholm Convention.

The workshop is financed by UNEP Chemicals and the Canadian POPs Fund, which provides financial resources for many POPs related workshops and activities worldwide. UNEP Chemicals appreciates these efforts, undertaken by the Canadian government to promote the Stockholm Convention as an effective international legally binding instrument for environmental policy.

I would like to thank the Minister in advance, for his welcoming remarks. I am certain that he will touch on many of the issues that face countries in implementing the Stockholm Convention. I take the opportunity to thank the State of Trinidad and Tobago for its progressive and exemplary role in POPs related national policy. Trinidad and Tobago is besides St. Lucia one of the two Caribbean states, which have ratified the Stockholm Convention on Persistent Organic Pollutants (POPs). For the time being, 31 States have ratified the Convention, which will enter into force 90 days after the 50th ratification has been deposited with the Secretary-General of the United Nations. We expect this to happen in late 2003 or early 2004, and the first Conference of the Parties will then be convened within a year.

The 12 POPs addressed by the Convention can be divided into pesticides, (8 out of the 12 POPs are considered pesticides), industrial chemicals (PCBs and hexachlorobenzene) and by-products (dioxins and furans) which are unintentionally produced during mainly thermal processes in industry, transportation and households.

This workshop focuses on the third category, the unintentionally produced POPs Dioxins and Furans. The Convention treats this group differently from the deliberately produced POPs. While the Convention aims to eliminate the pesticides and industrial chemicals within a timeframe and according to exceptions given in the Convention, it does not do that for the dioxins and furans. Instead, it requires continuing minimization and, where feasible, ultimate elimination.

What does continued minimisation mean? Basically, it means that next year's releases will be less than this year's, and that managing and minimizing Dioxin and Furan emissions will remain an ongoing responsibility for all Parties.

A key part of that responsibility will be:

- to update and improve continuously the dioxin and furan inventories;
- to improve and update continuously the emission estimation methods;
- to modernize continuously emission controlling and reducing technologies along with the technological progress in these technologies.

The first steps of managing and minimizing dioxin and furan emissions are:

- to identify the national sources,;
- to estimate or measure their activities; and
- to calculate the total national emissions of dioxins and furans.

To assist countries in this important step, UNEP Chemicals has developed the "Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases". The Toolkit, which is the focus of this workshop, provides a methodology and supporting information for undertaking the inventory. It is not a static document – not set in concrete – but will be updated in the light of experience. A revised version will be available at the next INC, which will be held in July 2003 in Geneva. But although we are seeking to improve the usefulness of the Toolkit, the fundamental methodology will not change.

We are fortunate to have with us Patrick Dyke, who is one of the authors of the Toolkit, and who will take you through the methodology and other aspects.

But this is not a one way process – we are also looking for your feedback, both here in the Workshop and later when you are using it. Only with feedback can we improve it.

Finally, I thank Ms Laurent and the staff of the Caribbean Industrial Research Institute (CARIRI), who were involved in the organization of the workshop and will contribute to its successful conduct within this week, for their efforts and commitment to this issue.

I wish all of us an instructive, interesting, productive and enjoyable week and would like us to keep in mind that UNEP Chemicals and CARIRI can only - to a certain extend - provide the vehicle, but you as the national authorities have to drive it to the point where all of us will reach the goals of the Convention.

Thank you very much for your attention.

FEATURE ADDRESS

Senator the Honourable Rennie Dumas

Minister of Public Utilities and the Environment

Let me first say that I am honored to have the pleasure to address you at this Workshop on Dioxin and Furan Inventory Training for English-speaking Countries in Central America and the Caribbean.

The Government of which I am a part is committed to facilitate the advance of Trinidad and Tobago to developed country status by the year 2020. Such development, I believe would be of no benefit if the region does not progress as well. In pursuit of this goal, the framework of best practices that have been developed worldwide and constitute "sustainable development" must inform all our actions.

As Government, our responsibility is primarily one of policy and where the environment is concerned this has to be guided by the various Multilateral Environmental Agreements to which we are party. In this instance I wish to mention two agreement which are of particular relevance to this Workshop, namely the Basel Convention and the Stockholm Convention.

The Basel Convention on the Control of Transboundry Movements of Hazardous Waste and their Disposal was developed in response to International concerns relating to the dumping of toxic chemicals by developed countries in developing countries and countries with economies in transition. The Convention seeks to reduce the transboundary movements of hazardous waste to a minimum consistent with their environmentally sound management.

Trinidad and Tobago acceded to the Basel Convention on February 18, 1994 and ratified the Ban Amendment on January 12, 2000.

The Stockholm Convention on Persistent Organic Pollutants (POPs) was developed to protect people and the environment from, initially, twelve dangerous chemicals eight of these are pesticides, two are industrial chemicals and two are by-products. All twelve chemicals spread worldwide through the atmosphere and have long-term negative effects on human and animal organisms hence the name Persistent Organic Pollutants (POPS)

The Convention contains regulations on the environmentally friendly disposal of POPs waste as well as regulations on minimizing unavoidable POPs emissions produced as by-products of combustion, dioxins and furans, as examples, being the focal point of this workshop.

Trinidad and Tobago acceded to the Stockholm Convention on December 13, 2002.

Within the Latin American and Caribbean Region there are three Basel Convention Regional Centres for Training and Technology Transfer of which the Caribbean Industrial Research Institute (CARIRI) is one.

In pursuit of Developed Country status the Government of Trinidad and Tobago is very serious and our move is supported by local as well as regional initiatives such as this.

The role and function of this Regional Centre includes:

Gathering, assessing and disseminating data and information in the field of hazardous waste;

Collecting information on new or proven environmentally sound technologies and know-how relating to environmentally sound management;

Identifying, developing and strengthening mechanisms for the transfer of technology;

Providing scientific, technical and legal assistance and advice to the Parties of the region at their request and;

Promoting public awareness.

I wish to commend CARIRI on this initiative as well as the other successes in hosting various Workshops in the past.

It is institutions like this, which will stand as a beacon in Trinidad and Tobago's trust for development. Your work continues to exemplify the commitment of the Government of Trinidad and Tobago to environmental stewardship.

I have been made to understand that at the recently concluded Inter-Regional Workshop for the Implementation of the Stockholm Convention held in Antigua in April, several delegates from the Caribbean expressed their desire that the Basel Regional Center at CARRI should also function as a Regional Center for the Stockholm Convention.

That this workshop is being coordinated by CARIRI, I believe is a step in that direction. I wish to stress, however the need for regional Governments to support the work of CARIRI, which is currently being financially supported by the Basel Secretariat and the Government of Trinidad and Tobago.

Additionally, as a region Caribbean countries need to become a Party to the Stockholm Convention since a Regional center for the Stockholm Convention would make no sense when only St. Lucia and Trinidad and Tobago are Party to the Convention

I am of the belief that Regional Governments have recognized the need to put mechanisms in place to control the use of POPs. Indications are that Regional Governments no longer allow the importation of most of the dangerous POPs controlled by the Stockholm Convention and most of these chemicals are no longer in use.

The POPs problem within the region is therefore related to the management and elimination of stockpiles of obsolete chemicals in an environmentally sound manner, and the clean up of contaminated sites, which is a very costly undertaking. Further, the Stockholm Convention is

virtually silent in this regard. The uniqueness of our situation is that we have a very limited land space and therefore every inch of land is precious.

Regional Governments have implemented mechanisms to deal with the intentional production and use of POPs covered by the Convention. Trinidad and Tobago, like other Caribbean countries I am sure, have problems dealing with unintentionally produced POPs especially Dioxins and Furan, which is the focus of this workshop. Thus this inventory training is critical and timely.

This problem is especially critical to Trinidad and Tobago with its heavy industrial development, which is capable of producing a tremendous amount of these by-products.

Dioxins and furans are never manufactured deliberately or produced commercially, and they have no known use. They are simply pollutants, by-products resulting from:

- The burning of anything containing chlorine, bromine and carbon which includes the incineration of hospital waste, municipal waste, hazardous waste, leaded gasoline, plastic, paper, coal and wood.

- The processes used to manufacture other chemicals such as certain pesticides, preservatives, disinfectants, and paper products.

Hospital waste incineration, the burning of Municipal waste, Forest fires/bush fires, which are hard to predict, and an annual occurrence during the dry season in Trinidad and Tobago are all sources of dioxins and furans. In these instances there is a need for us to revisit what are considered common practices and occurrences, and seek more environmental responsible ways for dealing with them. Recycling, re-use and repair industries may be some of the options available.

These sources of dioxins and furans release are much more difficult to control than emissions from industry. The Environmental Management Authority of the Ministry of Public Utilities and the Environment is at an advanced stage of drafting the Air Pollution Rules, which will regulate emissions from industries in Trinidad and Tobago, which includes dioxins and furans.

The World Health Organization upgraded dioxin from a "probable" to a "known human carcinogen" in February 1997.

The horror is that these sources that release dioxins and furans are continually adding these chemicals into the global environment, which never stops accumulating because they're non-degradable. It's a deadly legacy to leave to future generations.

Regional Governments need to become party to the Convention in order to ensure that these issues are properly addressed by the first Meeting of the Conference of the Parties. Representation can begin by respective Governments sending delegates to ICN-7 in July, which is an important meeting to negotiate issues to be addressed by the first COP.

Sessions such as the one in which you are engaged today are expected to contribute to the body of information and insights available to policy makers and managers both in the public and private sector, regionally. This session will equip technical staff in the various responsible Ministries to calculate dioxin and furan emissions from a range of sources. Thus it is clearly a desirable and capacity building exercise for the benefit of the region.

Focus on, the quantity of concerns and the quality of the work of those charged with managing public environmental concerns in Trinidad and Tobago has constantly progressed. As Minister, it is my responsibility to strive to ensure that the momentum is not lost. Towards that end, and in keeping with best practices of the sustainable development, I wish you success in your deliberations.

Public environmental management requires organizations to have the ability to specialize in particular areas, and act in an advisory capacity to the Government. This is your opportunity to do so.

Environmental issues are of great concern to my Government. As the international emphasis has changed from purely that of environmental impact and moved to issues of sustainable development, the interrelationship of natural resource management and human well-being has become even clearer. Our actions must be guided by well-informed decision-making and the involvement of all stakeholders.

The future is not for ourselves but for future generations, this is the crux of sustainability, which we strive for daily. The only way to ensure this is through sustainable development policy and practices. Do not underestimate the role which you will play. The Government and people of Trinidad and Tobago and the region will benefit from your performance.

With these few words I thank you, and may God continue to bless us all.

Introduction to the
Stockholm Convention on Persistent Organic Pollutants (POPs)

Andreas Arlt
Associate Expert
UNEP Chemicals

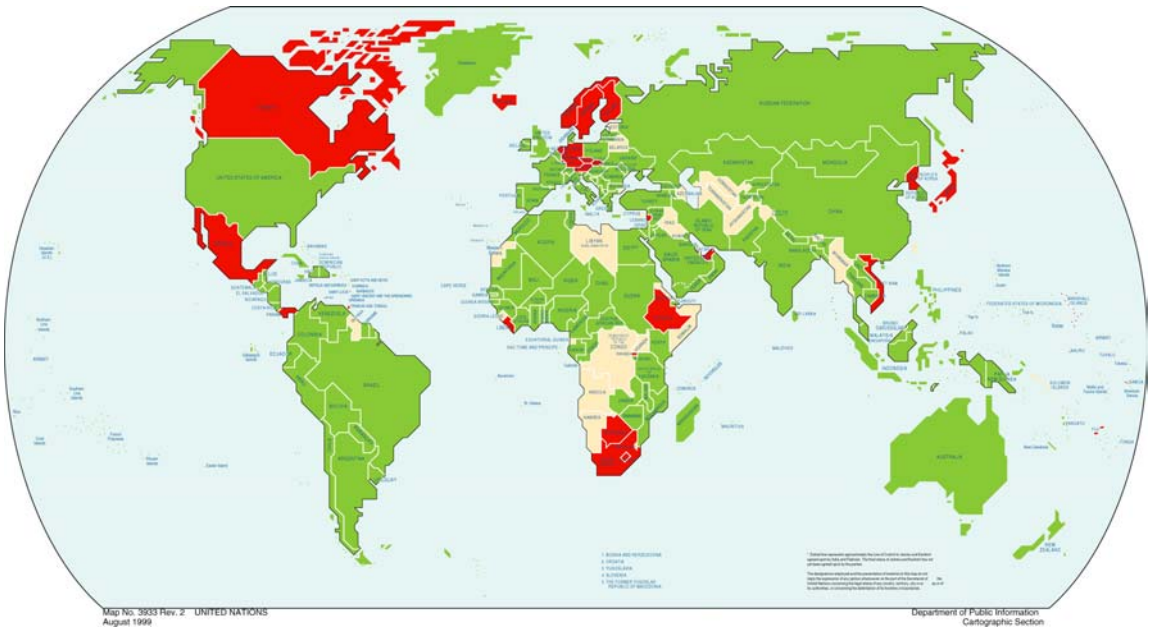
History of Persistent Organic Pollutants

- 1995: UNEP Governing Council requested (Decision 18/32) an international assessment on POPs and recommendations by the IFCS for international actions
- 1996: IFCS recommended international actions on POPs, including a legally binding instrument
- 1997: IFCS' recommendations were endorsed by the UNEP Governing Council and the World Health Assembly

The Stockholm Convention

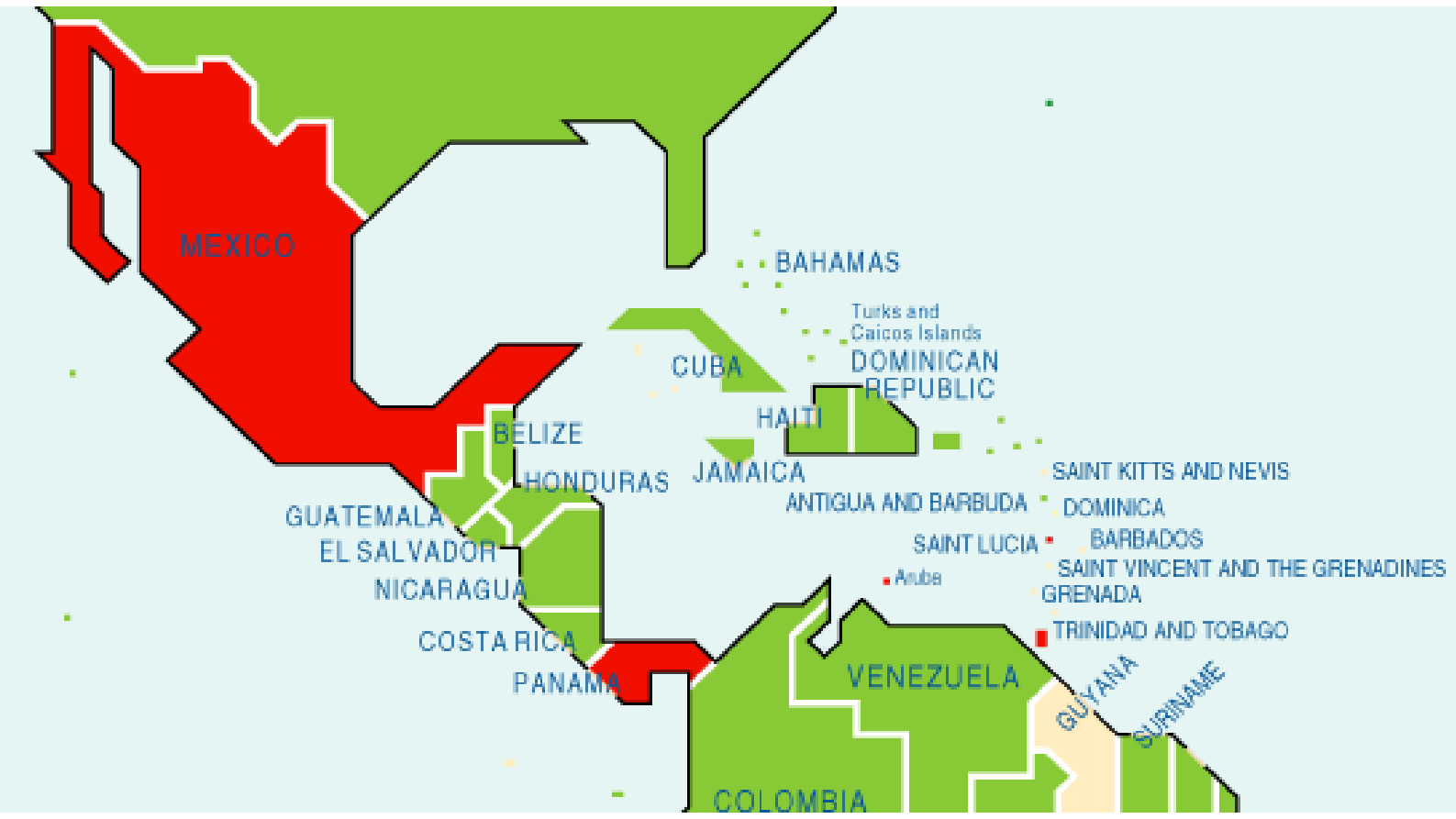
- aims to protect human health and the environment from POPs (initially 12 POPs)
- adopted by governments in Stockholm in 2001 and remained open to signature until May 2002
- will enter into force 90 days after 50th ratification (151 signatures, 30 ratifications) (Art. 26)
- will be a legally binding treaty for the Parties
- UNEP Chemicals host the Interim Secretariat

Signatures and Ratifications



Signatures and Ratifications

Caribbean & Central America



The Initial 12 POPs

Chemical	Pesticide	Industrial Chemical	By-Product
Aldrin	+		
Chlordane	+		
DDT	+		
Dieldrin	+		
Endrin	+		
Heptachlor	+		
Mirex	+		
Toxaphene	+		
Hexachlorobenzene	+	+	+
PCBs		+	+
Dioxins			+
Furans			+

Provisions

Four main provisions of the Stockholm Convention:

- Reduction and elimination of releases
  - iintentionally produced POPs (Art. 3, Annex A,B)
  - uunintentionally produced POPs (Art. 5, Annex C)
  - sstockpiles and wastes (Art. 6)
- Procedure for adding new POPs (Art. 8, Annex D)
- Financial and technical assistance (Art. 12-14)
  (GEF principal entity for financial mechanism)
- General obligations, such as
  NIPs (Art. 7), inf. exchange (Art. 9), reporting (Art. 15)

Intentionally Produced POPs

Goal: Elimination of production and use of all listed pesticides and industrial chemicals

That actually means for 9 chemicals (Art.3, Annex A)(Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Mirex, Toxaphene, Hexachlorbenzene, PCBs)

- Elimination of production and use (according to exemptions)
- Restriction/Prohibition of trade (import, export)
-

That actually means for DDT

- Restriction of use, production, trade to "acceptable purpose" in disease vector control

Polychlorinated Biphenyls (PCBs)

All Parties must (Annex A, Part I, II):

- cease production of new PCBs ***immediately***
  (at entry into force)
- eliminate use of in-place PCB equipment ***by 2025***
- achieve environmentally sound management of PCB wastes for the latest ***by 2028***
- report to the COP every 5 years on their progress

The COP will review progress on 2025 & 2028 targets every 5 years

DDT

All Parties shall (Annex B, part I and II):

- eliminate production and use *except* for disease vector control programs:
- a special DDT register is established
- reporting and other obligations
- promote research and development for DDT alternatives

The COP will:

- evaluate the continued need for DDT for disease vector control (at COP 1, every 3 years thereafter) (i.e., availability of technically and economically feasible alternative products, practices or processes)

Specific Exemptions (Art. 4)

- on production and/or use of 8 (of 10) chemicals
- register established for Annex A&B chemicals
- a State on becoming a Party may register for exemptions by informing secretariat (public register of countries)
- duration = 5 years, unless Party specifies an earlier date
- extension = 5 years, if Party requests and COP approves
- may be withdrawn by a Party at any time

Parties using POPs based on "specific exemptions" or "acceptable purposes" must take measures to prevent or minimize human exposure and releases to the environment

Exemptions

Chemical	Activity	Specific Exemption
Aldrin	Production	None
	Use	Local ectoparasiticide Insecticide
Chlordane	Production	As allowed for the Parties listed in the Register
	Use	Local ectoparasiticide Insecticide /Termiticide Termiticide in buildings and dams Termiticide in roads Additive in plywood adhesives
Dieldrin	Production	None
	Use	In agricultural operations
Endrin	Production	None
	Use	None
Heptachlor	Production	None
	Use	Termiticide Termiticide in structures of houses Termiticide (subterranean) Wood treatment In use in underground cable boxes
Hexachlorobenzene	Production	As allowed for the Parties listed in the Register
	Use	Intermediate Solvent in pesticide Closed system site-limited intermediate
Mirex	Production	As allowed for the Parties listed in the Register
	Use	Termiticide
Toxaphene	Production	None
	Use	None
PCBs	Production	None
	Use	Articles in use in accordance with the provisions of Part II of Annex A

Note (iv): <u>All</u> Parties are entitled to the PCB specific exemption

N.B. Parties using the PCB specific exemption will <u>not</u> be listed in the register [Article 4, para. 1]

Some exemptions are not time-limited

- laboratory-scale research
- reference standards
- unintentional trace contaminants in products and articles
- constituents of articles manufactured or already in use before or on date of entry into force of an obligation concerning that chemical

Trade Issues

- trade will be restricted for all POPs in Annexes A, B
- Imports/exports between Parties limited to shipments:
- intended for environmentally sound disposal, or
- to Parties with:
  - "specific exemptions" under Annex A or B, or
  - "acceptable purposes" under Annex B
- exports to non-Parties may take place but there are:
- conditions on both Non-Party and Party, and
- requirements (use & disposal of POPs) (Art. 3 and 5)

Unintentionally Produced POPs

Goal: Continuous minimization of total releases (of Annex C chemicals dioxins, furans, HCB, PCBs) (Art. 5)

- where feasible, ultimate elimination of these chemicals
- derived from anthropogenic sources (not e.g. forest fires)

Parties must:

- develop and implement action plans within 2 years of entry into force (within the NIPs)
- promote application of available, feasible and practical measures to achieve realistic and meaningful levels of release reduction or source elimination
- promote development and, where appropriate, require use of substitute or modified materials, products and processes to prevent formation and release of POPs

Unintentionally Produced POPs

For sources with the "potential for comparatively high formation & release" of POPs to the environment
(identified by each party within the Action Plan) (Art. 5 a,d), Parties must:

- for new sources:
- promote and, as provided for in an action plan, require use of best available techniques (BAT), and
- phase in any BAT requirements as soon as practicable but no later than 4 years after Convention enters into force
- promote use of best environmental practices (BEP)
- for existing sources, promote use of BAT & BEP

For other industrial source categories listed in Annex C, Part III, Parties must promote use of BAT & BEP for new and existing sources, such as:

- variety of combustion sources
- chemical production processes releasing unintentionally produced POPs

- waste recovery and disposal practices
- textile & leather dying & finishing
- motor vehicles
- destruction of animal carcasses
- crematoria

POPs in Stockpiles & Wastes

Goal: Environmentally Sound Management (ESM) of stockpiles, wastes, and products and articles upon becoming wastes that consist of, contain or are contaminated by POPs.

Parties must:

- develop and implement strategies to identify stockpiles, products and articles in use, and wastes containing POPs
- manage stockpiles in a safe, efficient and ESM until they are deemed to be wastes
- take measures to handle, collect, transport and store wastes in ESM and dispose of wastes in a way that destroys POP content, or otherwise in ESM taking into account international rules, standards and guidelines (Art. 6)

Parties must:

- not allow recovery, recycle, reclamation, direct reuse or alternative uses of POPs
- not transport these materials across international boundaries without taking into account international rules (e.g., Basel Convention)
- develop strategies for identifying contaminated sites and, if remediation is attempted, do it in an environmentally sound manner

Adding New POPs

Agreed process will be used to evaluate candidates nominated by Parties

- application of scientific criteria
  (POP's properties have to be shown)
- "precaution" is incorporated
- all Parties have the opportunity for full hearing on any nominated candidate
- transparent process
  (Art. 8, Annex D)

Financial & Technical Assistance

will be provided for developing countries and countries with economies in transition to implement the convention (Art. 12, 13, 14)

- Regional and subregional centres for capacity building and transfer of technology
- Developed countries provide technical assistance and new and additional financial resources to meet agreed full incremental implementation costs

- Global Environment Facility (GEF) has been named as the principal entity of the interim financial mechanism to fund capacity building and other related activities

Within the period prior to ratification:

- Projects to enable developing countries to prepare to meet their future convention requirements (e.g. NIP development) are financed and undertaken
- Global Environmental Facility
- Canada POPs Fund and other sources

General Obligations

- Develop, implement and update an implementation plan
- Designate a National Focal Point
- Promote and facilitate a wide range of public information, awareness and education measures
- Encourage/undertake research, development, monitoring and cooperation on all aspects of POPs and their alternatives
- Report to the COP on:
- measures taken by Party and their effectiveness
- data/estimates for total quantities of POPs in Annex A and B that are traded, and list of States involved

National Implementation Plan

Parties shall according to Art. 7:

- develop & endeavor to implement an implementation plan
- submit plan to COP within 2 years of entry into force of Convention for the Party
- review and update plan on a periodic basis, in a manner to be specified by COP
- cooperate with other Parties directly, or through intergovernmental organizations, and consult stakeholders in all these actions
- endeavor to utilize and integrate these plans in national sustainable development strategies

As part of its implementation plan under Article 7:

- Party in the DDT Register shall develop national DDT action plan to: **[Annex B Part II]**
- confine use of DDT to disease vector control
- explore alternatives to DDT, and
- take measures to strengthen health care and reduce incidence of disease
- Party shall develop an action plan within 2 years of entry into force to identify, characterize and address releases of unintentionally produced POPs in Annex C and facilitate implementation of the requirements of Article 5

Stockholm Convention

Further information:

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Introduction to Preparation of the Stockholm Convention National Implementation Plan (NIP)

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Introduction

This presentation and the accompanying CD Rom "NIPs Guidance Document UNEP Chemicals May 2003" aim at providing guidance to countries in the process of developing a NIP. The Guidance Document was developed under the framework of the UNEP "12 country project". This presentation gives an overview of the process and the Guidance Document, out-lines how to use it and how to enhance it through comments. The CD Rom contains the Guidance Document and many of the related guidance documents.

Background

- At the 12 country project PDF phase Global guidance was requested.

Stockholm Convention Article 7 requires all countries to develop NIPs but provides no guidelines.

GEF initial guidelines for Enabling activities are based on 12 country project design.

The Objective is to complement and enhance existing guidelines using the 12 country project framework.

Overview of the Guidance Document

Main parts

Structure and Use of the Guidance Document
General principles
National Implementation Plans
Why, what, who?
NIP Development - Summary of Phases

Structure and Use of the Guidance Document

Section 1: background information

Section 2: general principles to guide the compilation of the NIP

Section 3: basic obligation under the Stockholm Convention to develop a NIP

Sections 4, 5, 6, 7, 8, and 9: breakdown of the process of producing a NIP (steps in the assessment, evaluation and development of options, country endorsement)

Use of "hyperlinks"[1] to take the reader to more detailed information in annexes

Annex 1: Project management and coordinating functions
Annex 2: Unintentionally produced chemicals assessment
Annex 3: POPs pesticide production & use assessment
Annex 4: PCBs assessment
Annex 5: Outline contents of a NIP
Annex 6: Process flow chart

General principles for NIP development

Tailored to the needs of the Party
Use existing structures: not "reinvent the wheel" during development
Integration in national sustainable development strategies
Flexibility to respond to the listing of new chemicals

NIP Development: WHY, WHO, HOW, WHEN?

Convention Obligation

Develop and endeavour to implement a plan for the implementation of its obligations.
Review and update, as appropriate, in a manner to be specified by decision of the Conference of the Parties (COP).

Required outputs

1. **A NIP with high-level political commitment**

2. **Transmission to COP**
   Transmit the national plan to the COP within 2 years of the date Convention enters into force

Specific requirements re Unintentional by-products

Each party shall develop and implement an action plan to identify, characterize and address the release of chemicals listed in Annex C. The action plan will include evaluation of current and projected releases and maintenance of inventories and strategies for implementation and public awareness.

NIP Development: WHY, WHO, HOW, WHEN?

Primary Responsibility
Nominated official supported by the necessary teams and experts
Stakeholders – Who and Why
indicative groups
additional references
Method – How
No specification in the Convention
Document provides series of tasks and an outline procedure to develop a NIP with continuous reference to existing guidelines

NIP Development: WHY, WHO, HOW, WHEN?

NIP Development Phases

Phase I – Establishment of Co-ordinating Mechanism and Process Organisation

Phase II – Establishment of POPs Inventories and Assessment of National Infrastructure and Capacity

Phase III - Priority Assessment and objectives setting

Phase IV - Formulation of a prioritised and costed National Implementation Plan and specific Action Plans on POPs

Phase V – NIP Endorsement and Submission

Common format for each section

Objective and outcome
Primary Responsibility
Stakeholders – Who and Why
Tasks
Method and approach
Guidance required

Outline of a National Implementation Plan for Persistent Organic Pollutants

(Name of Country)

Executive Summary

1. Introduction

2. Country Baseline

2.1 Country Profile
2.1.1 Geography and Population
2.1.2 Political and Economic Profile
2.1.3 Profiles of Economic Sectors
2.1.4 Environmental Overview
2.2 Institutional, Policy and Regulatory Framework. *This section describes the present overall institutional, policy and regulatory framework within which the NIP will be implemented*
2.2.1 Environmental/Sustainable Development Policy and General Legislative Framework
2.2.2 Roles and Responsibilities of Ministries, Agencies and other governmental Institutions involved in POPs life cycles (source through to disposal, environmental fate and health monitoring)
2.2.3 Relevant International Commitments and Obligations
2.2.4 Principles of Existing Legislation and Regulations addressing POPs (manufactured chemicals and unintentionally produced POPs).
2.2.5 Key approaches and procedures for POPs Chemical and Pesticide Management including enforcement and monitoring requirements.

2.3 Assessment of the POPs Issue in the country *This section of the NIP would provide the current state of knowledge about POPs in a country.*
2.3.1 Assessment for Annex A Part I chemicals (POPs pesticides)
2.3.2 Assessment for Annex A, Part II Chemicals (PCB)
2.3.3 Assessment for Annex B Chemicals (DDT)
2.3.4 Assessment of Releases from Unintentional Production of Annex C Chemicals (PCDD/PCDF, HCB and PCBs)
2.3.5 State of knowledge on Stockpiles, Contaminated Sites and Wastes
2.3.6 Summary of future Production, Use and Releases of POPs – requirements for exemptions
2.3.7 Existing programmes for Monitoring of Releases and Environmental and Human Health Impacts – including findings
2.3.8 Current level of Information, Awareness and education amongst target groups
2.3.9 Relevant Activities of Non-governmental stakeholders
2.3.10 Overview of technical infrastructure for POPs assessment, measurement, analysis, management, research and development – linkage to international programmes and projects.
2.3.11 Identification of impacted populations or environments, estimated scale and magnitude of threats to public health and environmental quality
2.3.12 Details of any relevant system on assessment and listing of new chemicals

Outline of a National Implementation Plan for Persistent Organic Pollutants Cont.

3.0 Strategy and Action Plan Elements of the National Implementation Plan. *This section would have two elements :- a formal policy statement and the implementation strategy for the NIP.*

3.1 Policy Statement
Government's commitment to addressing the POPs issue, including the formal adoption or endorsement of the NIP. It would also, if appropriate, define how the NIP would be integrated within a country's overall environmental policies and sustainable development strategy.

3.2 Implementation Strategy
This section details the actions included in the NIP to meet the obligations of the Stockholm Convention. It would outline a framework mechanism to coordinate discrete NIP activities including review, reporting, evaluation and updating of the NIP.

3.3 Strategies and Action Plans: *This section would provide country specific action plans and strategies to meet Convention obligations. Each plan will identify aims, actions and needs.*

3.3.1 Action Plan: Institutional and Regulatory Strengthening Measures
3.3.2 Action Plan: Production, Import and Export, Use, Stockpiles and Wastes of Annex A POPs Pesticides (Annex A, Part 1 Chemicals)
3.3.3 Action Plan: Production, Import and Export, Use, Identification, Labelling, Removal, Storage and Disposal of PCBs and Equipment Containing PCBs (Annex A, Part II Chemicals)
3.3.4 Action Plan: Production, Import and Export, Use, Stockpiles and Wastes of DDT (Annex B Chemicals) where used in country
3.3.5 Action Plan: Releases from Unintentional Production of PCDD/PCDF, HCB and PCBs
3.3.6 Strategy: Identification of relevant stockpiles, articles in use and wastes – plan for assessment and mitigation of releases from Stockpiles and Wastes: Pesticides, DDT, PCBs and HCB (Annex A, B and C Chemicals)
3.3.7 Action Plan: Identification and appropriate management of Contaminated Sites (Annex A, B and C Chemicals)
3.3.8 Strategy for Information Exchange
3.3.9 Action Plan: Public Awareness, information and training
3.3.10 Action Plan: Monitoring
3.3.11 Action Plan: Reporting
3.3.12 Strategy for Research and Development

Outline of a National Implementation Plan for Persistent Organic Pollutants Cont.

3.4 Development and Capacity Building Proposals and Priorities: *This section will detail the priority areas where current capacity and capability need to be strengthened to achieve the objectives of the NIP. Priorities based on the need to meet Convention obligations and country priority issues will be highlighted.*

3.5 Timetable for Plan Implementation and measures of success: *Summary of principal targets contained in the detailed strategy with specific targets, milestones and performance indicators to allow progress to be reviewed and monitored.*

3.6 Resource Requirements: *This section would detail the projected costs of measures included in the NIP. Incremental costs for measures would be identified and potential sources of finance for both incremental costs and baseline costs would be noted. In accordance with Article 13 of the Convention alternate sources of funding will be considered.*

Annexes
Annexes could be used to provide details of detailed background data and information, specific action plans and other relevant information to meet the objectives of the NIP while keeping the main document simple in structure and clear. Such annexes might include:

A1: Government and Key Stakeholder Endorsement Documents
A2: Record of Stakeholder and Public Consultation
A3: Representative Public Information Materials
A4: Supporting information on chemicals
A5: Details of Relevant International and Regional Treaties

How to use the document

The present guidance document tries to be concise however it points the way to more detailed guidance on specific subjects (listed at the end of each section).

If using an electronic version of the document, it will be possible to link directly to web-based reference material. Hyperlinks mean that a user can jump from the main text to more detailed guidance which may be a part of the document, contained on the CD Rom or available on the web.

UNEP can assist in providing hard copies of most of the reference material.

Recognize that it is not the bible and that there are many possible ways to do a NIP This document offers suggestions for adaptation to national circumstances. Language variation compared to other guidance does not mean difference in concept. It can be a basis for the National Coordinating Committee (NCC) but will need companion documents (particularly for task teams)

The document is a draft and will be amended, taking account of issues arising during use in the field.

What is expected from Pilot Countries?

They will make document available to active stakeholders. They will use it (learning by doing) and provide comments to UNEP. These comments will augment/complement further development of the document.

Where to get more information.

http://www.pops.int/documents/implementation/
http://www.chem.unep.ch/irptc/Publications/
pub-09-012.pdf
UNEP Chemicals CD-ROM
Kristina Kiss supported by 22 UNEP Chemicals professionals

Questionnaire for Country Report

This questionnaire was distributed to each participant for use to make inputs into the report for the country they represented.

Country: **Representative(s):**

1. **Status quo in the country in terms of implementation of the Stockholm convention with specific reference to dioxin and furan releases**
   Linked to the presentations given during the workshop, provide a short summary on:
   a. What kind of actions have been undertaken with respect to the Stockholm Convention
   b. Status of the NIP project and cooperation with the implementing agency
   c. Work done to date on dioxins and furans
   d. Understanding of main sources in the country

2. **Additional sources of dioxin and furans**
   Based on the information obtained during the workshop did you identify any additional, significant sources of dioxin and furans in your country?

3. **Strategies and actions for conduct of inventories on dioxin and furan releases**
   - What projects or plans are in place on a national level?
   - What strategies and actions do you expect to use for conducting inventories on dioxin and furan releases within the next 12 month/
   - Has the workshop suggested any additional areas of activity (in relation to hazardous waste issues and PCBs)?
   - How do you see cooperation amongst countries over the next 12 months?

4. **Recommendations by the countries**
   What kind of recommendations would you give:
   - For further action by UNEP or the implementing agency on a national and regional basis
   - For the extension and modification of the toolkit to cover issues identified in the Caribbean
   - For fostering collaboration and cooperation between countries in the regional and between institutions

5. **Gaps of data, information, technical and financial assistance**
   What kind of gaps of data and information did you identify in order to conduct the national inventories completely and successfully?
   What kind of technical assistance would you require for the above?
   What kind of financial assistance would you need for the above?

6. **Additional comments**
   Please feel free to comment on any additional issues you consider of importance to your specific country or to the Caribbean region against the background of the Stockholm Convention.

Antigua and Barbuda

Report on Status of National Inventory of Dioxin and Furan Releases

Presented by:
Brian Cooper, Janil Gore-Francis and
Adelle Blair

Introduction and Background to Antigua and Barbuda

Physical Description of Antigua/Barbuda

Part of Leeward Island chain
Antigua 280 sq km; Barbuda 160 sq km
Volcanic and limestone origins
Relatively low-lying topography and semi-arid climate

Socio-Economic Background

- Population circa 70,000
- Mainly Afro-Caribbean with increasing influx of other cultures
- Highly literate population
- Relatively high standard of living
- Economy based primarily on Tourism
- Off-Shore and E-services gaining importance

Industry and Commerce

- Commercial activity mostly directed at servicing local population and tourism
- No heavy industry or chemicals manufacture
- Light manufacturing only
- Importation of most raw materials
- Power generation from fossil fuels

Current Management of Furans and Dioxins in Antigua and Barbuda

General Toxic Chemicals Management

- Legal regulation generally based on Public Health and Nuisance laws
- Agrochemicals regulated under Pesticides Control Act (1973)
- New Legislation in draft form includes non-pesticide toxic chemicals

International Obligations

– Stockholm Convention

- Became signatory - May, 2001
- Not yet ratified

- Status of POPs Enabling Activities

- Project approved April, 2003
- Administration and Work Programme currently under development
- No formal surveys yet carried out on Dioxins or Furans or other PTSs

– Basel Convention

- Convention ratified in April 1993

Training in Furan/Dioxin Management Issues

- Two persons attended UNEP workshop on management and identification of PCBs and Furans/Dioxins - Cuba, April 2001
- One person attended Costa Rica Meeting on PTS, November, 2002
- Antigua Barbuda hosted AOSIS Sub-Regional meeting on POPs Enabling Activities, April 2003
- AOSIS Meeting provided first national media coverage of POPs issues

Potential Sources of Furans and Dioxins

Category 1 Waste Incineration

1.1 Municipal Waste

- Collected municipal waste is currently deposited in a sanitary land fill.
- Current quantity = approx 34-40Kt/a
- No official burning takes place
- Uncollected household waste is frequently burnt in open fires (?t/a)
- A few small waste incinerators exist (capacity < 1 ton)

1.2 Other Wastes

- Currently no facilities for incineration of hazardous, medical, sewage or other wastes exist
- Animal carcasses are often burnt in the field following deaths due to periodic droughts, hurricanes etc. Numbers not available

Category 2 Metal Production

There is no primary metal production in Antigua Barbuda

- There are a few small businesses which reclaim copper etc from electrical cables by burning off the plastic

Category 3 Power Generation & Heating

3.1 Fossil Fuel Power Plants

3.2 Other Power Generation and Heating

- There is no use for domestic heating
- Cooking is by LP gas, Electricity or charcoal
- LPG consumption in range of 6.7MgalsUS/a
- Charcoal production from local biomass estimated at approx 200 t/a

Category 4 Mineral Products

- Mineral production is limited to a single asphalt mixing plant (Avg production 1998 – 2002 approx. 33,600t/a)
- There are a few home-based potteries making ceramic products

Category 5 Transport

5.1 Vehicles

Antigua Barbuda operates approximately:

- 17,000 licensed private vehicles (mostly 4-stroke gasoline powered)
- 4,000 commercial vehicles (pick-ups, buses etc.)
- 3,000 trucks and heavy equipment (diesel)

5.2 Fuel Consumption

Antigua Barbuda consumes approximately (2000):

- 11.2 Mgals (US) Gasoline
- 12.2 Mgals (US) Diesel fuel
- 20.3 Mgals (US) Jet A1 fuel
- 72,000 gals (US) Aviation gasoline
- 15.5 Mgals (US) Bunker "C" fuel (mostly consumed for electricity generation)

Category 6 Uncontrolled Combustion Processes

6.1 Biomass Burning

Forest/Grassland Fires

- Significant acreages of Citronella grassland and associated scrub forest are burnt every year (estimated at 200 Ha)
- Agricultural Residues - Approx. 25 Ha/a of cotton are burnt for pest management purposes

6.2 Waste Burning and Accidental Fires

- Uncollected household waste is frequently burnt in open fires (Probably not more than 10% of collected garbage – see Sec 1)
- Accidental fires – no data available
- Construction/Demolition – no data available

Category 7 Chemicals and Consumer Goods

7.1 Materials Processing

- No significant production of chemicals, paper, textiles or leather materials occurs in Antigua Barbuda, apart from garment manufacture and craft-based paper and textile production
- A small petroleum refinery is essentially mothballed but does process limited amount of Bunker Fuel

Category 8 Miscellaneous

8.1 Drying of Biomass

- There is no significant drying of biomass in Antigua Barbuda except in the field using solar heat.
- There are several small bakeries which use wood fuel for baking. This sometimes includes waste wood from building construction/demolition sites

8.2 Other Sources

- Cremation is not practised in Antigua Barbuda and there are no crematoria
- Dry cleaning not widely practised, only few establishments
- Information on consumption appears unreliable
- Smoking is not widely practised. No data available on cigarette consumption

Category 9 Disposal/Landfills

9.1 Landfills and Waste Dumps

9.2 Sewage and Liquid Wastes

- There is no central sewage system in St. John's
  - Most domestic and commercial sewage is treated in individual septic tanks
  - Some households still use pit latrines
  - Most hotels and some businesses have mini-treatment plants

9.3 Composting

- Composting is not widely practised
- National Solid Waste Management Agency has been promoting composting of vegetative material to reduce volume of material going into the main disposal site

9.4 Open Water Dumping

- Rivers and drainage canals are frequently used as (illegal) dumping sites for .
- Occasional disposal of dredge spoils is carried out at sea (e.g. recent dredging of St. John's Harbour dumped approx. 1.5 Mm^3 of dredge spoil in deep water several miles off-shore)

9.5 Waste Oil Disposal

- No facilities exist for waste oil recycling or thermal destruction
- Waste oil is generally "poured away" or used as preservative/pesticide
- Oil Company has started "Oil Farm"
  - Approx. 2 ac of lined soil pits to dispose of collected waste oil Service Stations
  - Processes approx 300,000 gals annually
  - Likely to become "hot spot" as residues accumulate

Category 10 Hot Spots

Some anticipated "Hot Spots" include:

- Several areas where old transformers have been dumped
- Municipal landfill site which receives all kinds of solid waste
- Area of dredged spoil from previous dredging of St. John's harbour
  Oil farm site as residues accumulate

Conclusion

This survey is obviously a very preliminary effort to assess possible sources of Dioxin and Furan emissions. More efforts at quantification will have to be made. It is anticipated that the POPs Project will provide the resources to begin this process.

Country Report on Dioxin and Furan Releases - 22 May 2003

1. Status quo in the country in terms of implementation of the Stockholm Convention with specific reference to dioxins and furans

   NIP project approved, Technical Advisory Committee (TAC) (multisectoral) formed and 1st Meeting of TAC held early May 2003. Work done to date was determination of estimates for each category in preparation for composing this workshop's country presentation. UNEP is agency being worked with for NIP.

2. New sources of dioxins and furans identified in the workshop

   Differentiation / Considerations of sources of biomass and fuels as dirty or clean

3. Strategies and actions for conduct of inventories on dioxins and furans releases

   - Currently in early stage of NIP execution
   - Strategies and actions - interviews, Surveys, and Workshops to be done by Consultant under guidance of TAC to the project

   Additional areas of activity will include consideration of wood preservatives on used wood used by bakeries. Difficulty is expected in handling open burning issue in eight of situation of illegal burning. Co operation among countries - combined effort to get sample testing done to include Networking among participants to facilitate information sharing. It is suggested that a regional meeting be held in about six (6) months to access progress made to date.

4. Recommendations for further action by UNEP, etc :

   Provision of a definition of and rating methodology for incinerators
   Determination of emission factors for open burning (various types of)
   Consideration of funding for remediation of hot spots
   Toolkit extension and modification to cover Caribbean issues
   - Development of BATs and BEPs which are relevant to technology in the Caribbean

   Fostering collaboration and co operation between countries and institutions
   - Development of a common system or procedure for handling (collecting and testing) of dioxins and furans samples
   - Support of AOSIS Meeting. (Antigua, April 2003), recommendation for the Basel Convention Regional Centre at CARIRI to be used as the center for both the Stockholm and Basel Conventions.

5. Gaps of data, information, technical and financial assistance

Categorization of jet fuel
Emission factor for charcoal (provision of)

Technical assistance required
- Public awareness information for all publics (brochures, videos, posters, etc)
- Testing of unknown pesticide / chemical stocks to determine if POPs are present

Financial assistance
- Provision of funds by UNEP for testing of samples of dioxins and furans generated by surveys under the NIP project
- Provision of funds for conduct of surveys for illegal waste disposal sites and contribution to dioxins and furans emissions.

6. Additional Concerns

There is a need to keep Furan / Dioxin issues / concerns in perspective and in relation to wider POPs and Environmental issues. This includes adequate assessment of various risks and effects of potential solutions to Dioxin / Furan releases. Political support for national activities will depend on practical and affordable solutions to these problems.

The Bahamas Report on Status of National Inventory of Dioxin and Furan Releases.

Prepared by BEST Commission/Department of Environmental Health Services

The Bahamas

- Archipelagic nation of 700 islands and cays.
- Main source of income and employment is Tourism.
- Current Population - Approximately 300,000.
- Relatively high standard of living.

International Obligations

- Signed the Stockholm Convention on March 20th, 2002.
- Submitted National Implementation Plan awaiting approval for funding from the World Bank.
- Preparing to ratify the Stockholm Convention.

Sources of Dioxins/Furans

Landfills

- four in operation.
- 2 under construction.
- 13 more to be constructed in the near future.

Waste Incineration

- Hospitals
- Hotels

Crematoria

- four currently in operation on two islands.
- New Providence
- Grand Bahamas

Other sources

- Backyard burning - illegal under Environmental Health Act.
- Vehicles
- Forest Fires
- Lead Smelting

Legislation

- No legislation currently exists to adequately address management of dioxins and furans.

Emissions Monitoring

- No monitoring system currently exists, hence no quantitative data exists on the daily, monthly or annual emissions of dioxins/furans in The Bahamas.

Needs Assessment

- Adequate Legislation.
- Increased laboratory capacity.
- Continuous emissions monitoring.
- Public Education.
- Political Will.

Country Report on Dioxin and Furan Releases - 22 May 2003

Representatives: *Mr. Stefan Moss - BEST*

Ms. Lisa Moxey – Department of Environmental Health Services

1. Status quo in the country in terms of implementation of the Stockholm Convention with specific reference to dioxins and furans

   (a) With respect to the Stockholm Convention the following actions have been undertaken

      (i) Application has been made for funding to prepare 'NIP' to the World Bank June 2002
      (ii) Participated in various workshops to remain current on information pertaining to the implementation of the Stockholm Convention

   (b) The Bahamas is now awaiting approval of the Project Proposal from the World Bank

(c) Bahamas has identified sources of Dioxins and Furans.

(d) Due to the lack of research, only a partial understanding of the main sources has been attained.

2. New sources of dioxins and furans identified in workshop.

Yes in addition to dredging, a few other sources that appear to be low emitters of dioxins and furans have been identified.

3. Strategies and actions for conduct of inventories on dioxins and furans releases

(a) (i) To date there is an ongoing PCB inventory
(ii) Leaded Gasoline has been phased out
(iii) There is a ban on pesticides that contain POP's

(b) Upon approval for 'NIP', a detailed strategy involving intense research on Dioxins and Furans will be conducted. This activity will include a variety of Stakeholders. Data will be collected from the relevant agencies via surveys, questionnaires and interviews where necessary.

(c) The workshop has suggested other activities as it pertains to hazardous waste issues. Because of this, contaminated sites have been identified as 'hot-spots'. GIS technology will be used to obtain GPS coordinates for these sites of interest.

(d) Cooperation amongst other countries over the next twelve months will produce, if undertaken:
- Sharing of experience
- Sharing of information
- Sharing of solutions

4. Recommendations for further activities by UNEP Etc.

(a) Continue hosting such workshops to foster closer relations between countries and the implementing agency. This will lead to increased knowledge on the subject matter.

(b) Modify toolkit to consider cultural nuances, idiosyncrasies with respect to Dioxins and Furans. Add a system of maintaining the Dioxins and Furans inventory once completed.

(c) Consider financing workshops for the Caribbean and assist Caribbean consultants to provide experiences, recommendations and background information. Assist Caribbean countries to draft a program for their workshops based on standard proceedings.

5. Gaps of data, information, technical and financial assistance

(a) Laboratory analytical, qualitative and quantitative data based on international standards has been identified as a data gap.

(b) Financial assistance for purchasing of the required field and laboratory equipment.

6. Additional Concerns

Upon our country's post evaluation, any additional concerns identified will be forwarded to the relevant authorities.

Barbados

Report on Status of National Inventory of Dioxin and Furan Releases

Thérèse N. Yarde
Environmental Engineering Division
Ministry of Physical Development & Environment

Persistent Organic Pollutants in Barbados

Barbados is participating in the UNEP Pilot Project for the implementation of the Stockholm Convention. The activities include:
Development of a National Implementation Plan

- National Chemicals Management Profile
- Inventories
- Development of a Control and Management Strategy

Action to date on Air Quality Control In Barbados

There is no specific legislation regarding air emissions. In the past, most efforts at air emissions control centered around inorganic pollutants; NO_x, SO_x, and particulates. Recently there have been increasing numbers of complaints about air quality related ailments.

Sources of Dioxins and Furans

Incinerators, there are , of varying capacity, located on the island at the Airport, Port, Hospital, Animal Control Centre. There are also 2 privately operated: 1 at a private hospital, 1 at a chemicals formulation plant

There is one Cement Kiln located in the north of the island.

Other Industrial Sources of Dioxins and Furans

Power Plant which Burns primarily Bunker C fuel, with some diesel and natural gas engines but has stack emissions control or routine monitoring.

Other Sources of Dioxins and Furans

Household burning of waste is illegal in Barbados. However, this is still a fairly common method of waste disposal It is difficult to assess the extent of this practice.

Landfill Burning , there is spontaneous combustion at the national sanitary landfill. It is difficult to assess the contribution of this activity to overall dioxin and furan emissions.

Other sources include vehicular emissions, Cane fires and industrial facilities (e.g. sugar factories).

Aims

- To upgrade and improve the operation and management of incinerators
- To improve emissions control in industrial facilities
- To control spontaneous burning at the landfill
- To regulate vehicular emissions
- To eliminate household burning as a waste disposal method

Challenges

- Economic considerations with respect to retrofitting incinerators with emissions control and installing of new incinerators
- Need for Technical capacity for carrying out inventories and operations and maintenance of incinerators
- Lack of Regulatory Control for Controlling types of waste incinerated and monitoring for compliance with emissions standards.

Country Report on Dioxin and Furan Releases - 22 May 2003

Representatives : Mr Cameron Brathwaite
Ms Ann-Marie Eversley
Ms Therese Yarde

1. Status quo in the country in terms of implementation of the Stockholm Convention with specific reference to dioxins and furans

   Although Barbados has neither signed nor ratified the Stockholm Convention, funding has been received as part of a UNEP pilot project for the development of a National Implementation Plan. The project, which includes carrying out inventories, was launched in February 2003. Inventories are scheduled to begin in June 2003. This will be some of the first research done in Barbados in respect of dioxins and furans. Major sources of dioxins and furans are expected to include:

   Incinerators, Open / uncontrolled waste burning ,
   Power generation, Traffic / transport,
   Industrial and manufacturing processes.

2. New sources of dioxins and furans identified in the workshop

   Additional sources brought to our attention by the workshop include:

- Waste oil disposal
- Sediment dredging
- The presence of hotspots such as old dump sites, old refinery sites, sites of past chemical fires.

The workshop also made us aware of how we can use the inventory to assess and project changes in PCDD/F emissions due to new plans and policies (e.g. changes in solid waste management strategies).

3. Strategies and actions for conduct of inventories on dioxins and furans releases

   The only plan addressing dioxins and furans is that funded by UNEP for the Stockholm Convention. Over the next twelve (12) months, we hope to see co operation in:

   - Information exchange
   - Sharing of experiences and results
   - Development of a regional sampling proposal / plan.

4. Recommendations for further activities by UNEP etc.

   Recommendations include hosting / facilitating similar workshops for different stakeholder groups such as Ministers, policy makers and high level administrative officials (so as to improve political will) and industrial operators (to raise public awareness and improve co operation).

   The toolkit could also be extended to include more data on small scale, low-tech activities and operations which may be prevalent in the Caribbean and other parts of the developing world.

5. Gaps of data, information, technical and financial assistance

   The main data gap was the lack of empirical data, rather than the theoretical numbers included in the toolkit. Although there are some provisions in our project for financial and technical assistance, we anticipate a need for greater assistance to help us develop the empirical data to support our POPs reduction plans and policies.

6. Additional Concerns

   Awareness raising among other stakeholder groups (particularly those identified in our answer to question 4) is key, and it would be beneficial for similar workshops to be held targeting these stakeholder groups, so as to ensure an effective collaborative effort within nations and in the region.

Belize

Report on Status of National Inventory of Dioxin and Furan Releases

Presented by:
Jeavon Hulse
Environmental Officer
Department of the Environment
Ministry of Natural Resources, Environment and Industry

Belize

- Location in Central America with to the North - Mexico, West and South - Guatemala, East - Caribbean Sea
- Size - 8,866 sq. miles
- Population is 250,000 persons.
- Main Industries are Agriculture (sugar, citrus, banana), Aquaculture and Tourism

Main Sources of Dioxins and Furans

Open Air Burning of the following:

- dump sites throughout country
- Slash & Burn
- Bush & Forest fires
- PET (plastic) bottles
- Disposal of animal Carcasses
- Eradication Programs
- Flooding etc.
- Disposal of Pesticide containers

Incineration

- Medical wastes,
- Cruise ship wastes,

Bakery operations

Metal Smelting by Mennonites

Production of White Lime

Operation of old vehicles / diesel generators. It should be noted that use of leaded fuels was phased out in 1985

Legislation

Environmental Protection Act which prohibits residential burning. Solid Waste Management Act addresses waste collection and disposal.

Concerns

External input of POPS into the Country

It should be noted that Energy generating programmes to come on stream are the use of bagasse and Cohune palm (*Attalea cohune).*

Country Report on Dioxin and Furan Releases - 22 May 2003

1. Status quo in the country in terms of implementation of the Stockholm Convention with specific reference to dioxins and furans

   Belize signed the Stockholm Convention in March 2002. Belize has prohibited the importation of most of the POPs Pesticides; while 2 has never been registered in Belize.

   Belize has expressed its intention to use DDT should the need arise. The Ministry of Health in collaboration with PAHO has conducted an inventory of pesticides in country. This identified 14 tonnes of stockpiled DDT at the Ministry of Health compound in Belmopan and San Ignacio.

   PCB transformers have been phased out by the power company. Approximately 40 transformers are stockpiled.

Belize has drafted a project proposal for its NIP and is in the process of submitting this proposal to UNEP.

2. New sources of dioxins and furans identified in the workshop

Belize has identified most of the main sources of dioxins and furans. Sources which were not considered include dioxins and furans originating from crematories, dredging and dry cleaning.

3. Strategies and actions for conduct of inventories on dioxins and furans releases

On a national level, there are no projects nor plans in place to address dioxins and furans; however, as part of the project proposal for the NIP, a possible project is being proposed to systematically identify and locate main sources of POPs including dioxins and furans.

Based on this workshop, Belize will hopefully utilize the information acquired to assist in the conducting of inventories on dioxins and furan releases in the next 12 months. Presently no work is being conducted which focuses primarily on dioxin and furans.

4. Recommendations for future activities by UNEP etc.

UNEP should conduct other training and capacity building exercises to assist countries in complying with their obligatious under the convention and implementing the convention in country.

The toolkit should be modified to take into consideration the unique conditions in the Caribbean and in Small Island Developing States.

As each country proceeds with the development of their national inventories, countries should share experiences learnt and lessons learnt; especially for countries where pilot projects are currently being conducted.

5. Gaps of data, information, technical and financial assistance

Some of the primary gaps with respect to Belize would be for the collection of correct data and the lack of suitably trained technicians to actually go out and identify sources and collect data. Gaps also include the lack of adequate financial resources to conduct monitoring and evaluation exercises.

6. Additional Concerns

Of concern to Belize, considering its geographical location to other countries is the possible influence and input of POPs from neighbouring countries.

The Commonwealth Of Dominica

Report on Status of National Inventory of Dioxin and Furan Releases

Dominica does not possess the industries, which are known to be traditional sources of dioxins and furans resulting as a result of combustion. In the absence of such industries, some practices though not of a large scale may contribute to dioxins and furans emissions in the country.

Sources of Dioxins and Furans

Poor solid waste management practices – The largest portion of solid waste generated in the country is disposed of at two landfills. The activities undertaken there however are inadequate to effectively store, collect and treat some hazardous waste generated on the island.

Medical waste – disposal is by incineration at main hospital when the incinerator is operational.

District Health Centres – clinical waste is disposed of by open burning.

Tyres – Used tyres are burned on the landfill face in the absence of a proper disposal methods such as shredding to reduce bulk and allow burying at landfill.

Open burning of refuse is practiced around the country in the absence of a reliable collection system for solid waste.

Automobiles – Dominica has discontinued the sale of leaded gasoline thus reducing the contribution from that source.

Production of coals – burning of petroleum products for road building activities.

Small industrial activities – combustion of petroleum products at electrical generation plant, agro-industries, rum distilleries, bottling plants and soap and detergent factory.

Another minimal source of dioxins and furans generation can be as a result of burning of chemicals among household refuse.

Country Report on Dioxin and Furan Releases - 22 May 2003

1. Status quo in the country in terms of implementation of the Stockholm Convention with specific reference to dioxins and furans

    a) Letter has been submitted to government re ratification of convention

b) National implementation plan has not commenced. No focal point or competent authority has been appointed.

c) No specific activities have been directed to dioxins and furans, however, certain activities being carried out will reduce dioxins and furans.

e.g. ban on leaded gasoline
new landfill under construction
tyre slicer to reduce on tyre burning

d) Main categories can be identified.

2. New sources of dioxins and furans identified in the workshop

Additional sources not identified in report e.g. charcoal burning, bakeries etc, smoke house barbecue.

3. Strategies and actions for conduct of inventories on dioxins and furans releases

The Environmental Coordinating Unit has been established to co ordinate all environmental agencies who undertake monitoring functions on various environmental areas.

Solid waste Management programme seeks to minimize and control treatment and disposal of solid waste.

- Set up management team
- Sensitise general public and stakeholders – July to September
- Set up protocol for conducting inventory – July to September
- Carry out inventory - October ongoing
- Develop national implementation plan – January ongoing

Areas that workshop has suggested

- Stock piling of pesticides and other chemical
- Disposal of transformers
- Collection and disposal of waste oil

- Lead acid batteries

Co operation among countries

- Information sharing
- Technology exchange

4. Recommendations for future activities by UNEP etc.

Testing for level of Dioxins and furans,

- help in identifying sources,
- identify old chemical stockpile

Extension and Modification

- to include management of sensitive and fragile ecosystems
- help to modify practices to make them less hazardous

Promote Collaboration

Provide Training, exchange of technology and information

5. Gaps of data, information, technical and financial assistance

No data on emissions, limited public awareness, more government involvement re legislation

Need financial assistance

- To carry out inventory
- For monitoring / laboratory support
- To dispose of waste that cannot be handled in country.
- National workshop

Grenada

Report on Status of National Inventory of Dioxin and Furan Releases

Prepared by: Guido Marcelle
Benedict Peters
John Auguste

Country Background

Grenada is a small Island State with an area of 133 square miles and has a population of approximately 100,000. Grenada's major sectors are tourism, agriculture and manufacturing (small).

- Grenada has signed the Rotterdam Convention but not yet signed the Basel or Stockholm Conventions.

- No POPs Authority designated

Potential Sources of Dioxins and Furans

- A preliminary inventory was undertaken.
- No actual monitoring was done

Waste Incineration

- Waste Incinerators - Airport
  - General Hospital

- Simple Incinerator–like devices exist for burning wastes at government clinics and other hospitals, also for abattoirs.

Other Situations

- Open burning of residential wastes
- Concrete garbage dumps are set on fire
- Burning of biomass at sugar cane factories
- Periodic forest fires
- Open burning at dump sites
- Burning of plastics and plastic products
- Burning of tyres (sometimes used to kill bamboo stools)
- Hot mix / Asphalt preparation areas
- Charcoal production

- Barbecuing a growing business
- Cigarette smoking

Industrial Situation

- Two large electrical generators are operated in Grenada and Carriacou.
- Numerous small generating units
- Boilers - Brewery, Agro processors, Laboratories, Laundries
- Transportation – motor vehicles – gasoline and diesel (only unleaded gasoline is now used)
- Crematorium – one

Concern

What is the possibility of dioxins and furans being deposited on island from elsewhere via the air?

Strategic Actions

- Need to reconstruct the nonfunctional new land fill
- Need for some legislation in place "no specific legislation regarding air emissions related to use of incinerators or open burning".
- Investigate situations with respect to old electrical transformers, dredged soil etc.
- Recognize the need for full inventory – qualitative and quantitative – for Dioxins and Furans among others, thus the need to source resources
- Need some public awareness activities
- Implementation of Environmental incentives or disincentives for various sectors.

Country Report on Dioxin and Furan Releases - 22 May 2003

1. Status quo in the country in terms of implementation of the Stockholm Convention with specific reference to dioxins and furans

    a) Presentation for accession submitted from Ministry of Finance to Foreign

Affair Ministry on the road towards ratification.

b) NIP project not yet initiated
c) Preliminary qualitative (survey) investigation undertaken identifying some likely sources
d) Among some (restricted) personnel a fair understanding of the possible sources. However, no degree of quantification.

2. New sources of dioxins and furans identified in the workshop.

   Not really. Grenada may need to identify hotspots and get details on waste collection and waste separation (if any) before dumping. Consideration for dredging activities.

3. Strategies and actions for conduct of inventories on dioxins and furans releases

   - Set up a working POPs committee (involve the media)
   - Designate a focal point – designated focal authority for POP's
   - Do a presentation to stakeholders after a preliminary investigation using new information.
   - Initiate steps for setting up NIP. Prepare a project – Seek funding – Involve local consultants
   - Basically the pesticides in the dirty dozen are banned by the Pesticide Control Board
   - Foster some linkages between focal points, information exchange, check with parties who may have done work on NIP or hazardous waste surveys e.g. St Vincent, Antigua, St Lucia, Barbados
   - A Regional Communiqué should be released.

4. Recommendations for further activities by UNEP etc.

   - Institutional strengthening of focal points
   - Support for testing – actual analysis for dioxins and furans
   - Clarification on incinerators
   - Continue to foster workshops, streamline toolkit for this region's needs

5. Gaps of data, information, technical and financial assistance

   - Legal expertise
   - POP's expert to work with local consultants

- Elements of training needed – capacity building
- Support to focal point – e.g. computer etc
- A project to be prepared for assisting with NIP development
- Support for testing
- Public awareness activities
- Work on new Pesticides and Toxic Chemicals act.

6. Additional Concerns

- Need to know potential areas of funding
- Need to do sampling however limited
- After the assent/ratification to the convention, Grenada should have a POP's Act to give legal effect to our ratification and control of related activities – burning of wastes, emissions etc.

Jamaica

Report on Status of National Inventory of Dioxin and Furan Releases

Presentation by: Nicole Smith
Kirk Pennant
Trevor Ramikie

1. Background

a. Role of the Natural Resource Conservation Authority (NRCA) since 1991

b. Role of the National Environment and Planning Agency (2001-present).

c. Party to the Basel Convention – April 2003

d. Signatory to the Stockholm Convention

e. Project Proposal submitted to UNEP for the development of a National Implementation Plan (NIP) on Pops has been approved. A national co-coordinator is now being sought for the programme.

f. The National Solid Waste Act (2001) effected.

2. Current Situation

- Educational Programme on POPs planned
- Public Awareness Campaign to be launched
- The Air Quality Regulations of 2003 and their effect on reduction of dioxins and furans
- (Vehicle Emissions not addressed by Regulations)

3. Possible Sources of Dioxins and Furans

3.1 Waste Incineration

- hospitals (approximately 14)
- Industrial Areas:
    - Montego Bay
    - Kingston
- Bauxite Companies
    - Production of Alumina to be investigated
- Commercial
    - Supermarket Incineration

3.2 Open Burning

- Agricultural
    - (Cut and slash/burning)
    - Sugar cane fires
- Domestic (Household) Burning)

3.3 Power Generation

- Air Emission from plants (3 major facilities) – JPs Co, JPPC, JEP
- Co-generation

3.4 Manufacturing

- Caribbean Cement Company (CCC)
- Effect of Kiln
- Bauxite Production
- Other Manufacturing Processes

3.5 Landfills / Dumps

- Riverton City – Kingston – Fires
- Retirement Dump – Montego Bay
- Small Dump Site (5)

4. Actions To Date

- Phased out leaded gasoline
- Commenced the upgrading of Riverton City Dump to a sanitary landfill
- All Pesticides on POPs list are already banned.
- Developed – Air Quality Regulations
  - Stack Emission targets

5. Conclusion

- Need exists for public awareness campaign and education
- Critical need to conduct an inventory of Dioxins and Furans emissions
- Cultural barriers/practices exist which must be overcome
- Implementation of NIP to be the main focus of activity

Jamaica Country Report on Dioxin and Furan Releases - 22 May 2003

1. Status quo in the country in terms of implementation of the Stockholm Convention with specific reference to dioxins and furans

a) - Recently signed the Stockholm Convention
- Drafted air regulations 2003-04-22
- phased out leaded gasoline
- Upgrading dumpsite to sanitary landfill
- Banned all pesticides on the POPs list

b) Budget of project approved for NIP

- National co-ordinator being sought through the National Environment and Planning Agency NEPA

c) No work done to date on dioxins and furans

The potential sources of release are now more understood based on the categorization

- Biomass burning
- Incineration
- Slash / burn / agricultural
- Residential burning

2. New sources of dioxins and furans identified in the workshop

- lime production
- dredging
- hot spots
- composting

3. Strategies and actions for conduct of inventories on dioxins and furans releases

- A project and a coordinator are being put in place for eighteen (18) months.
- Ensure that the inventory exercise is placed on the agenda for the POPs workshop within 6 months.
- Develop NIP with and necessary instruments in place e.g. (surveys, questionnaires)
- To conduct three workshops on Dioxins and Furans
- For a steering committee for the National Inventory exercise Conduct the initial and interim inventory within 9 months for at least or 50% of categories.
- Yes, Foundries and production of dioxins and furans.
- Co operation is critical in ensuring that objectives set within a 12 month period are achieved through lessons learnt - example from Barbados and Trinidad and Tobago.

4. Recommendations for future activities by UNEP etc.

Technical Assistance programmes especially in the area of monitoring e.g. equipment for evaluation of dioxins and furans

- add method of conducting simple - material balances

- conduct one additional workshop
- the assistance of consultant in the application of emission factors.

5. Gaps of data, information, technical and financial assistance

- Historical data not available
- Assumption made in quantify and quality
- Technical training in analysis for dioxins and furans.
- Financing of sampling plans

6. Additional Concerns

- Public awareness campaign needed
- cost being analysis to be conducted
- information given to do cost / benefit analysis
- important – Health issues
- possible costing

St Kitts And Nevis

Report on Status of National Inventory of Dioxin and Furan Releases

Presented by: Ms June Hughes
Mr. Horatio Hanley
Mr. Alexander Riley

St. Kitts and Nevis is a part of the Leeward Island chain, both islands have an area of 100 square miles and a population of approximately 40,000 inhabitants.

The main industries for St. Kitts and Nevis are:

- Tourism
- Sugar production and;
- Light manufacturing.

Management of POPs in St. Kitts and Nevis - General Toxic Chemicals Management

Legislation

- The Public Health Act
- Pesticide and Toxic Chemicals Act
- National Conservation and Environment Protection Act
- Solid Waste Management Protection Act

International Obligations

- Ratified the Basel Convention
- Currently reviewing the Stockholm Convention with the intention of ratification.
-

Potential Sources of Dioxins and Furans

- There are two incinerators at the main hospitals in both St. Kitts and Nevis, which handle waste from all Health Centres and other Hospitals.
- Both Electricity Power Plants use diesel as the fuel source.
- There are a few householders who use wood and coal burning for fuel for cooking.
- Charcoal is still produced on a small scale for fuel mainly for the weekend barbeque pits.
- There are a number of vehicles using diesel and gasoline. Leaded Gasoline was phased out in 1999.

- There a number of uncontrolled scrub land fires mainly caused by spontaneous combustion (usually in periods of drought)
- Burning of forest land for agricultural use
- Burning of Sugar Cane Fields
- Dry cleaning is done on a small scale.
- In 2001 two new sanitary landfills were opened (one on each island). This has greatly reduced open landfill fires.
- There is no centralized sewage system. Sewage is still disposed of in Pit Latrines, Septic Tanks for householders and small Package Treatment Plants for the Hotels.

No inventory was ever conducted on PCBs, dioxins or furans. There is therefore no data source to draw upon. Attempts will have to be made to conduct a thorough assessment/inventory.

Country Report on Dioxin and Furan Releases - 22 May 2003

1 Status quo in the country in terms of implementation of the Stockholm Convention with specific reference to dioxins and furans

a. No action has been undertaken in respect to the Stockholm Convention. At the moment the Convention is being reviewed for possible ratification.

b. We are at the point of looking at formulating the NIP. We expect to have the proposal completed and submitted in the next two months.

c. None apart from the preliminary assessment for this workshop.

d. We now have a better idea of what our main sources of dioxins and furans are and where to locate potential sources.

2. New sources of dioxins and furans identified in the workshop

- Boiler at the Breweries and the Sugar Factory
- Use of Bagasse as a fuel source
- Dying of textiles
- Dump that was converted into sanitary landfill - a potential hotspot
- Backyard burning
- Dredging - we are reusing the sediments as an aggregate
- Clay pottery industry

3. Strategies and actions for conduct of inventories on dioxins and furans releases

- None. No current projects and plans at the national level.

- Strategy will depend on the formulation and approval of the National Implementation Plan (NIP)
- There is already and awareness of dangerous pesticides, use this awareness to link into the dioxins and furans issues
- Involve the stakeholders such as hospitals, the Breweries and the SSMC to conduct the inventories.
- Sharing of information
- Assistance with the clarification of the gray areas

4. Recommendations for further activities by UNEP etc.

a. Support for a regional analytical center re: equipment and training of personnel
b. Toolkit should be supported by practical analytical applications for clarity
c. A network on dioxins and furans be established for information sharing and problem solving

5. Gaps of data, information, technical and financial assistance

Information
a. Lack of statistical data (data of all kinds)
b. Personnel to conduct the inventories
c. Finances to support the process

Technical assistance: - training of personnel
Financial Assistance: - Monies to establish an inventory database and to fund analysis

6. Additional comments

St. Kitts – Nevis needs:

- to formulate legislation to deal with issues such as backyard burning, air quality etc.
- to establish Emission standards for dioxins and furans
- a Public Awareness Strategy that would neither overplay nor underplay the issues, placing them in the right context for the country.

St. Lucia

Report on Status of National Inventory of Dioxin and Furan Releases

Representatives: Mr. Patrick Andrew
Mr. Laurianus Lesfloris
Ms. Shirlene Simmons

Country Background

Area	616 sq. km (238 sq. miles)
Population	157,774 p
GDP per capita	US$ 2,563.80

Major Sectors - Agriculture : US$ 24m
- Tourism : US$ 1.2m
- Manufacturing : US$ 24.4m

Source Statistical Department, St Lucia 2001

International Conventions

St. Lucia signed the Basel Convention: 9th Dec. 1993
St. Lucia acceded to the Stockholm Convention on POPs: 4th Oct. 2002
Submitted the project proposal to UNEP for onward dispatch to the GEF to develop the National Implementation Plan: 22nd April 2003

Current Situation

Agricultural Situation

- Burning of agricultural lands prior to cultivation
- Burning of crops and agricultural waste
- Burning of pasture lands for animal grazing

Cultural Situation

- Charcoal Production
- Charcoal-pot used to cook and roast food
- Barbeques (private and public)
- Wood-fired ovens for bread making

Industrial Situation

- Electrical Generation Plants powered by diesel engines (3)
- Production of cleaning chemicals (1)
- Boilers (4) - (Brewery, Distillery, Linen Company and manufacturer of clay products)
- Transportation (motor vehicles and other diesel powered engines)
- Incinerators are no longer in use on the island. They were used for the incineration of biomedical waste. (2)

Other Situations

- Open burning of waste at the residential level
- Forest Fires especially during the dry season (spontaneous)
- Burning of plastics and plastic products

Strategic Responses

- Incineration has been phased out
- Steam sterilization replaces the incineration of biomedical waste
- In 1998 open waste burning was discontinued at the islands 2 disposal sites
- In 2003, 2 sanitary landfills were commissioned in the North and South of the island
- Unregulated dumps have been phased out
- St. Lucia phased out leaded gasoline in 1999

Legislative and Managerial Responses

- The St. Lucia Solid Waste Management Authority (SLSWMA)
- - SLSWMA Act No. 20 of 1996 (under review)
  - Hazardous Waste Advisory Committee
- The Environmental Health Department of the Ministry of Health
  - Nuisance Regulation of the Public Health Act No.8 of 1975
- Pesticide and Toxic Chemicals Control Act No.15 of 2001
- The Environment Department
- Obligations under the various MEAs to address various environmental issues

Country Report on Dioxin and Furan Releases - 22 May 2003

1. Status quo in the country in terms of implementation of the Stockholm Convention with specific reference to dioxins and furans

   St. Lucia ratified the Stockholm Convention on POPs 4th October 2002. The Ministry of Physical Development, Environment and Housing has been identified as the Convention focal point. The Enabling Activities project proposal for the country has

been completed and submitted to the implementing agency (UNEP), and the Global Environment Facility (GEF) for approval. There has been no research done to date on dioxin and furans. The sources and potential sources have been identified. One of the activities within the Enabling Activites project is a comprehensive inventory of the dirty dozen-POPs chemicals and pesticides.

2. New sources of dioxins and furans identified in the workshop

St. Lucia has identified additional issues as a result of this workshop. Waste oil and its use as a source of fuel. This activity previously seen as a waste management practice is now seen as a transfer of pollution issues. Gold processing is an area of concern and further investigation into the activity will be required.

3. Strategies and actions for conduct of inventories on dioxins and furans releases

There are no projects or plans in place at the national level to conduct inventories. In the short term, information gathering from industries and other producers of dioxin and furans will be conducted by the Environmental Health Department of the Ministry of Health and other relevant government agencies.
Networking and sharing of information with other islands in the region is recommended as well as working closely with Barbados to learn from their experiences as Barbados is currently conducting the pilot study for the region.

4. Recommendations for future activities by UNEP etc.

Action by UNEP Chemicals:- Continued capacity building in the form of workshops for industry, high level policy officials and other stakeholders in the process. Establishing standard emission levels for dioxins and furans. Classification of low technology in the toolkit. The toolkit should include those specific issues related to our needs and concerns in the Caribbean. Assistance in attaining the capacity for testing for dioxin and furan releases.

5. Gaps of data, information, technical and financial assistance

The need for Empirical data. Assistance, financial and technical is required. Public education and awareness materials are also required.

6. Additional Concerns

St. Lucia with technical and financial assistance from the FAO conducted an inventory on spent agricultural chemicals. Stockpiles have been identified for disposal. Chemicals need identification as the labels are not present on the containers. Approximately 50 used transformers and capacitors have been identified for disposal. The Pesticide and Toxic Chemicals Control Act (2001) and the Solid Waste Management Authority Act (1996) are pieces of legislation-to name a few- that address issues of solid waste, hazardous waste and pesticide and toxic chemicals.

St. Vincent & the Grenadines

Report on Status of National Inventory of Dioxin and Furan Releases

St Vincent and the Grenadines is a miniscule state both in terms of land space and economy comprised of a mainland and thirteen (13) small cays, five (5) of these cays are inhabited and the others are used for Tourism purpose. The population of St Vincent and the Grenadines is 107,000 people, 49% male and 51% female

Over the years the main source of income was agriculture, but this sector has now been taken over by the tourism sector. Like all other countries of the world, there is a problem with the generation of Dioxins and Furans. These chemicals originate from burning of agricultural land just before the rainy season. Also with the mushrooming of barbeque pits all over the island, there is much burning of charcoal for use in this area.

SOURCES OF DIOXINS AND FURANS

There are approximately nine (9) private slaughter houses and one government owned slaughter house which use treated and untreated lumber/wood for fuel. There are also thirty two (32) public health facilities and three privately owned clinics which use incinerators. Seven health centers and the three private hospitals do incineration.

Tyre burning is a significant problem. Approximately 2,500 tyres are burned monthly. There are eleven electricity plants in St Vincent and the Grenadines. Eight of these are diesel powered while three are hydro powered. Approximately 150 – 45 gallon drums of used oil are sent to Trinidad quarterly, while those from other activities are disposed of indiscriminately. Some household burning still takes place though on a reduced scale.

DISPOSAL

Disposal of waste takes place at a sanitary landfill in Diamond and at a dumpsite at Amosvale on the mainland. All the inhabited islands have their own garbage dumps. Covering of these materials is done daily. There are plans to build another sanitary landfill in a small town in the north of the island called Barrouallie. There is also one distillery and one brewery generating waste.

CONCLUSION

Much effort is being made to educate the population in the disposal of waste. The Public Health Department has many educational programmes on radio, television, schools, and also assists doctors clinics and NGO's to help alleviate or minimize garbage generation, the need for collection and disposal. Also the St Vincent Solid Waste Management Unit is involved in the education of the population in waste management.

Country Report on Dioxin and Furan Releases - 22 May 2003

1. Status quo in the country in terms of implementation of the Stockholm Convention with specific reference to dioxins and furans

   Presentation for accession submitted from Ministry of Finance to Foreign Affairs Ministry on the road towards ratification. NIP project not yet initiated

2. New sources of dioxins and furans identified in the workshop

   May need to identify hotspots and get details on waste collection and waste separation (if any) before dumping. Consideration should be given to use of material from dredging activities.

3. Strategies and actions for conduct of inventories on dioxins and furans releases

   - Set up a working POPs committee (involve the media)
   - Designate a focal point – designated focal authority for POP's
   - Do a presentation to stakeholders after a preliminary investigation using new information.
   - Initiate steps for setting up NIP. Prepare a project – Seek funding – Involve local consultants
   - Foster some linkages between focal points, information exchange, check with parties who may have done work on NIP or hazardous waste surveys e.g. Antigua, St Lucia, Barbados

4. Recommendations for future activities by UNEP etc.

   - Institutional strengthening of focal points
   - Support for testing – actual analysis for dioxins and furans
   - Clarification on incinerators
   - Continue to foster workshops, streamline toolkit for this region's needs

5. Gaps of data, information, technical and financial assistance

   - Legal expertise
   - POP's expert to work with local consultants
   - Elements of training needed – capacity building
   - Support to focal point

- A project to be prepared for assisting with NIP development
- Support for testing
- Public awareness activities

6. Additional Concerns

- Need to know potential areas of funding
- Need to know how to do sampling however limited

Suriname

Report on Status of National Inventory of Dioxin and Furan Releases

OPEN BURNING OF WASTE IN SURINAME

Abstract

In Suriname, the practice of open burning of chlorine-containing wastes and the poor combustion conditions make an important dioxins and furans source. Open burning of trash or construction waste that contains PVC may result in significant but unquantified dioxins and furans emissions. Until now no emissions characterization study to examine, characterize and quantify emissions of dioxins and furans and other pollutants of concern has been done, although a lot of burning occurs. We do not have equipment to do this kind of research.

Due to lack of data this report will focus on the open burning activities in Suriname, their possible effects and measures to solve the problem

Legislation

The registration, import and use of pesticides in Suriname are regulated by:

1. The Pesticide Act of 7 December 1972, (G.B. 1972, no 151).
2. The Pesticide Decree of 12 December 1974, (G.B. 1974 no 89)

Although it was approved by Parliament in 1972 and 1974, this pesticide legislation came only into force on the 1th of July 1990.

The Act covers the trade and use of pesticides. The decree, which refers to Article 13 of the Act, covers the sale, storage, safety equipment, destruction of packing material and special measures for the use of very poisonous materials.

The Pesticide Decree is now being revised to compy with the FAO Code of conduct for the sale and use of chemicals and is now waiting for final approval by the policy makers. Residue legislation is still lacking.

A special decreee was prepared by the Ministry of Trade and Industry to prohibit chemicals occurring on the PIC list, this was finalized on September 1, 1999, S.B. 34. The toxic chemicals mentioned on this PIC list (POP's included) are prohibited to be imported.

The import of pesticides is regulated at this moment by three authorities:
The Ministry of Trade and Industry covers the permit to import and all import-permits regarding pesticides need to be approved by the Ministry of Agriculture, Animal Husbandry and Fisheries. At the moment the import actually takes place, the Custom Officers demand another approval of the Ministry of Agriculture.

The use of pesticides is not yet regulated, because of the fact that the new decree is not yet in force, but pesticides which are not allowed, are confiscated by the Pesticide Department. Other sanctions are not taken at this moment.

The reduction of pesticide use is being promoted by the Ministry of Agriculture, Animal Husbandry and Fisheries through the following measures:

- To improve the knowledge of the farmer with regard to recognition of pests and diseases, in a way that if it is necessary to apply pesticides, he will choose the appropriate pesticide.
- To teach the farmer, when to apply pesticides and thus reduce the amount and avoid excessive spraying.
- To adapt IPM techniques as cultural measures, resistant varieties, biological control, etc.

International Obligations

Conventions:
Ratification of the Stockholm and Basel Conventions have not taken place because the Environmental legislation is not in place.
The Rotterdam Convention is ratified under responsability of the Ministries of Foreign Affairs, Agriculture, Animal Husbandry and Fisheries and Trade and Industry.

Introduction

The main way of disposing of waste in Paramaribo is through uncontrolled landfilling (open dump). But in many areas of the country, solid waste disposal practices consist of open burning using barrels or open pile burning in stead of, or in addition to disposal to the legal uncontrolled landfill or burial pits in backyards.

The motivations of residents, companies and commercials for open burning their waste (garbage or refuse) may include convenience, habit or cost avoidance.

Broadly, the urban solid waste consists of household, industrial and hospital waste which is disposed of indiscriminately. Though waste from hospitals and nursing homes is required to be collected and treated separately, in Paramaribo, such wastes form a component of the municipal solid waste.

There are no regulation to ban the open burning of waste. Only in dry periods when the open burning forms a risk for the community and neighbors start complaining do the police and fire brigade department start with education programs or give warnings.

Emissions from open burning of solid waste are released at ground level resulting in decreased dilution by dispersion. Additionally, the low combustion temperature and oxygen-

starved conditions associated with open burning may result in incomplete combustion and increased pollutant emissions. These pollutants can damage human health and the environment. In contrast, modern waste combustors have all stacks and specially designed combustion chambers, which provide high combustion temperatures, longer residence times, and better waste agitation while introducing air for more complete combustion.

Until now no research is done to the impact of open burning on human health and the environment.

Open burning definition

Open burning can be defined as:

- Burning in open, outdoor fires;
- Burning in burn barrels;
- Burning in incinerators that do not meet the emission limitations specified for solid and infectious waste
- Any other outdoor open burning where combustion air is not effectively controlled and combustion products are not effectively vented through a stack or chimney.

Of the above forms of open burning, the first are applied the most. Backyard or open burning is by definition "uncontrolled" burning and results in very high levels of toxic chemicals emitted in the smoke. Compared to controlled municipal incinerators it takes place at much lower temperatures (400-500^{0}F), with virtually no combustion air control, and with none of the very expensive high-tech pollution filtering apparatus required before the incinerator stack. Open burning results in incomplete combustion of the wastes being burned. Dioxin generation occurs during combustion or burning when both organic matter and an available chlorine source are present. Much evidence suggests that the global dioxin burden stems primarily from the life-cycle of chlorine-containing synthetic organic materials (e.g., polyvinyl chloride (PVC) plastic, chlorinated solvents, chlorinated pesticides, chlorine-based bleaching agents, etc.). Although many materials can serve as chlorine-donors in combustion-based processes, PVC plastic plays an important role in most of the major dioxin sources. This is not surprising, because PVC is the most abundant product of chlorine chemistry.

Problems

For many years people have burned their trash without understanding the complex and serious dangers that occur as solid waste transforms into air pollution. Besides the fact that it is dangerous, there are several good reasons not to burn trash, and the composition of modern refuse has everything to do with it.

- The composition of common household waste and industrial waste contains many materials that become very toxic when burned and can led to serious health problems such as lung cancer, emphysema and bronchitis. Now more than ever, we find that literally thousands of common products are made of plastic, or other synthetic materials. A few examples: plastic wrap, eating utensils, cups, bottles, toys, pipes, furniture, sneakers, litter boxes, computer components, pens, storage containers, trash cans, electrical parts, etc. The durability and economic convenience of synthetic materials has made them a way of life. With today's wastes, it is very difficult to keep plastics out of even carefully sorted paper-only waste. However, the sheer number of products has posed a problem with disposal.

- The US EPA now considers open burning a major source of dioxin. Burning plastics can be especially problematic, with PVC plastic in particular contributing to high emissions of dioxin. Dioxin is a persistent, bio-accumulative toxin which means it isn't broken down into safer chemicals, and it is concentrated in the food chain. Dioxin in smoke drifts away to eventually settle on nearby fields, it can be eaten by cows where it is concentrated in their fat. Some is then excreted with the milk while the rest remains in the animal's fat. When humans consume dairy products and meat they end up with the long-lived dioxin in their own bodies.

  Very high levels of toxic chemicals and particulates are present in the smoke from open burning of waste. These may cause acute respiratory and other health problems in those breathing the smoke.

- Open burning can also be a significant fire risk, with frequent accidental house burning, when it get out of control.

- Open burning often emits acid vapors, carcinogenic tars, and "heavy metals" such as lead, cadmium and chromium, as well as unhealthful levels of carbon monoxide. The closer you stand to the open fire, the more of these harmful chemicals you inhale. Residual ash is another result of incomplete combustion. Frequently, a significant portion of material of the pile--especially at the bottom--is not burned up. Ash disposal can cause problems sooner (for those immediately exposed) or later (for example, if water contacting the ash becomes contaminated and gets into groundwater and/or surface water). People use this ash as a fertilizer for vegetable growth. This ash may contain heavy metals which are taken up by the plant and by eating this they enter the human body.

- Burning prohibited materials--such as plastics, asphalt, rubber and other man-made materials--generates additional hazardous air pollutants. A 1994 study done for the U.S. Environmental Protection Agency showed that each pound of garbage burned in a burn barrel emits twice as much furans, 20 times more dioxin and 40 times more particulates than if that same pound of garbage were burned in an incinerator with air pollution controls.

Why do people burn?

In many parts of Paramaribo as well as rural areas--burning has been the waste disposal method of choice for a significant part of the population for many years. People choose to burn for a variety of reasons, including:

- Waste collection service is unavailable or inconvenient in their area.
- They want to avoid the cost of waste collection services.
- "We've always done it this way."
- Convenience

Some people burn their wastes once or twice a week, and a smaller part burn wastes every day as a matter of habit.

Major contributors of dioxin to the environment include (in Suriname):

- Incineration of Waste (banana industry)
- Incineration of Medical Waste
- Wood Burning
- Backyard burning of household waste
- Uncontrolled landfill fires

The emissions are not known because no data is available.

Burning in incinerator
Banana industry

Blue plastic polyethylene bags (so called dursban bags) impregnated with the insecticide chlorpyriphos (Dursban) are used in the banana industry in Suriname (figure 1). The use of plastic covers became standard practice. After harvesting the dursban bags are burned in a simple constructed incinerator.

The banana industry (Jarikaba) uses 112.176 tons of dursban bags. These bags are burned in an incinerator that is not properly vented or have any filter system. How much of the insecticide contributes to the dioxin emission is not known because the concentration of the insecticide is unknown.

Fig. 1: Immature banana bunch ("stem") in protective plastic cover; Surland Suriname.

Medical Waste Incinerators

In Suriname hospital waste is processed as follows (in general):

- needles are burned in the incinerator of Suralco (ALCOA Suriname)
- human anatomical wastes and infectious waste are buried or burned in the medical waste incinerator
- all other wastes go to legal open dump (which is put on fire by scavengers)

The quality and quantity of waste burned in the incinerator is not known, so it is quite difficult to estimate dioxin/furan emissions.

Incinerators are responsible for the majority of identified dioxin releases, globally. What are the materials that result in dioxin formation in these combustion sources? "In combustion processes in which both chlorine and a carbon source are present, PCDD/Fs can be formed. The large quantities of PVC in the medical waste stream is one reason why medical waste incinerators are such a significant dioxin source. PVC is used in packaging, gloves, infusion bags, tubing, trays, and numerous other medical applications.

Uncontrolled landfill fires

On the uncontrolled landfill a mix of residential, commercial, institutional and industrial waste is dumped without previous selection of recyclable materials. In Suriname it is a normal practice that this open dump is set on fire by scavengers, on a daily basis, the dump is always burning. There are several reasons for this behavior. In many cases, metal products (copper-cables) coated or covered by PVC, are re-used and to get the metal part the PVC cover is burned. The result is the formation of significant amounts of dioxin. During this open

fire process other chloro-containing products (furniture, package materials, etc.) are also burned emitting smokes and ashes that contain dioxins and furans or other POPs contaminants.

A rough estimate of waste dumped at the open dump was done five years ago: 90,000 tons of residential waste and 50,000 tons of industrial waste is dumped yearly. But it is still difficult to estimate the emission of dioxins.

Dioxins are transported primarily through the air and are deposited on the surfaces of soil, buildings and pavement, water bodies, and the leaves of plants. The principal route by which dioxins are introduced to most rivers, streams and lakes is soil erosion and storm water runoff from urban areas.

Backyard burning of residential/commercial waste

A waste characterization study of residential waste conducted in 2002 by L. Zuilen showed that in the in the lower income areas more than 30% of the people burn their waste. The burned waste is very variable: yard waste, paper, carton, plastic materials, scrap tires, food waste, etc. In fact this burning habit are comparable with landfill fires. Maybe the impact can be bigger because in the residential areas people live closer together.

Wood burning

In the forestry and wood processing sector there is limited use of wood chemicals. After the eighties no wood chemicals were used on a large scale, may be some big companies still use such chemicals but most of the smaller companies do not use wood chemicals. Wood burning will become an important dioxin source when wood with chemical additives or residues are burned (treated wood preserved with e.g. pentachlorophenol).

Dioxin formation in the burning of natural wood is negligible. Some scientists disagree with this statement as they suggest that potential production of chlorinated dioxins from the combustion of uncontaminated wood raises the possibility of background levels of dioxins from natural sources such as forest fires. Dioxin production has been measured from wood-burning stoves although investigators disagree on the interpretation of the results. At the present time, however, the significance of such sources cannot be assessed. The reasons for dioxin production from wood burning are unknown but some work suggests that the trace quantities of chloride in natural wood are sufficient to enable the formation of chlorinated dioxins. Using mathematical models and the available data on dioxin production from such sources, maximum air concentrations of about 5×10^{-7} ng dioxin/m^3 and maximum surface concentrations of about 0.2 ng/m^2 are predicted for a situation of 50 wood-burning homes within a 1 km radius of each other.

These estimates are substantially less than those associated with municipal or industrial incinerators. Such sources of dioxin entry and distribution into the environment could be significant in locations where wood burning is prevalent.

Solutions

Open burning IS NOT an environmentally sound way to dispose of waste

Open burning must be regulated; there are important reasons for that. Many harmful air pollutants can be emitted when some kinds of materials are burned. Burning can produce very toxic pollutants that irritate the eyes and lungs and can even cause cancer.

Replacing of all-pervasive blue Dursban bags with untreated white plastic bags and a ribbon tied to the stem which delivers the systemic hit using, just 1% of the active organophosphate (OP) ingredient of the blue bags.

The government must strongly discourage individual property owners from using burn barrels or open pile burning to dispose of household garbage, and prohibit commercial organizations from practicing open burning.

Burning permits are also designed so that people may burn only in areas where and at times when the risk of wildfire is not high. If a burning permit or license is obtained, it does not give authority to burn materials that it is illegal to burn under state law.

The substitution of PVC plastic is an effective way of reducing the environmental impacts of such incinerators.

What can individuals do instead of burning household and yard wastes?

Instead of burning it can be recommended to people to:

- Reduce usage--buy in bulk or larger quantities and demand less packaging on the products you buy.
- Reuse items--find someone else who can use it, have a yard sale, or donate it to a resale organization.
- Recycle newspaper, office paper, cardboard, corrugated cardboard, magazines, aluminum, metal and acceptable plastics.
- Compost leaves and plant clippings.
- Chip brush and clean wood to make mulch or decorative chips
- Dispose of allowable waste materials at a licensed landfill.

Recommendations

- Emission characterization studies on dioxins must be done
- The laboratory must be equipped with measuring equipment.

Pesticides

Pesticides are not produced in Suriname. They are usually imported in large containers and are sometimes re-packed to smaller containers. Pesticides are however also imported in small packages.

Pesticides: Prepared by Mrs. A. van Sauers-Muller, based on documentation of several presentations of Mr. R. Goedar, Department of Pesticides.

Country Report on Dioxin and Furan Releases - 22 May 2003

1. Status quo in the country in terms of implementation of the Stockholm Convention with specific reference to dioxins and furans

    a. The Stockholm Convention was signed, not ratified yet by Suriname. Suriname is in process to identify a focal point.
    b. There is no NIP at this moment, although some inventories have been made:

    - An inventory for obsolete pesticides (FAO).
    - an inventory was made of energy use in view of the climate change study.
    - an impact study of pesticides used in rice and vegetable cultivation was done in the coastal area.
    - Nimos plans to conduct an inventory on Ozone depleting gasses (CFCs) in the near future.

    c. None
    d. Yes, but to a lesser extent than in the Toolkit. On national level the understanding is even less.

2. New sources of dioxins and furans identified in the workshop

    The most significant sources were already identified before the workshop presentation.

3. Strategies and actions for conduct of inventories on dioxins and furans releases

    a. None, no projects are planned on national level.
    b. An action for conducting inventories on dioxins and furans in Suriname

    - identification of a focal point
    - University research
    - National workshop

    c. Yes, for example monitoring PCBs in transformer systems

d. Exchange on expert level, with regard to survey methodologies and identification of funding sources.

4. Recommendations for future activities by UNEP etc.

a. Visit by expert to the countries during the survey (for technical operation assistance)
b. Use the recommendations made during the workshop.
c. To set deadlines for inventory of certain categories (or group of) to be followed by a regional workshop.

5. Gaps of data, information, technical and financial assistance

a. Recognition of other possible sources for example crematoria, transport sector. Lack of information with regards to processes and the chemicals/additives used for fabrication.
b. Technical assistance (expert for survey, literature)
c. Financial assistance for survey, equipment, workshop.

Trinidad and Tobago

Report on Status of National Inventory of Dioxin and Furan Releases

Background

Ratified the Basel Convention in 1994
Assented to the Stockholm Convention 2002
Focal Point- Ministry of Public Utilities & Environment
Competent Authority - Pesticides and Toxic Chemicals Control Board

Submission of a Proposal for implementation of the NIP is under discussion with UNDP

Sources of Dioxins and Furans emissions

Open Waste Burning
Landfill fires
Forest fires/bush/crops
Fe & Steel
Cement Kilns (Trinidad Cement Company Limited)
Transformer Oils
Medical Waste Incineration
Asphalt Mixing
Vehicle Emissions
Cigarette Smoke
Crematoria
Power Generation

Management Strategies

Preparation and publication of Air Pollution Rules
Preparation and publication of Hazardous Waste Rules
Public Awareness & Education
Environmental Incentive Programmes
Use of Economic Instruments

Country report on Dioxin and Furan Releases - 22 May 2003

National Focal Point – Ministry of Public Utilities and the Environment

1. Status quo in the country in terms of implementation of the Stockholm Convention with specific reference to dioxins and furans

   a) All intentional POP's use and importation not allowed. Legislated by the Pesticide and Toxic Chemical Control Board does not allow for the importation of unregistered pesticides.

   b) The issue is mainly one of Management of stockpiles containing POP's chemicals. The country currently has 20 tonnes of DDT that is unwanted and needs to be disposed of.

   c) Currently the Ministry of Public Utilities and the Environment is negotiating with local UNDP office to draft a proposal from GEF for the NIP.

   d) Environmental Management Authority is drafting Air Pollution Rules that will address emissions from industries.

   e) Main sources are known especially industrial sources. However, some sources not considered were brought to light by this workshop.

2. New sources of dioxins and furans identified in the workshop

   - Open burning of domestic / household waste
   - Cremation
   - Cooking using charcoal
   - Dredge spoils from reclaimed land

3. Strategies and actions for conduct of inventories on dioxins and furans releases

   a) The Government would initiate an inventory on sources of Dioxins and Furans

   b) Emission testing would be conducted once the sources are identified

   c) Once funding is available a National Consultation involving the stakeholders will be initiated to build awareness among Industry and the General Public. This consultation workshop will also be used to try and gather some of the information needed to estimate emissions. This workshop would not only focus on dioxins and furans but the overall problem of hazardous waste generation.

d) UNEP Chemicals would be invited to attend workshops to provide technical guidance.

e) Actual testing facilities must be available

f) Ministerial retreat including Permanent Secretaries should be conducted to build awareness on issues of Hazardous Waste Management

4. Recommendations for future activities by UNEP etc.

- UNEP to provide technical and financial assistance
- Network of the Focal Points possibly the Basel Convention Regional Centre at CARIRI as the regional centre
- Streamline the Toolkit to suit regional needs.

5. Gaps of data, information, technical and financial assistance

Need for collection of actual Data instead of using only estimates.

Introduction to the

Standardized Toolkit to Establish Dioxin Inventories

Presented by Patrick Dyke
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Outline - Introduction, background and concepts

- Methodology in Toolkit
- Presentation of results
- Discussion of emission factors and source classification
- Questions

Questions

Are there additional areas that need strengthening?
Would additional guidance be useful –

- Additional compounds – HCB, PCB, other?
- Guidance on measuring programmes and methods?
- Guidance on the use and interpretation of measured data?

Background and context

Why compile inventories?

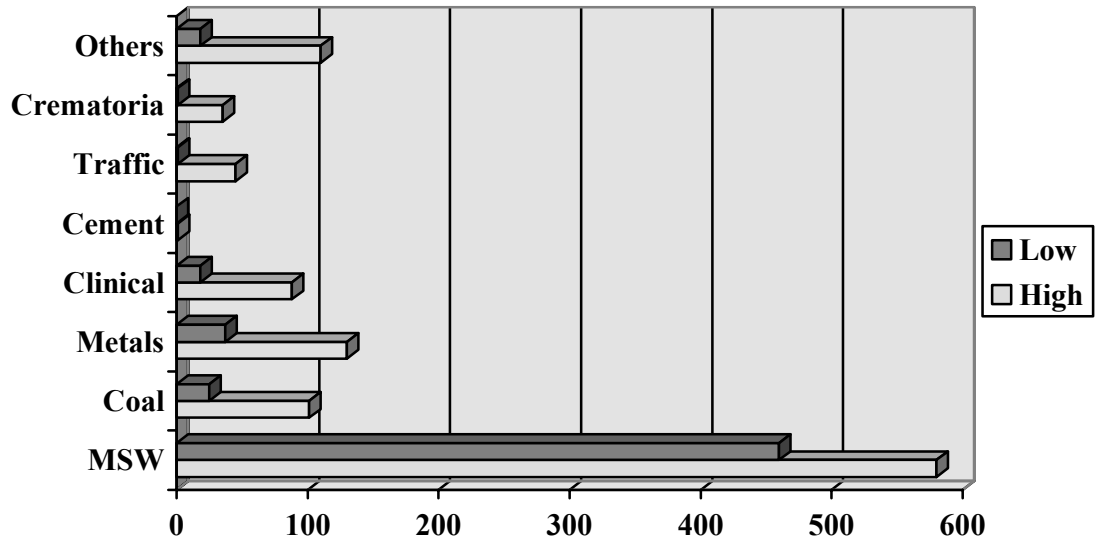
- International commitments:
- The Stockholm Convention is one of several agreements to control releases of POPs
- An inventory can give guidance about where source reduction efforts should be directed to have greatest impact
- It can identify major source categories
- As well as high emitting plants

Stockholm Convention

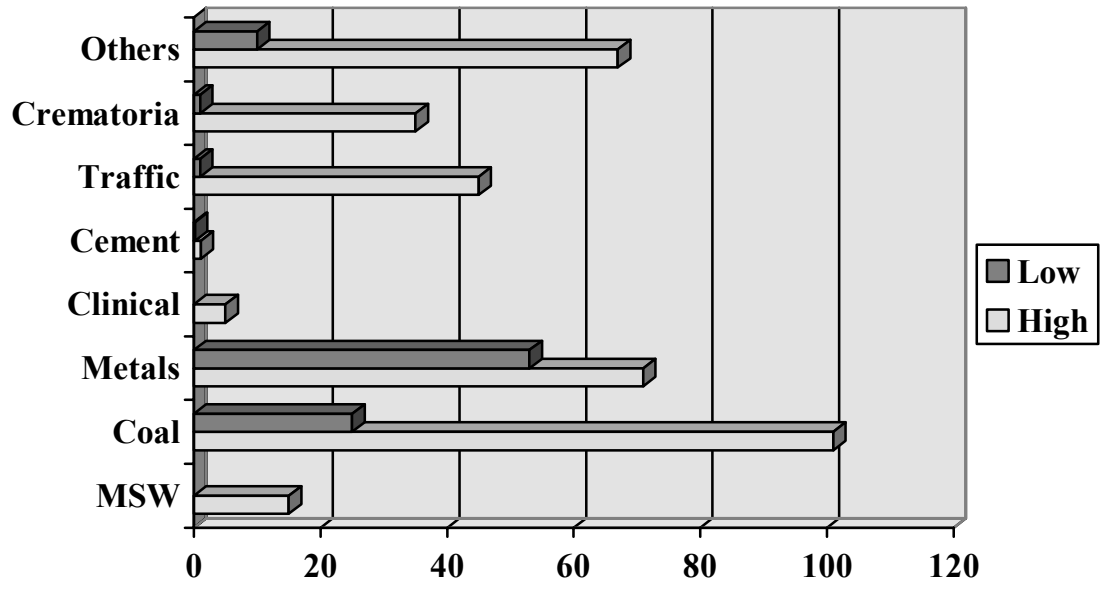
- Unintentional by-products:
- "…each party shall take the following measures to reduce total releases of PCDD/F, PCB and HCB, with goal of continuing minimization and, where feasible, elimination"

- Develop and maintain source inventories for current and projected releases

Dioxin Emissions g TEQ/Y to Air - present estimate (Example only)



Dioxin Emissions g TEQ/Y – future estimates (note how different this may be)



Emissions estimates (g TEQ/Y) can change significantly over time – it is valuable to understand projected trends (see example graphs and tables for illustration – these are from the UK and Germany)

Table 20: Trends of PCDD/PCDF emissions in Germany (Johnke 1998). Fluxes in g I-TEQ/a

	1989/90	1994/95	Estimate 1999/2000
Waste Incineration	400	32	<<4 (<2)
Metal production and processing, total	750	220	<40
Secondary aluminum	25	18	<1
Smelting plants in foundries	3	2	<2
Sintering plants	575	158	<20
Steel - Oxygen plants	5	4	<3
Steel - Electro	30	5	<2
Others	112	33	<12
Power Plants	5	3	<3
Industrial and Commercial Boilers	20	15	<10
Other Thermal Industrial Processes	1	<1	<1
Crematories	4	2	<1
Traffic	10	4	<1
Domestic Furnaces	20	15	10
Total	**1210**	**291**	**<<70**

Why is guidance required?

- Awareness raising workshops identified a need for help on assessing sources of dioxins.
- Inventories of PCDD/F have not been assembled in a standard form.
- Existing inventories are limited and cannot be easily compared.
- In 1998 only 15 countries had inventories - these were largely developed, western countries.
- A simple, standard approach would assist developing countries.

UNEP Inventory Toolkit

Aim is to provide a framework to assess releases of PCDD/PCDF, which:

- is straightforward and resource efficient
- produces consistent and comparable results
- does not necessarily require sampling
- reliably identifies major sources in a country
- can be used to help prioritize sources
- can be used to identify potential hot spots

Compounds considered

Currently addresses:-

- Polychlorinated dibenzo-*p*-dioxins (PCDD); and
- Polychlorinated dibenzofurans (PCDF)

Does not include PCB or HCB.
PCDD/F are quantified as Toxic Equivalent - TEQ

Elements of the Toolkit

Basic framework and system for identifying and classifying relevant processes and activities. Approach for examining the relevant processes to identify key characteristics which influence releases of PCDD/PCDF. Database of default emission factors. Guidelines for the presentation of the findings to ensure comparability and clearly identify gaps.

Context

- The Stockholm Convention may apply to about 200 countries
- Some have advanced knowledge of PCDD/F
- Some have basic knowledge and good capability to build an inventory
- Some are starting from a very low point of knowledge and have few resources
- The challenge is to help all to produce meaningful inventories

Updates and revisions

The development of any inventory must respond to changes in data and understanding. The intention is that countries and institutions provide feedback on all aspects to UNEP

- Local data on emissions factors
- Ease of application
- Additional sources to consider
- Clarification or other comments.

Inventory objective

A listing of releases of a pollutant

- Usually on an annual basis
- Usually to air but can be extended to water and land as well as in products
- By plant or by sector
- Linked to an identified date or time period

Enhanced by being transparent and repeatable

Basic concept

Annual emission = activity x emission factor

Made complex because:

- many sources
- different technologies have different emission factors
- activity statistics may be unavailable
- conditions change with time
- experience in one country may not be reflected in another

Toolkit Methodology - Toolkit contents

The Toolkit consists of:

- A protocol for inventory assembly and presentation
- Sector by sector discussion of
  - Default emissions factors
  - The processes involved
  - The factors relevant to classifying processes
- Electronic spreadsheet of emission factors to aid data assembly
- Outline example questionnaires
- Tables of conversion factors

Application: 5-Step Approach

1 Use Screening Matrix as a guide to identify Main Source Categories present in the country
2 Use subcategory list to identify specific activities in the country's Main Source Categories
3 Obtain information on individual sources to classify these (questionnaire) and select default emission factors
4 Quantify identified sources by applying default/measured emission factors
5 Apply nation-wide to establish full inventory

Emission factors

- Emissions vary considerably
- Emission factors provided are not complete due to a lack of comprehensive data
- The intention is to provide broad factors suitable as representative of a technology category
- Cannot assume that an emission factor will exactly match emission from an individual plant although it should equal the average for the sub-category
- Usually expressed in µg per tonne of material

Screening Matrix

- From experience with PCDD/PCDF sources, a list of 10 Main Source Categories was derived which covers all known potential major sources
- Sequence does not imply any ranking of Main Source Categories (importance of individual sources will vary from country to country)
- Releases to all media - air, water, land, products and residues - are considered

Screening Matrix Table

No.		Main Source Categories and Subcategories	Air	Water	Land	Product	Residue
1		Waste Incineration	X				X
2		Ferrous and Non-Ferrous Metal Production	X				X
3		Power Generation and Heating	X		X		X
4		Production of Mineral Products	X				X
5		Transport	X				
6		Uncontrolled Combustion Processes	X	X	X		X
7		Production and Use of Chemicals and Consumer Goods	X	X		X	X
8		Miscellaneous	X	X	X	X	X
9		Disposal	X	X	X		X
10		Identification of Potential Hot-Spots	Probably registration only to be followed by site-specific evaluation				

Subcategory Level

- For each Main Source Category a series of processes or activities have been listed
- For each, the main types of releases are indicated
- For each of these an estimate of the activity in a country should be made
- For each process a range of default emission factors is given reflecting different levels of technology or other parameters controlling PCDD/PCDF emissions from this process

Category 1

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
1		**Waste Incineration**	**X**				**X**
	a	Municipal solid waste	x	x			x
	b	Hazardous waste	x	x			x
	c	Medical waste	x	x			x
	d	Light weight aggregate (*e.g.* from shredder)	x				x
	e	Sewage sludge incineration	x	x			x
	f	Waste wood combustion	x				x
	g	Animal carcasses and rendering	x				x

Category 2

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
2		**Ferrous and Non-Ferrous Metal Production**	**X**				**X**
	a	Iron ore sintering	x				x
	b	Coke production	x	x	X	x	x
	c	Steel production (prim., sec.)	x				x
	d	Copper production (prim, sec.)	x				x
	e	Aluminum production (prim., sec.)	x				x
	f	Lead production (prim., sec.)	x				x
	g	Zinc production (prim., sec.)	x				x
	h	Brass production (prim., sec.)	x				x
	i	Magnesium production		x			x
	j	Shredder (*e.g.* automobile)	x				x
	k	Wire reclamation by combustion	x	(x)	X		x

Category 3

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
3		**Power Generation and Heating**	**X**		**X**		**X**
	a	Fossil fuel power plants (coal, oil, gas and co-combustion of waste)	x				x
	b	Biomass power plants (wood, straw, other biomass)	x				x
	c	Landfill, biogas combustion	x				x
	d	Household heating and cooking (biomass)	x		x		x
	e	Domestic heating (coal, wood, oil, gas)	x		x		x
	f	Production of heat/energy in industry	x				x

Category 4

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
4		**Production of Mineral Products**	**X**				**X**
	a	Cement kilns	x				x
	b	Lime	x				x
	c	Brick	x				x
	d	Glass	x				x
	e	Ceramics	x				x
	f	Asphalt mixing	x			x	x
	g	Light weight aggregate kilns	x			x	x

Category 5

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
5		**Transport**	**X**				
	a	4-stroke engines (*e.g.* automobiles)	x				
	b	2-stroke engines (*e.g.* mopeds, tuk-tuks, *etc.*)	x				
	c	Diesel engines (*e.g.* trucks, busses, machinery, *etc.*)	x				x
	d	Heavy oil fired engines (*e.g.* ships, tanks, *etc.*)	x				x

Category 6

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
6		**Uncontrolled Combustion Processes**	**X**	**X**	**X**		**X**
	a	Fires/burnings - biomass (forests, grassland, fields, farming residues, *etc.*)	x	(x)	(x)		x
	b	Fires - waste burning, landfill fires, industrial and other accidents	x	(x)	(x)		x

Category 7

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
7		**Production of Chemicals and Consumer Goods**	**X**	**X**		**X**	**X**
	a	Pulp mills	x	x		x	x
	b	Paper mills (prim., recycling)	x	x		x	x
	c	Chemical industry (chlorophenols, halogenated organics, Cl_2 production, oxy-chlorination processes)	x	x	(x)	x	x
	d	Petroleum industry (refineries)	x				x
	e	Textile plants		x		x	
	f	Leather plants		x		x	

Category 8

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
8		**Miscellaneous**	**X**	**X**	**X**	**X**	**X**
	a	Drying of biomass (green fodder, wood chips)	x				
	b	Crematoria	x				x
	d	Smoke Houses	x			x	x
	d	Dry cleaning residues		x			x
	e	Tobacco smoking					

Category 9

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
9		**Disposal**	**X**	**X**	**X**		**X**
	a	Landfills and waste dumps		x			
	b	Sewage/sewage treatment	x	x	X		x
	c	Composting				x	
	d	Open water dumping (*e.g.* into rivers, lakes, oceans)		x			
	e	Waste oil disposal (not combustion)		x	X		

Category 10

No.		Categories and Subcategories	Air	Water	Soil	Product	Residue
10		Identification of Potential Hot-Spots	Supposedly registration only to be followed by site-specific evaluation				
	a	Production sites of chlorinated organics			X		
	b	Production sites of chlorine			X		
	c	Formulation sites of chlorinated phenols (pesticides)			X		
	d	Application sites of chlorinated phenols (pesticides, indoor wood treatments)	X	X	X	X	
	e	Timber manufacture and treatment sites		X	X	X	X
	f	PCB-filled transformers				X	X
	g	Dumps of wastes/residues from Categories 1 - 9	X	X	X		X
	h	Sites of relevant accidents		X	X		X
	i	Sites of relevant accidents		X	X		X
	j	Dredging of sediments					X

Presenting the Inventory

Interim Inventory

- At an early stage a country will have a listing of the processes carried out in the country and an estimate of the activity
- First estimates of potential emissions can be made by combining the activity and the range of emission factors for that process
- This will give a potential range of annual PCDD/PCDF emissions for each process
- This can be used to invite comments and gather additional information

Example - extract from interim inventory

Category	Process	Activity Statistic (t/a)	Default Emission factor range (µg TEQ/t)	Potential emissions using default factors (g TEQ/a)	Country data (g TEQ/a)	Comment
2a	Iron ore sintering	8,000,000	0.3-20	2.4-160	--	To be refined
2b	Coke production	0	NA	0	0	No production
2d	Secondary Copper production	50,000	4-800	0.2-40	3	Based on testing of 100% of plants

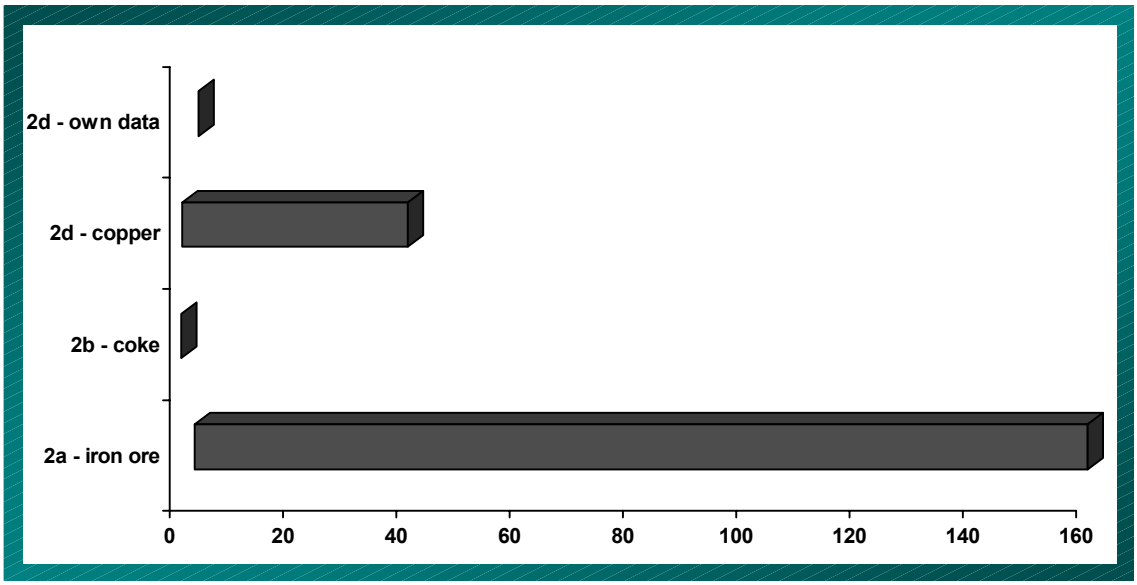
Supporting data

2a – Iron ore sintering
- Production of 8 Mt per year, no data on plant characteristics nor local test data
- This category will need further examination

2b – Coke production – no production in this country

2d – Copper production
- Of great interest, one plant using scrap copper, has been extensively tested and measured emissions used to give annual estimate of 3 g TEQ to air

Graphic representation



Building a Detailed Country Inventory

- Processes and activities carried out in the country must be examined in more detail
- For each process key parameters are given which influence PCDD/PCDF emissions
- Questionnaires are provided to assist in gathering relevant information for accurately classifying the processes with respect to their PCDD/PCDF releases

Example of data needed

- For each sub-category we need enough data to classify the process according to the emission factors given
    - Eg – aluminium production Need – for each plant or group of plants:
        - Mass throughput
        - Outline of plant design – type of process and flue gas treatment applied
        - Any data from the plant on emissions
- Questionnaires may be one way of getting the data

Data collection

The most appropriate data gathering will depend on the category, the resources available and the potential emissions

- Use national statistics
- Regulatory data
- Different government agencies
- Trade associations, industry and experts
- Data from a survey
- Questionnaires to some or all plants

Full inventory Report

- Summary – releases from the 10 sectors
- Detailed inventory (sub category level)
- Process by process analysis
- Supporting data or references
- Data gaps
- Assessment – main sources, expected changes, main gaps, priorities
- Releases to all media for each sub-process
- Process by process summary:

– number and type of processes
– activity and classification
– validated local test data
– emission factors applied
– other relevant information (*e.g.* plans to upgrade facility, install pollution controls, *etc.*)

Results Table 1 - air emissions

No.	**Categories and Subcategories**	**Annual release – g TEQ/a**		**Comment**
	Waste Incineration	**Air**		
		Toolkit	Own data	
1a	Municipal solid waste			
1b	Hazardous waste			
1c	Medical waste			

Results Table 2

No.	**Categories and Subcategories**	**Annual release – g TEQ/a**								Comment
	Waste Incineration	**Water**		**Soil**		**Product**		**Residue**		
		Tool kit	Own data	Tool kit	Own data	Tool kit	Own data	Tool kit	Own data	
1a	Municipal solid waste									
1b	Hazardous waste									
1c	Medical waste									

Later stages

- Additional research at country level
- Refine main source estimates
- Note that knowledge is developing – emission factors and classifications may be revised and updated – this may change the ranking and magnitude of sources
- Regular updating is likely to be needed

Feedback and Support

- Toolkit is new - countries are invited to provide feedback to UNEP on all parts of the Toolkit and the experience in using and applying it
- External assistance could be valuable support in evaluating certain categories, selecting adequate (measured/default) emission factors, dealing with special cases, provide technical process expertise
- UNEP would be the first point of contact for help (hfiedler@unep.ch)

Evaluation and Next Steps

National dioxin inventories (full reports or at any intermediate stage) can be sent back to UNEP for:

- Completion of the inventory (in case assistance is required)
- UNEP will compile all available information and publish its own "global" dioxin inventory
- Follow-up: confirmatory measurements, study of priorities or poorly characterized sources, case studies (depending on funding)

Acknowledgements

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- The team was:
- Heidi Fiedler (UNEP Chemicals)
- Patrick Dyke (PD Consulting)
- Hans-Ulrich Hartenstein (Consultant)

UNEP´s Homepage **http://www.pops.int**

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Contents

- Category by category examination of the Toolkit
- Discussion of emission factors and source classification
- Data gathering methods

Basic concept

- Annual emission = activity x emission factor

- Made complex because:
  - many sources
  - different technologies have different emission factors
  - activity statistics may be unavailable
  - conditions change with time
  - experience in one country may not be reflected in another

Emission factors

- Emissions vary considerably
- Emission factors provided are not complete due to a lack of comprehensive data
- The intention is to provide broad factors suitable as representative of a technology category
- Cannot assume that an emission factor will exactly match emission from an individual plant although it should equal the average for the sub-category
- Usually expressed in µg per tonne of material

Screening Matrix

No.		Main Source Categories and Subcategories	Air	Water	Land	Product	Residue
1		Waste Incineration	X				X
2		Ferrous and Non-Ferrous Metal Production	X				X
3		Power Generation and Heating	X		X		X
4		Production of Mineral Products	X				X
5		Transport	X				
6		Uncontrolled Combustion Processes	X	X	X		X
7		Production and Use of Chemicals and Consumer Goods	X	X		X	X
8		Miscellaneous	X	X	X	X	X
9		Disposal	X	X	X		X
10		Identification of Potential Hot-Spots	Probably registration only to be followed by site-specific evaluation				

Subcategory Level

- For each Main Source Category a series of processes or activities have been listed
- For each the main type of releases are indicated
- For each of these an estimate of the activity in a country should be made
- For each process a range of default emission factors is given reflecting different levels of technology or other parameters controlling PCDD/PCDF emissions from this process

Waste incineration and open burning

- Dioxins and furans are closely associated with waste burning
- Releases are affected by:
- Material burned
- The design and operation of the combustion equipment
- Design and operation of any flue gas treatment
- PCDD/F can be present in wastes and may be formed in the combustion/gas cleaning systems

Category 1

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
1		**Waste Incineration**	**X**				**X**
	a	Municipal solid waste	x	x			x
	b	Hazardous waste	x	x			x
	c	Medical waste	x	x			x
	d	Light weight aggregate (*e.g.* from shredder)	x				x
	e	Sewage sludge incineration	x	x			x
	f	Waste wood combustion	x				x
	g	Animal carcasses and rendering	x				x

Waste incineration

- Combustion using technological equipment
- Wide variety of plant types – specifically <u>not including</u> open burning or barrel burning (category 6)
  - Municipal and similar wastes – from households, commerce etc
  - Hazardous/chemical wastes (industry)
  - MEDICAL wastes – wastes from health care/hospitals
  - Light weight aggregate (only few places)
  - Sewage sludge
  - Waste wood
  - Animal carcases

MSW incinerators

- Large-scale operations – typically municipality
  - Few in number
  - Identify each plant: find throughput, equipment description, flue gas treatment, fate of residues

- Smaller-scale operations
  - Examples include hotels, commercial operations
  - Usually low-tech, possibly larger number
  - Identify number and basic type
  - Consider operational characteristics

Hazardous waste incineration

- Usually associated with industrial facility or specialist waste management operation
- Usually relatively few
- Range or technologies used
- Wide range of wastes burned
- Identify locations, size of plants, wastes burned, throughput, plant description

Medical waste incineration

- All countries produce medical wastes
- Health care facilities, hospitals, doctors, clinics etc
- In many cases it is burned
- Frequently many small combustors
- Identify typical practice
- Emissions can vary very widely
- Estimate amounts of wastes, plant types, pollution controls (if any)

Light weight aggregate

- Combustion of residue from metal reprocessing operations (particularly car-shredding)
- Few dedicated plants
- Identify any fluff or light weight aggregate streams and note their fate

Sewage sludge incineration

- Usually few central plants
- Technologically complex in most cases
- Generally low emissions
- Might be cases where some items retrieved from sewage works are burned (sewage screenings)

Waste wood, animal carcases

- Considering dedicated facilities for each category
- Consider the generation of waste wood – how much, what type of source, is it likely to be contaminated
  - Wood production
  - Wood processing
  - Demolition of buildings
  - Any wood treatments on the waste
  - Animal carcase burning
  - Review animal rearing, consider fate of dead stock

Category 6

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
6		**Uncontrolled Combustion Processes**	**X**	**X**	**X**		**X**
	a	Fires/burnings - biomass (forests, grassland, fields, farming residues, *etc.*)	x	(x)	(x)		x
	b	Fires - waste burning, landfill fires, industrial and other accidents	x	(x)	(x)		x

Uncontrolled combustion

- Wide range of possible sources
- By its nature poorly regulated, controlled or understood
- Becoming recognised as an important source in countries where:
- Industrial sources have been controlled
- Waste is burned routinely
- Large scale biomass combustion takes place
- Hard to quantify

Emission Factors from uncontrolled combustion

Classification	Emission factors – µg TEQ/t				
	Air	Water	Land	Product	Residues
1. Forest fires	5	N/D	4	N/A	N/D
2. Grassland and moor fires	5	N/D	4	N/A	N/D
3.Agricultural residue – in field	30	N/D	10	N/A	N/D

Data collection

- Very wide range of possible fires
- Hard to get data but initial estimates are valuable
- Typical landfill practice (burning may be used to reduce volume and prolong lifetime

of landfill)
- Is it common practice to burn combustible wastes?
- Households – in the open, in household stoves for heating
- Construction and demolition
- Other fires – homes, factories, cars
- Consider spot surveys, samples

Examples

- Routinely excluded from older inventories
- Newer inventories indicate that these sources could be the major ones now
- US estimated c 1000 g TEQ per year from landfill fires
- Open waste burning in the US produced about 1000 g TEQ per year also (compared to MWCs in 2001 – 12 g approximately)
- Often ignored since it is hard to get an estimate
- More research is needed

"Natural" fires

- Refer to central statistics or experts on forestry/agriculture
- Area consumed by forest and grassland fires
- Make estimates of the mass of wood/biomass involved (guidance is given if no data is available)
- Gather information on agricultural practices where residues are burned – eg straw, stubble, prunings from trees

Emission Factors from uncontrolled combustion – 2

Classification	**Emission factors – µg TEQ/t**				
	Air	Water	Land	Product	Residues
1. Landfill fires	1000	N/D	N/A	N/A	ND
2. Accidental fires in houses/factories (PER EVENT)	400	N/D	residues	N/A	400
3. Uncontrolled domestic waste burning	300	N/D	""	N/A	600
4. Accidental fires in vehicles (PER EVENT)	94	N/D	""	N/A	18
5.Open burning of wood (construction/demolition)	60	N/D	N/D	N/A	10

Category 2

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
2		**Ferrous and Non-Ferrous Metal Production**	**X**				**X**
	a	Iron ore sintering	x				x
	b	Coke production	x	x	X	x	x
	c	Steel production (prim., sec.)	x				x
	d	Copper production (prim, sec.)	x				x
	e	Aluminum production (prim., sec.)	x				x
	f	Lead production (prim., sec.)	x				x
	g	Zinc production (prim., sec.)	x				x
	h	Brass production (prim., sec.)	x				x
	i	Magnesium production		x			x
	j	Shredder (*e.g.* automobile)	x				x
	k	Wire reclamation by combustion	x	(x)	X		x

Metal production and processing

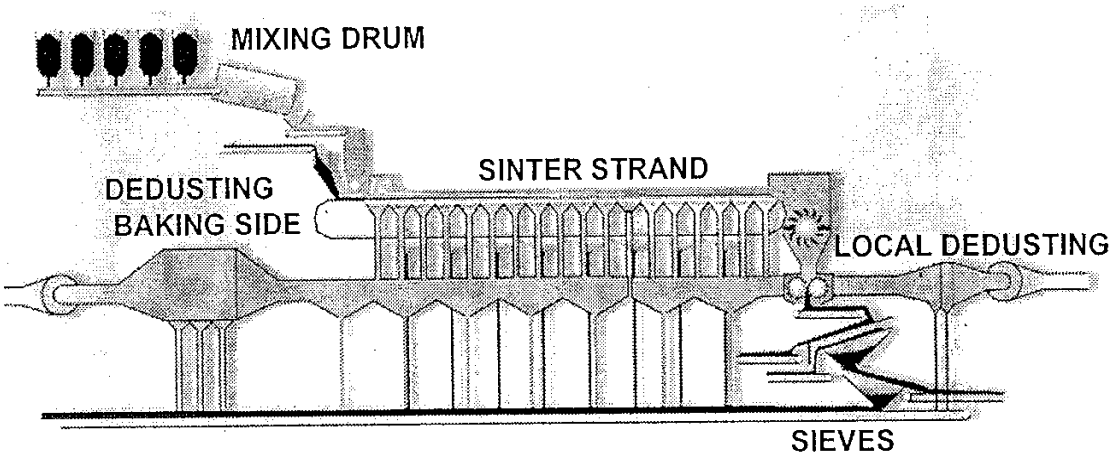
- Many potential sources of PCDD/F in this sector
- Thermal processes widely used
- Some refining techniques can cause releases – use of hexachloroethane for non-ferrous metals
- Use of metals from scrap – in particular contaminated scrap
- Variable pollution controls

Iron Ore Sintering

- Identified as a major source in some inventories
- Large-scale industrial production process
- Preliminary step in some iron and steel making processes
- Preparation of ore for the blast furnace

Schematic

BACKGROUND I : THE SINTERPLANT



Emission Factors for Iron Ore Sintering

Classification	**Emission factors – µg TEQ/t of iron ore sinter**				
	Air	Water	Land	Product	Residues
1. High waste recycling, incl oil contamination	20	N/D	N/A	N/D	0.003
2. low waste use, well control plant	4	N/D	N/A	N/D	0.003
3. high technology, emission reduction	0.3	N/D	N/A	N/D	0.003

Data collection

- Likely to be few plants –
- Therefore feasible to get information on individual plants
- Need:
- Production (t per year)

- Outline of process used
- Knowledge of whether dioxins have been an issue

- Factors:
  - Is waste recycled – esp dusts and oils
  - Is process carefully controlled
  - Have technologies been installed for dioxin control

Examples

- In Germany some plants were found to have very high emissions
- Linked to use of sinter line for recycling of dusts and cutting oils
- In UK tests on all plants showed emissions of about 3-4 µg TEQ/t – recycling less prevalent
- Dioxin reduction by wet scrubbing, active carbon and suppression by urea requires investment and will be evident

Coke production

- Coke is used in iron making (and for other purposes)
- Coke is produced from coal by carbonization
- Typical "coke ovens" are large units and coal is heated externally
- Coke is discharged and quenched
- Emissions of PAH and other pollutants can be significant
- Few data on PCDD/F
- Emissions factors are for air and water releases
- Identify coke producers and scale and type of units

Iron and steel plants

- Several processes to produce iron and steel
- Sinter plants and coke production already described
- Emission factors are available for iron/steel making in electric arc furnaces and other designs
- Emissions are affected by the types of material processed (in particular the presence of "dirty" scrap) and the pollution controls on the plant
- Electric arc furnaces can be large-scale

Iron and steel making

- Identify sites of production
- Review typical practice – furnace types, materials processed, air pollution controls in place
- Large-scale metal production from ores would typically be on few sites, small-scale processing might be found at many sites

- Filter dusts may be contaminated with PCDD/F and care should be taken about any use which could cause contamination

Ferrous metal foundries

- Melting of iron and steel
- Typically batch type and small scale
- Capacity up to 30 t/d
- Often many sites
- Less regulated than the large scale processes
- Harder to get information
- Possibly too many sites to get data on each one

Emission Factors from Ferrous foundries

Classification	Emission factors – µg TEQ/t				
	Air	Water	Land	Product	Residue
1. Cold air cupola or rotary drum, no APCS	10	N/D	N/A	N/D	ND
2. Rotary drum, fabric filter	4.3	N/D	N/A	N/D	0.2
3. Cold air cupola, fabric filter	1	N/D	N/A	N/D	8
4. Hot air cupola or induction furnace, fabric filter	0.03	N/D	N/D	N/D	0.5

Data collection

- Need to form picture of industry
- Make use of regulatory information
- Are there limits on dust for example
- Work with experts in the industry
- Work with trade associations
- Build up a picture of the main players in the industry
- Think of using a survey or sampling main sites
- Aiming for initial classification by type of furnace and pollution control fitted

Examples

- Most existing inventories have only limited data on this sector
- More testing is being carried out in some countries
- Eg USA, New Zealand
- More data is needed

Non-ferrous metal production

- The production of non-ferrous metals has been found to be a potentially significant source of PCDD/F
- Various processes are used in primary and secondary (production using scrap) production
- Thermal processes can release PCDD/F to air
- PCDD/F may also be found in residues
- Only limited data are available at this time
- Releases affected by process design and operation and materials processed

Copper production

- The production and processing of copper which uses thermal processing and scrap copper
- Copper can catalyse the formation of PCDD/F
- Potentially high emissions
- Emissions data are available to distinguish three levels of emissions from secondary copper production
- In addition data for melting processes and primary copper production (much lower)
- Identify any processing of scrap copper and consider technology and controls used

Aluminium production

- PCDD/F associated with Al production
- Primary electrolytic production may yield some PCDD/F in sludges and anodes
- Main interest is in processing of secondary (scrap) aluminium
- A variety of input materials can be used with different Al and contaminant contents
- Need to consider number and type of Al recovery operations
- Typical practice and plant layout

Lead production

- Primary lead production has not been identified as a major source of PCDD/F
- Processing of scrap lead bearing materials is potentially significant
- A major source of scrap lead is vehicle batteries
- Three classifications are given
- PVC battery separators have been linked to high emissions
- Identify fate of lead in batteries, consider any reprocessing, classify to assign emission factors

Zinc production

- This sector has not been well studied but initial data show if could be significant
- Crude zinc is sometimes produced along with lead
- Rotary kilns may be used to recover scrap zinc along with ores and residues
- The presence of organic materials and chlorine in the high temperature kiln can lead to

PCDD/F formation
- High emissions are seen where no pollution controls are present

Brass production

- Brass is made from copper and zinc
- Emissions are likely to be influenced by the presence of impurities (scrap) and the design and operation
- Two factors are given based on the level of pollution control

Magnesium production

- Magnesium production via the $MgO/MgCl_2$ process
- High formation in the thermal process to convert MgO by heating with coke and Cl_2
- Data available on this process used in Norway
- High releases to water were measured due to the use of wet scrubbing of the flue gases
- Identify and consider any magnesium production, including the recovery of scrap

Other non-ferrous metal

- The metals industry is complex and multi-tiered
- For the purposes of the inventory we need to address thermal metal processing
- Consider also the use of Cl_2 or hexachloroethane in purification steps
- Review metal processing and recovery of scrap materials in the country
- Emission factors are provided based on thermal treatment using different levels of APC

Metal shredding

- A step in the recovery of metallic wastes
- Large-scale mechanical hammers which process goods to produce ferrous scrap and non-ferrous "fluff"
- Mainly used to recover steel, increasingly now a non-ferrous metal stream would be recovered too
- Often used to process cars
- Some releases to air have been reported

Wire reclamation

- Practice of burning copper wire to remove coating/insulation
- Copper promotes formation of PCDD/F
- Poor combustion conditions can enhance releases
- Practice may be legal or illegal and may take place illicitly
- Attempt to estimate amount of wire recovered (consider amount produced and how this is disposed of)

Category 4

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
4		Production of Mineral Products	X				X
	a	Cement kilns	x				x
	b	Lime	x				x
	c	Brick	x				x
	d	Glass	x				x
	e	Ceramics	x				x
	f	Asphalt mixing	x			x	x
	g	Light weight aggregate kilns	x			x	x

Mineral production

- Interested in thermal processes in this sector
- High temperatures, large gas volumes
- Consider fuels used and conditions of process
- High releases have been associated with poorly controlled use of waste fuels
- Review sector, identify significant industries
- Identify typical practices, fuels, wastes, operational controls

Cement production

- Large-scale rotary kilns
- High temperature required to make clinker
- Variety of kiln types ("wet" and "dry")
- Raw materials travel towards the hot end of the kiln
- Fuel is burned at the hot end
- Wastes may be burned in some kilns
- Releases to air and in residues have been identified

Cement kilns

- Test data showed that wet type kilns had potentially higher releases
- The temperature of the pollution control device also influenced releases (high temperatures in electrostatic precipitators can enhance formation of PCDD/F)
- Toolkit emission factors are based on:
- Kiln type
- Temperature of ESP
- Identify production sites (few in number), type of kilns used, pollution controls, fuels and wastes burned

Lime production

- Thermal processing of limestone or similar to produce lime
- Lime may be used by several industries – construction, agriculture, steel etc
- Different fuels are used
- Emissions can be influenced by:
- Combustion conditions and process control
- Raw materials and fuels
- Emission factors are based on classification using air pollution control levels

Brick production

- Bricks made from clay using thermal process
- Emissions to air depend on the process design and operation and materials burned
- Few data are available
- Two categories are given:
- Kilns with effective dust control
- Kilns with little or no dust control
- Likely to be relatively few sites
- Identify typical practices and approaches

Glass production

- High temperature processing of raw materials
- Kilns may be fired by a variety of fuels
- Pollution controls vary
- Two classes of emission factor are given:
- Furnaces with little or no dust control
- Furnaces with effective dust control

Ceramic production

- Thermal process so will likely produce some level of PCDD/F
- Too little information to classify and estimate emissions at this time

Asphalt mixing

- Asphalt used primarily for road construction
- Typically produced by combining minerals (rock chips, sand, fillers) and bitumen
- Drying of the minerals may result in releases of PCDD/F
- Two classifications of release are given:
- Plants using no gas cleaning
- Plants with fabric filters or wet scrubbers

Category 3

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
3		Power Generation and Heating	X		X		X
	a	Fossil fuel power plants (coal, oil, gas and co-combustion of waste)	x				x
	b	Biomass power plants (wood, straw, other biomass)	x				x
	c	Landfill, biogas combustion	x				x
	d	Household heating and cooking (biomass)	x		x		x
	e	Domestic heating (coal, wood, oil, gas)	x		x		x
	f	Production of heat/energy in industry	x				x

Power generation and the use of fuels (except transport)

- Wide variety of processes covered by this category
- Large-scale electricity generation
- Industrial/commercial use of energy
- Combustion of landfill and other bio-gas in flares/engines/boilers
- Domestic heating and cooking
- Main vectors are air and residues
- NOTE THAT EMISSIONS FACTORS ARE PER TJ (not per tonne)

Fossil fuel/waste co-fired

- Four categories of process/emission factor
- Based on fuel burned
- Releases primarily to air (some residue)
- Highest releases expected from fossil fuel/waste co-firing
- Lower releases for coal fired plant, heavy oil and lowest for light oil/natural gas
- Identify main power generation plants, fuels used, equipment design
- Review other industrial/commercial use of fossil fuels and characterise using classifications

Biomass power generation

- Increasing use of biomass worldwide for power generation/heating
- May be dedicated wood burning
- May be associated with wood processing or agricultural residue streams
- Bark burning
- Straw

- Rice husks etc
- Two classes based on fuel and general type of operation
- Identify and review the major uses of biomass for energy

Landfill gas/biogas

- A variety of gases can be generated by decomposition of wastes
- Frequently encounter gas collected from landfills – can be used for direct heating or energy generation or may be flared
- Biogas from digestion processes – for example sewage sludge
- Single emissions factor used to characterize all types

Household heating and cooking

- The use of biomass in stoves and other appliances is a major source of heat for cooking and heating
- Many factors will influence emissions of PCDD/F
- For the purposes of the inventory two classifications are provided:
- Use of potentially contaminated wood/biomass
- Clean (virgin) wood/biomass
- Identify the use of biomass in domestic heating/cooking
- Review types of fuels used and types of equipment

Household heating (fossil fuel)

- Category related to use of coal, oil and gas for domestic and residential heating
- Assumed to be burned in closed appliances (ie stoves/boilers)
- Emissions linked to fuel burned
- Identify extent of the practice, typical fuels and equipment used

Category 7

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
7		Production of Chemicals and Consumer Goods	X	X		X	X
	a	Pulp mills and paper mills	x	x		x	x
	b	Chemical industry (chlorophenols, halogenated organics, Cl_2 production, oxy-chlorination processes)	x	x	(x)	x	x
	c	Petroleum industry (refineries)	x				x
	d	Textile plants		x		x	
	e	Leather plants		x		x	

Production and use of chemicals

- Historically this sector has had examples of very high releases/contamination
- A wide range of potentially important sources
- Note that releases can result from production but also from use of certain chemicals

Pulp and Paper

- Releases may be to air, water or in residues (which may be land disposed)
- Air releases from combustion processes – black liquor burning, burning of sludge or bark for energy
- Releases to water mainly from bleaching process
- Sludges can contain PCDD/F
- Considerable work has been done on releases of PCDD/F from pulp and paper and modern plants should be much cleaner

The Chemical industry

- Various chemical manufacturing processes can produce PCDD/F
- Formation is favoured if:
- Temperatures are >150°C
- The conditions are alkaline
- UV radiation or other radical initiators are present
- Generally potential for PCDD/F formation follows the pattern:
- Chlorophenols>Cl aromatics>Cl aliphatics>Cl catalysts/inorganic chemicals
- Note that release is determined by formation potential, volume and also waste treatment

Releases from chemical production

- Releases to air not generally identified as a major problem – but note the combustion of waste streams (should be accounted for under waste incineration)
- Releases to water can be significant – depending on the process and the water treatment
- Releases in products can be significant – so the use of some products can introduce PCDD/F to the environment
- Residues and wastes can be contaminated

Chlorphenols

- The production process for chlorophenols can lead to the formation of PCDD
- Pentachlorophenol has been widely used:
- Wood preservative
- Anti-sapstain treatment
- Also as herbicide
- PCDD/PCDF can be present as an impurity
- Levels depend on source/process used
- Estimate use of PCP and also likely presence in materials that are imported (eg timber)

Polychlorinated Biphenyls

- PCB were widely used in "open" and "closed" applications
- PCB oils are contaminated with PCDF
- Link this work to PCB inventory work
- For the purposes of the toolkit we are interested in the amount of PCDD/F in the oils and the amount being released via leakage/loss etc

Herbicides/Phenoxyacetic acids

- Chlorophenol derivatives
- Potentially contaminated with PCDD/F
- Production and use could result in releases
- Consider:
- 2,4,5 T
- 2,4 D
- Sesone, DMPA, Silvex, Erbo, Ronnel, trichlorophenol
- Link to work on pesticides where possible
- Identify likely use of these compounds, estimate mass and release where possible

Other chemicals

- Chlroanil – linked to various dioxazine dyes used in textiles industry
- Emissions factors given for chloranil produced by different routes
- Chloronitrofen – sometimes used as a replacement for PCP, levels of contamination vary by process used
- Chlorobenzenes – few data on levels of contamination

Large-scale chemicals

- Chlorine production – too little information to give emissions factors at present (note sludges from electrolysis cells)
- EDC/VCM/PVC – has been studied in detail in US and Europe
- Releases depend on the process used and the levels of pollution control applied
- Very low concentrations in PVC product

Petroleum industry

- Limited examination for PCDD/F formation/release
- Regeneration of catalyst for the catalytic cracking process
- In addition there will be combustion sources
- The presence of chlorine from seawater may enhance releases
- Review the industry, identify thermal processes involving organic materials and chlorine and catalyst regeneration

Textile/leather industry

- Several points of entry for PCDD/F:
- PCP or other pesticides on raw materials
- Dyes
- Finishing processes
- Large volumes of effluent released to water
- Often a disparate sector with many small-scale operations
- Not enough information for emission factors except in products
- Review industry, consider use of dyes, typical water treatments, source of raw materials etc

Category 5

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
5		Transport	X				
	a	4-stroke engines (*e.g.* automobiles)	x				
	b	2-stroke engines (*e.g.* mopeds, tuk-tuks, *etc.*)	x				
	c	Diesel engines (*e.g.* trucks, busses, machinery, *etc.*)	x				x
	d	Heavy oil fired engines (*e.g.* ships, tanks, *etc.*)	x				x

Transport

- A significant user of fuel in most countries
- Comparatively poorly characterised in terms of PCDD/F releases
- Releases to air are considered
- Gasoline engines with leaded fuel and chlorinated scavengers were the highest emitters
- Diesels and 2-stroke engines may also release PCDD/F
- Heavy-fuel oil fired engines should also be addressed (any use of reclaimed oil should be noted)

Transport estimates

- Emission factors are given in terms of tonnes of fuel burned
- Country data may supply volumes of fuel used which can be converted to mass
- Other data may be in terms of miles or km driven which would have to be converted by typical fuel consumption data
- Data may be available from planning, transport, energy ministries
- Take great care to ensure units are clear and correct!

Category 8

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
8		**Miscellaneous**	**X**	**X**	**X**	**X**	**X**
	a	Drying of biomass (green fodder, wood chips)	x				
	b	Crematoria	x				x
	d	Smoke Houses	x			x	x
	d	Dry cleaning residues		x			x

Miscellaneous sources

- Combustion processes:
- Drying of biomass
- Crematoria
- Smoke houses
- Tobacco smoking
- All have potential for forming PCDD/F
- Chemical cleaning process:
- " dry cleaning"
- Mainly concerned with stripping of PCDD/F from materials that are cleaned

Biomass drying

- Drying of biomass – where the biomass is used for animal feed there is the potential for introducing PCDD/F into the food chain
- Review practices
- Identify drying steps used in animal feed production
- Identify main processes and sources of fuels
- Contaminated wood/other materials used in direct drying of most concern

Crematoria

- Cremation is increasing in several countries
- A variety of technologies are employed
- Poor combustion conditions and poor control over materials added can increase emissions
- Review cremators, identify types of controls used
- Note - Emission factors are given on per cremation basis (not by mass)

Smoke houses

- Smoking of food for flavour and preservation
- Releases of PCDD/F influenced by combustion conditions/gas clean-up and by materials burned
- Highest emissions for applications using treated wood or otherwise contaminated materials
- Note that high emissions will also likely lead to higher levels of PCDD/F in the products

Dry cleaning

- The cleaning of clothes using solvents
- PCDD/F have been found at elevated levels in the residues from the solvent distillation
- The most likely origin is from PCDD/F cleaned from the clothes rather than the solvent
- Heavy textiles which may have been treated with PCP would contain more PCDD/F
- Identify typical practice for handling and recovery of solvents, estimate the amount of residue from distillation
- Note that emission factor is per tonne of residue

Category 9

No.		Categories and Subcategories	Air	Water	Land	Product	Residue
9		**Disposal**	**X**	**X**	**X**		**X**
	a	Landfills and waste dumps		x			
	b	Sewage/sewage treatment	x	x	X		x
	c	Composting				x	
	d	Open water dumping (*e.g.* into rivers, lakes, oceans)		x			
	e	Waste oil disposal (not combustion)		x	X		

Landfill disposal

- Many wastes may have levels of PCDD/F in them
- The handling and treatment of these wastes means transfers of PCDD/F will occur
- The fate of PCDD/F and rates of release depend on the disposal practices
- Releases in leachate are considered
- Landfills containing hazardous wastes may have higher releases
- Estimate volumes of leachate from landfill sites and apply emission factors
- Note typical practice for leachate handling

Sewage treatment

- Waste waters from industry, commerce and residences will carry with them PCDD/F
- The way in which the waters are handled and treated will affect releases of PCDD/F to the environment
- Releases can occur to water and with products/residue (sludge)
- Review at the country level the production of waste waters and how they are handled
- Identify types of treatment and nature of sources of waste water

Composting of waste

- PCDD/F have been associated with the organic fraction of municipal wastes and measured in composts
- Highest levels will be linked to contaminated feed materials (eg where PCP treated wood is introduced)
- Identify extent of composting as a waste treatment process
- Estimate the mass of compost produced and the type of wastes which are processed

Waste oil disposal

- Waste oils may be contaminated
- Thermal treatment may be in a number of processes (on-site burners, power stations, asphalt mixing etc)
- Review practices for waste oil generation, collection, disposal
- Note thermal treatment systems
- Take special care over potentially contaminated oils – in particular PCB containing oils

Category 10

No.		Categories and Subcategories	Air	Water	Soil	Product	Residue
10		Identification of Potential Hot-Spots	Supposedly registration only to be followed by site-specific evaluation				
	a	Production sites of chlorinated organics			X		
	b	Production sites of chlorine			X		
	c	Formulation sites of chlorinated phenols (pesticides)			X		
	d	Application sites of chlorinated phenols (pesticides, indoor wood treatments)	X	X	X	X	
	e	Timber manufacture and treatment sites		X	X	X	X
	f	PCB-filled transformers				X	X
	g	Dumps of wastes/residues from categories 1 - 9	X	X	X		X
	h	Sites of relevant accidents		X	X		X
	i	Dredging of sediments					X
	j	Kaolinitic or ball clay site			X		

Hot spots

- Potentially contaminated sites
- Contamination may come from historic activities or current activities
- Each site is likely to be different
- The toolkit aims to identify potential sites to help with the first stage of assessment

Chemical production and use

- Production of certain chemicals can lead to PCDD/F formation
- Production sites may be contaminated
- Production wastes can be significant
- Chloro-chemical production sites should be considered
- The use of chlorinated phenols may have led to contamination
- Pentachlorophenol was widely used for wood treatment
- Identify sites and examine practices – chemicals used, wastes produced, evidence of leakage etc

PCB oils

- PCB fluids were contaminated with PCDF
- Levels vary and appear to increase in use
- Fluids contained in electrical equipment constitute a reservoir
- Releases of PCB will cause releases of PCDF

- Concentrations are provided which allow estimates of PCDF releases with leaks
- Link to work on inventory of PCB equipment
- Estimate quantities of PCB fluid present and amounts that may leak

Wastes

- Wastes from processes identified in the earlier categories as source of PCDD/F will likely contain PCDD/F
- Identify potentially contaminated sites/dumps by considering sources of wastes:
- Chlorophenol residues
- Certain chemical production wastes
- Combustion/incineration/metal process residues
- Dumps can contaminate water via leachate and are a reservoir

Sites of accidents

- Accidental fires produce PCDD/F which will be found in residues and soot
- Fires or other accidents at chemical production sites may cause significant contamination

Sediment dredging

- Sediments can be long-term stores of PCDD/F
- The dredged material from contaminated waterways can contain significant amounts of PCDD/F
- For the purpose of an inventory note where potentially contaminated sediments may deposited

UNEP´s Homepage

http://www.pops.int

Toolkit Category Questionnaire

Participants were divided into three working groups for two sessions and assigned Toolkit Categories.

For the Toolkit Category assigned the Consultant requested each Working Group to address the following questions:

1) What is the information required to identify sources for the category?

2) What is the information required to assign emission factors to the sources identified?

3) What are the information sources?

4) Who are the persons involved in providing the information?

5) What are the links to other parts of the national inventory of dioxins and furanes?

6) What are the Caribbean issues related to this aspect of the Dioxins and Furanes inventory?

Category - Waste Incineration

Group Report

Working Group 1
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Jeavon Hulse - Belize
Xavier Boniface - Dominica
Dr. Guido Marcelle - Grenada
Trevor Ramikie - Jamaica
Alexander Riley - St. Kitts and Nevis
Shirlene Simmons - St. Lucia
Gerda Wesenhagen - Suriname
Lisa Moxey - The Bahamas
Dr. Derrick Balladin - Trinidad and Tobago
Stephen French – Trinidad and Tobago

Question 1 Information required to identify sources

- Incinerators (number, capacity and location)
  - Types (sub-category) and quantities of waste incinerated (tons/year)
  - Sources of waste (Ports, Industry, Municipal, Medical Facilities etc.)
  - Description of technology (low- low tech., low tech., high tech.)

- Background Information - Hospital (estimated waste generated per bed.)
  - Determine if waste is segregated?
  - What waste is actually incinerated?

Question 2 Information required to assign Emission Factors

- Sub-categories of waste incinerated
- Sufficient information to assign incinerator to a particular class:
  - design
  - emission control
  - fuel used
  - rated capacity vs. loading

Question 3 Information Sources to identify incinerators and provide information

1. Waste Management authorities
2. Government Ministries and Agencies
3. Private Sector (industry, hotels)
4. Private and Public Medical Facilities
5. Waste Collection companies
6. Surveys/Questionnaires/Interviews
7. General Public
8. Non-Governmental Organizations (NGOs) and Community Based Organizations (CBOs)
9. Record Keeping (in order that information can be retrieved/updated as needed)

Question 4 Persons Involved

- Stakeholders mentioned in question 3
- Research Institutions
- Incinerator operators/engineers
- Grass Root Organizations

Question 5 Links to other parts of Inventory

1. Bottom end incinerator technology may be better assigned to open burning (toolkit needs better guidance)
2. Mass balance calculation may be used to assess the accuracy of solid waste generation and disposal data
3. Using information from the other categories within the toolkit to cross check with findings

Question 6 Caribbean Issues

1. Incinerators are at the bottom-end of the spectrum
2. Dioxin and furan reduction efforts must take into consideration religious and cultural beliefs and practices
3. Need for Public awareness, education and participation
4. Ways of integrating efforts relating to the needs of other MEAs given the small size of island States and their limited resources (human, technical and financial)
5. The need for development of appropriate Best Available Technology (BAP) and Best Environmental Practices (BEP)
6. As small island states we do not manufacture or intentionally produce Persistent Toxic Substances, and our ability to control these substances is assisted by international trading restrictions and bans

Category - Biomass

Group Report

Working Group 2

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Annmarie Eversley – Barbados
Ferdinia Carbon – Dominica
John Auguste – Grenada
Kirk Pennant – Jamaica
Horatio Henley – St. Kitts & Nevis
Patrick Andrews – St. Lucia
Benedict Charles – St. Vincent
Alies Elizabeth Van Sauers – Suriname
Kenneth Kerr – Trinidad and Tobago
Eka Rudder-Fairman – Trinidad and Tobago

Sources

- Slash and Burn
- Cane Fires
- Forest Fires
- Charcoal Production

Sub category Slash and Burn -Emission Factors

- Proximity to habitation
- Proximity to waterways
- Type/Composition of waste
- Prevalence and Frequency

Slash and Burn -Information Sources

- Ministry of Agriculture
- Surveys
- Farmers
- Developers
- Fire Department
- History (of Area)

Slash and Burn - Parties Involved

- Government
- Farming Community
- Developers
- Fire Department

Slash and Burn- Linkages

- Meteorological Department (wind speed and direction, rainfall)
- Legislation

Slash and Burn - Special Considerations

- No written data available
- Surrounded by water
- Monitoring equipment (no facilities for testing)
- Cultural
- Legislation (availability and enforcement)

Sub category Forest Fires

Emission Factors	- same as Slash and Burn
Information Sources - Forestry	- same as Slash and Burn
Parties Involved - Forestry	- Same as Slash and Burn
Linkages	- Meteorological - Biodiversity - Same as Slash and Burn

Special Considerations - same as Slash and Burn

Category - Uncontrolled Waste Burning

Group Report

Working Group 3

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Benedict Peters - Grenada
Nicole Smith - Jamaica
June Hughes - St. Kitts & Nevis
Laurianus Lesfloris - St. Lucia
Louise Zuilen - Suriname
Stefan Moss - The Bahamas
David Persad - Trinidad and Tobago
Wayne Rajkumar - Trinidad and Tobago

Sources

- Uncontrolled burning at waste/dump sites.
- Domestic burning.
- Burning of Supermarket waste.
- Burning of waste from abattoirs.
- Medical waste burnt in the open.
- Forest fires
- Tires burning

- Construction/demolition
- accidental fires, e.g. at factories, homes, vehicles.
- burning of hazardous waste, e.g solvents pesticide containers etc.

Information Required

- Sources
- Amount
- Legislation and cultural practices.
- Types of material being burnt.
- Frequency, a) of the event b) #of persons involved.
- Location a)where it is being done and in relation to other countries.
- Weather conditions e.g. important for Suriname which is land locked.

Emission Factor; factors

- Material being burnt.
- method of burning e.g. landfill vs. domestic fire.

Where to get information

- Fire Department
- Health Department
- Agriculture Department
- Solid Waste Management Agency/Landfill Operator
- Newspaper/Media
- Customs Information e.g. for factory fires.
- Environmental Management Agency/Dept
- General Public

Other sources of information

Surveys and Questionnaires

Stakeholders

- General Public
- Private Sector Companies
- Non-Gov't Organizations (NGOs) and Community Based Organizations (CBOs).
- All public sector agency previously listed.

Other links in the inventory

- Biomass
- Waste Incinerators
- Category 9. Disposal

Residues

Leachate to

- ground water/ water table
- Surface water - River, Lake, Ocean

- Air- Particulate
  - movement to other countries
  - Movement within a country
  - production of smog = acid rain
- Soil - remain in soil or returned as acid rain.
- Plant and Animals uptake (terrestrial and marine)

Caribbean uniqueness

- Lack of capacity for research
- Lack of resources, financial, human, technical, for waste disposal e.g. for enforcement and legislation.
- Coastal Environment
- Small size
- Fragile ecosystems, high endemics and bio-diversity

Category - Production and Use of Chemicals

Group Report

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Stephen French – Trinidad and Tobago

Question 1 Information Required to identify sources

- Various Industry
- Number of plants under the various Industries
- Types of processes
- Chemicals used/imported (Pesticide Control Boards)
- Customs (Import information)
- Registers
- Pollution release and transfer registers

Question 2 Information Required to Assign Emission Factors

- Detailed description of chemicals
- Description of chemical use
- Description of process (thermal etc.)
  - end product
  - energy source
  - mass balance
- Materials safety data sheet
- Processes of the Industry

Question 3 Information Sources:

1. Government Ministries / Agencies
2. Chemical Suppliers
3. Manufactures Association
4. Pesticide Control Boards
5. Process Plants
6. Customs
7. Fire Service
8. Statistics Departments
9. Chemical Plants
10. Environment Authorities/Agencies CBOs, NGOs

Question 3 Information Sources- How will information be collected ?

- Reports
- Questionnaires / Surveys
- Interviews

Question 4 - Other sources of information on processes and data

- Research Institute
- Government Ministries / Agencies
- Chemical Suppliers
- Manufacture Association
- Pesticide Control Boards
- Process Plants
- Customs
- Fire Service
- Statistics Departments
- Chemical Plants
- Environment Authorities/Agencies CBOs, NGOs

Question 5 Links to other parts of Inventory

- Disposal and residues from process
- Waste Incineration (Category 1)
- Hot Spots (Category 10)
- Use of Chemicals and Production (Category 2)
- Power generation (Category 3)
- Transport (Category 5)
- Ozone Depleting Substances
- Marine resources

Question 6 Caribbean Issues

- No capability of disposal
- Need for CARICOM legislation
- Need for Networking between islands
- Need for Exporters to be part of the disposal solution

Category - Power Generation

Group Report

Working Group 2

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Sources

- Fossil fuel
- Biomass Power Generation (Bagasse – sugar factory)
- Biogas combustion (cooking)
- Household cooking

Information Needed

- Sources of fuel (clean? Used?)
- Number of power plants
- Location of power plants (residential area, geographic location)
- Type and quantity of fuel used
- Type 3 fate of residues generated
- Disposal methods for transformers, batteries and spent oil

Power Generation - Information Sources

- Level of technology used
- Material used
- Efficiency of power generators
- Climatic conditions

- Management of power companies for records, samples, etc.
- Surveys re: household power generator
- Information or bagasse from companies
- Government Ministries (relevant)

Power Generation - Parties Involved

- Government Ministries/regulatory agencies
- Power companies
- Householders
- NGOs
- Statisticians

Power Generation - Linkages

- Category 5 – transport
- Category 9 – disposal
- Category 10 – hot spots
- Residues end up in air and particulates settle in HGO soil (through rain fall etc.)

Power Generation - Special Considerations

- Small size of countries
- Fragile --- (forests, bio diversity etc.)
- Importance of ecotourism to economy

Category - Transport/Internal Combustion Engines

Group Report

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Sources

Transport/Internal Combustion Engines

- Vehicles: Air, Land Water
- Other combustion Engines:
  - Lawn Mowers
  - Chain Saws
  - Weed Eater etc.

Information Required

Quantity and Types of Vehicles and Internal Combustion Engines

- Type of Fuel
  - Leaded
  - Unleaded
  - Diesel
- Frequency of Use – miles/month
- Age of vehicles/engine
- Condition of use
- Catalytic converters
- Current legislation.

Amount of Fuel Used per type of vehicle

- Fuel efficiency
- Engine size
- Fuel consumption
- Emission per/mile for ships

Where to get information

Customs
Licensing Authority
Ministry of Transport/Aviation/Trade
Vehicle distributor/gasoline company
Maritime Services/Port Authority
Used Car dealers / Manufacturers
Ministry of Energy
Ship companies
General public

Other sources of information

Surveys and Questionnaires
Retailers

External Sources

Cruise ship companies
Car Manufacturers
NGO's.

Other links in the inventory

Power Generator – Category 3
Petroleum Industry – Category 7
Waste Oil Disposal – Category 9

Residues

Surface Water

Marine Environment

Land / Air

Caribbean Issues

High Level of Ship Traffic

Car Importation
Lack of data
Lack of capacity
Lack of political will to phase out leaded gasoline
Small land size

Specific areas for which guidance was requested

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During the course of the workshop a few specific issues were identified for which delegates sought clarification in the application of the Toolkit.

Charcoal production and use

Several countries identified the practice of producing charcoal from wood as a potentially significant practice (and likely growing in some places). No explicit emission factor is given in the Toolkit for this practice. For now the best approach is to estimate the mass of material produced and the typical practices (technology, scale, number of plants, types of materials processed). Further guidance will be sought and the estimate of activity can be combined with an emission factor at a later time.

For charcoal burning (cooking using charcoal) it is suggested that an estimate of the activity is combined with the emission factor from Category 3e, coal burning at the domestic level. This will provide an initial estimate of releases and is consistent with advice to countries in Asia.

Wood burning in bakeries

Several countries identified the practice of wood-firing for bread making. This may produce PCDD/F and countries noted the potential for increased exposure due to possible contact between flue gases and food.

Although there is no explicit category in the Toolkit this practice is similar to the "smoke houses" described in Category 8c. The two levels of factors applied would be those for contaminated wood (1) if this was used as fuel and uncontaminated wood if this was the fuel (2).

Burning of tyres (open burning)

Several delegates noted that discarded tyres were an increasing problem in the region and in some cases they were burned in the open. At present there is no emission factor for tyre burning in the open. The practice should be noted, the quantities of tyres estimated and the emission factor for open burning of domestic and similar waste applied (in many cases tyres will be burned as part of a mixed waste). Table 48, subscategory 3.

Burning of supermarket waste

Examples of commercial organizations burning wastes in the open or in barrels were provided – supermarkets were mentioned. The delegates correctly identified this practice as a potential source of PCDD/F. The best approach at present is to estimate the mass of material involved and treat it for the purposes of making estimates of emissions as similar to domestic waste burned in the open (Category 6, table 48, subcategory 3).

Dredging

Several countries identified significant amounts of dredging activity taking place and expressed an interest in this as a potential source of PCDD/F.

Note that dredged material is not necessarily a significant source of PCDD/F – it may be if the sediments are particularly contaminated. Contaminated sediments should be identified (they may be associated with outfalls from industry with significant PCDD/F potential etc – likely sites could be identified by consideration of the major source categories in the Toolkit).

Jet fuel

Antigua noted that a significant amount of jet fuel was supplied in Antigua. No category or emission factor is given for the combustion of jet fuel in aircraft. It was noted that much of the fuel would be combusted elsewhere than in the country of supply. For the purposes of making an inventory the amount of fuel supplied should be noted. If an estimate of emissions is to be made the fuel could be treated as similar to Category 3, part a, factor 4 – light oil/natural gas fired boilers. No information indicating significant releases of PCDD/F from this use of fuel are known to the author.

Incinerator classification

During the workshop it became clear that there would be areas where the overlap between "open burning" carried out in barrels etc and "low technology" incinerators – for example basic barrels with chimneys or simple box type incinerators – could cause confusion.

For now the best approach is to identify the types of practice that are carried out and typical incineration/combustion practice. An initial classification made as part of an initial inventory can be reviewed and may be updated in the light of additional work that will be recommended to UNEP on this issue.

Feedback on the Toolkit

UNEP invited comments on all aspects of the Toolkit. Delegates were helpful in making suggestions, at the same time issues were identified during the training by the presenter.

Delegates had had little time to examine the Toolkit in detail. Comments are invited as the Toolkit is reviewed and applied at any time and should be submitted to UNEP or the facilitators.

During the training instances of errors in tables (units etc) were identified and UNEP will be informed to have them cleared up.

Delegates noted that there was no emissions data for the region and expressed a desire to know that emissions factors were applicable and appropriate. Several also noted that common issues and priority sources would be identified during the application of the Toolkit and this would form a solid basis for proposing a measurement programme that might be required and could be carried out at a regional level.

Many delegates had made use of the Toolkit to consider their countries and develop an initial list of likely major sources. It had been useful for this.

Review of Category 3 (power generation) revealed that the units of TJ as the basis for making emissions estimates were difficult to use – being very large and not a unit commonly encountered.

Classification of incinerators and the overlap with open burning were noted as areas that require some clarification and review. Additional guidance would be useful to assist non-experts with the types of technology and process they might encounter.

Some practices of open burning are not currently explicitly included in the Toolkit – examples given were burning of tyres (at times to remove bamboo stands) and burning of commercial waste at supermarkets etc. Feedback will be provided to UNEP to request that this sector is strengthened and the inclusion of all types of waste burning is made clear.

Common Themes and Future Needs

Report of the deliberations of the Participants on common needs and planned future activities to carry out dioxin and furan inventories as part of implementation plans for the Stockholm Convention.

Current situation

- Uneven status of implementing process for Stockholm Convention among the countries in the Caribbean Region
- Preliminary work only on PCDD/F to identify sources
- No testing being undertaken anywhere in the region

Workshop contribution to capacity building

- Helped to identify several additional potential sources which may be important to countries (dredging, fuel use, chemical use, contaminated sites)
- Useful exercise to start the process
- Identified some areas of the Toolkit that could be clarified/strengthened (e.g. incinerator definition)
- Identified some additional sources which are not described in the Toolkit (e.g. charcoal burning)
- Identified areas for future actions at the regional level
- Valuable kick off to regional cooperation

Areas for clarification and strengthening of Toolkit

- Clarification of the overlap between open burning and poor quality incinerators (e.g. barrels, barrels with chimneys) (remove ambiguity)
- Review of wide differences between open burning/poor quality incinerator emission factors
- Characteristics of processes that define appropriate emission factor (e.g. incineration), perhaps using pictures, diagrams, examples of international practice
- Many open burning practices are found, not all are explicitly described

Countries' Future plans identify

- Steps to progress ratification and implementation of Stockholm Convention / Basel Convention important
- Inventory work will be linked to NIP development
- Need for awareness raising (wider stakeholder workshops)
- Clear recognition of the need to link work on different Conventions and plans to do so (Basel, Stockholm, Rotterdam) and other initiatives (PCB inventory, hazardous waste inventories)
- Need to work with stakeholders and institutions in country, there was recognition that

meaningful implementation plans require high-level political endorsement
- Need for coordination and sharing of technical assistance (external and local)
- Consideration of the use of GIS or similar tools to record locations of hot spots

Regional cooperation

All countries see value in cooperation in the region

Recommend using CARIRI (Basel Regional Centre) for example:

To support Stockholm Convention implementation
To facilitate information exchange (perhaps using a web site), capacity building exercises etc
To coordinate and optimize the provision of external expertise at the regional level
Sharing of findings and methods used during the inventory development
Collaboration for any future testing that may be required

International external assistance

- There are roles in raising awareness and getting political commitment both at the national and international levels, international support with the development of awareness materials would be welcomed.
- Support for development of testing programmes and technical training is also seen as necessary both regionally and from international sources,
- Cost benefit and priority assessment guidance is needed
- In 12 months (depending on progress) most countries agreed there will be need for having a workshop for a review of existing inventories and initial action plans (prior to finalizing/publishing inventory)

Specific guidance

- Charcoal use – for now it was agreed to use factors for coal burning Category 3e
- Open burning of tyres – for now it is agreed to treat as open burning of mixed waste
- Dredging is a common activity BUT it is recognized that it does not necessarily mean there is a dioxin issue
- Need for more guidance on classification of incinerator types

Looking forward – Recommendations for the future

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Inventory development

- The Toolkit forms a guide
- Make every effort to make some estimate of activity/emissions for all sectors/activities
- Note unknowns and uncertainties
- Check your calculations for accuracy
- Do a reality check
- Seek advice if something isn't working
- Focus on the major issues
- Develop initial inventories
- Review findings amongst colleagues, between countries, compare against international findings
- Use inventory to develop outline action plans
- Identify major unknowns and major issues
- Develop programmes with UNEP or others to fill gaps and refine estimates
- This is the first step not the last

Coordinate efforts

- Several areas overlap
- National Implementation Plans – pesticides, PCB, stockpiles, contaminated sites and wastes
- Basel Convention work
- Regional initiatives
- National air quality and waste management strategies
- Sustainable development
- Decisions should take account of the wider context of sustainable development not just PCDD/F

Appendix 1

Opening Programme

OPENING PROGRAMME

UNEP- CHEMICALS SUB -REGIONAL WORKSHOP ON NATIONAL INVENTORY OF DIOXIN AND FURAN RELEASES

MAY 19-22, 2003
CASCADIA HOTEL
PORT OF SPAIN, TRINIDAD AND TOBAGO

8:30 am	Registration
9:00 am	Opening Ceremony
Welcome	Chairperson – Mr. Liaquat Ali Shah Chief Executive Officer - CARIRI
Address	Mr. Andreas Arlt - Associate Expert United Nations Environment Programme-Chemicals
Feature Address	Honourable Minister – Mr. Rennie Dumas Ministry of Public Utilities & Environment Trinidad and Tobago
Vote of Thanks	Mr. Stefan Moss Participant–The Bahamas

CONTROL HAZARDOUS WASTES

UNEP

CARIRI
Caribbean Industrial Research Institute

Appendix 2

Workshop Programme

Programme

UNEP-Chemicals Sub regional Workshop
"National Inventory of Dioxin and Furan Releases"
Hosted by:
Basel Convention Caribbean Regional Centre (CARIRI)
Port of Spain, Trinidad and Tobago, 19-22 May 2003

Monday, 19 May 2003	
8:30–9:00	Registration
9:00-9:45	See Formal Opening Programme Welcome –Chief Executive Officer, CARIRI Opening Remarks Mr Andres Arlt UNEP Chemicals Feature Address Minister, Ministry of Public Utilities and the Environment
9:45-10:15	***BREAK***
10:15-11:15	Introduction to the Stockholm Convention Mr Andres Arlt UNEP Chemicals
11:15-12:15	Introduction to Preparation of National Implementation Plans (NIP) under the Stockholm Convention - Mr Patrick Dyke Consultant
12:30–14:00	***LUNCH BREAK***
14:00-15:40 16:00-17:30	Presentations given by the countries on actions to date on dioxins and furans See Country Presentations
19:00–21:00	*Reception*
Tuesday, 20 May 2003	
9:00-10:45	Introduction to Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases Mr Patrick Dyke Consultant Presentation of the categories of sources - Toolkit Categories Mr Patrick Dyke Consultant Category 1: Waste incineration
10:45-11:15	***BREAK***
11:15-12.30	Category 6: Open Waste Burning
12:30-13:30	***LUNCH BREAK***
13:30-15:30	Category 2: Ferrous and Non-Ferrous Metal Production Category 4: Mineral Products
15:30-16:00	***BREAK***
16:00-17:30	Examples – work with the Toolkit Questionnaire Discussion and presentation Subcategories Waste Incineration, Biomass, Uncontrolled Waste Burning Groups 1,2, and 3

Wednesday, 21 May 2003	
Presentation and discussion in details about the categories of sources (continuation)	
9:00-10:30	Examples – work with the questionnaires
	Discussion
	Category 5: Transportation
10:30-11:00	Category 3: Power generation and heating
11:00-12:30	Category 8: Miscellaneous
12:30-13:30	***LUNCH BREAK***
13:30-15:30	Category 9+10: Disposal/Landfills and Hot spots
15:30-16:00	***BREAK***
16:00-17:30	Examples – work with the Toolkit Questionnaire Discussion and presentation
	By Groups 1,2, and 3 Categories Production and use of chemicals, Power Generation, Transport- internal combustion engines
Thursday, 22 May 2003	
9:00-10:30	Presentation continued
	Category 7: Production and Use of Chemicals and Consumer Goods
	Identification of the needs of the participating countries, e.g. different technologies, issues not covered in the Toolkit, *etc*.
	Toolkit Guidance Requested
10:30-11:00	***BREAK***
11:00-12:30	Organisation of the work in the countries, e.g. functioning, organization of national institutions, schedule, assistance, cooperation on a sub-regional basis, workshops
12:30-13:30	***LUNCH BREAK***
14:00-16:00	Final discussion, Consultant's Recommendations for the Future and preparation of the report Common Themes and Future Needs and acceptance of the report
	Conclusions of the workshop

Appendix 3

List of Participants

SUBREGIONAL WORKSHOP ON
"NATIONAL INVENTORY
OF DIOXIN AND FURAN RELEASES"

PORT OF SPAIN, TRINIDAD AND TOBAGO, 19-22 MAY 2003

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