



**United Nations Environment Programme**  
**UNEP Chemicals**



## **Proceedings**

### **Subregional Training Workshop "Dioxin and Furan Inventories"**

**Kampala, Uganda, 12-15 August 2003**

This UNEP Chemicals is supported by the Canda POPs Fund

IOMC

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

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.

Material in this publication may be freely quoted or reprinted, but acknowledgement is requested together with a reference to the document. A copy of the publication containing the quotation or reprint should be sent to UNEP Chemicals.

Available from:

UNEP Chemicals  
International Environment House  
11-13, chemin des Anémones  
CH-1219 Châtelaine  
Geneva, Switzerland  
Tel.: +41 (22) 917-8132  
Fax: +41 (22) 797-3460  
E-mail: [chemicals@unep.ch](mailto:chemicals@unep.ch)  
<http://www.chem.unep.ch>

UNEP Chemicals is part of UNEP's Technology, Industry and Economics Division

# **Sub-regional Training Workshop on Dioxin and Furan Inventories**

## **Kampala, Uganda, 12-15 August 2003**

### **1 GENERAL**

The four days sub-regional workshop on dioxin and furan inventory training for Anglophone African and neighboring French-speaking African countries was held 12 to 15 August 2003 at the Africana Hotel in Kampala, Uganda. Fifty experts from 15 countries, namely Burundi, Comoros, Djibouti, Egypt, Ethiopia, Ghana, Gambia, Kenya, Madagascar, Nigeria, Rwanda, South Africa, Sierra Leone, Sudan, and Uganda, and two staff from UNEP Chemicals attended this workshop. For complete addresses of the participants, see Appendix 1, pages 42 to 52. The agenda for the Workshop was as follows (for details, see Appendix 2, page 53):

- 1) Opening of the workshop;
- 2) Objectives and follow-up of this workshop;
- 3) Interrelationship between dioxin/furan inventory and the Stockholm Convention and its national implementation plans; Update on BAT/BEP;
- 4) Country presentations of dioxin/furan issues;
- 5) Introduction and overview of the Toolkit;
- 6) Detailed discussion of sources categories;
- 7) Conclusions, recommendations, and follow-up;
- 8) Closure of the meeting.

#### **1.1 Opening of the meeting**

The opening ceremony of the workshop was chaired by the Executive Director of the National Environment Management Authority (NEMA), Dr. Aryamanya-Mugisha, Henry and attended by Honorable Minister of State for Environment, Lt. General Odongo Jeje, and Dr. Heidelore Fiedler, Scientific Affairs Officer, of UNEP Chemicals.

Dr. Fiedler thanked the Minister of State and the Executive Director, NEMA, for their presence and welcomed participants on behalf of UNEP Chemicals and the National Environment Management Authority of Uganda, who organized the workshop. She mentioned that this workshop serves the purpose to assist countries in the region to establish their initial dioxin and furan inventories within the national implementation plans under the Stockholm Convention on POPs. She conveyed the awareness by UNEP and other organizations that African and other developing countries face problems such as; poverty, slow economic development, poor health and environment and which compete for scarce resources and are offered higher priority when compared to issues to do with chemicals' management and especially the management of persistent organic pollutants which are usually

not first priority. But she stressed as well that many countries in the region are Party or signatories to the Stockholm Convention. She congratulated the four countries that are already Party to the Stockholm Convention, namely Egypt, Liberia<sup>1</sup>, Rwanda, and South Africa. The ratifications and signatures underline the country's commitment towards sustainable chemicals' development. She mentioned that inventories of dioxins and furans are important parts within the National Implementation Plans and the starting point for release reduction of unwanted byproducts. She concluded by wishing all a stimulating, successful and enjoyable week in Kampala.

The Honorable Minister of State, Lt. General Odongo Jeje welcomed the participants on behalf of his government and himself. He expressed his pleasure that UNEP had chosen Kampala and NEMA to host this workshop. He explained that Uganda is not a signatory to the Stockholm Convention but that the necessary documents had already been prepared for submission to the Cabinet to obtain approval to accede to the Convention so that Uganda will be one of the fifty Parties when the Convention enters into force. The State Minister closed by expressing his gratitude to UNEP and all those that have provided assistance and officially opened the workshop (Full speech in Appendix 3, page 54).

For the continuation of the program, the workshop participants selected Professor J.H. Ephraim from Ghana as chairman and Ms. Nomazini Mdi from South Africa as rapporteur.

## 1.2 Workshop objectives (Dr. Heidi Fiedler, UNEP Chemicals)

The objectives of the workshop are to present the Toolkit so as to assist in the implementation of National Implementation plans, through the identification of sources and estimations of the emissions of dioxins and furans.

During the workshops the group was invited to discuss:

- The Toolkit in more detail;
- Sources and categories of dioxins and furans;
- Mathematical estimation of release;
- Questionnaires on furans and dioxins within one own country, *e.g.*, if you don't have analytical capacity, means of determining whether one has a bad incinerator, type of furnace, flue gas, operational times, what happens to fly ash, temperatures;
- Identify needs that come during the course of the workshop for assistance;
- Establish information on how to proceed with preliminary inventories;
- Establish collaboration and cooperation among focal points and task teams on furans and dioxins that are represented in the workshop.

Country presentations were volunteered from Kenya, Ghana, Egypt, South Africa, Burundi, Nigeria, Rwanda, and Gambia.

---

<sup>1</sup> Unfortunately, Liberia was not able to attend this workshop

### **1.3 Dioxin and Furan Inventories within the National Implementation Plans of the Stockholm Convention (Fatoumata Keita-Ouane – UNEP Chemicals)**

The presenter introduced the Stockholm Convention as a legally binding agreement for its Parties. The convention has control provisions for intentionally and unintentionally produced POPs, stockpiles and wastes, and has financial and technical assistance procedures. The general characteristics of POPs were recalled as well as the specificities of dioxins, furans, HCB and PCBs: the fact that they are produced un-intentionally through secondary sources, thermal and chemical processes. The presentation also highlighted Convention requirements concerning unintentionally produced POPs and the related obligations for Parties (develop action plans within two years, promote/require the application of BAT (Best Available Techniques) and BEP (Best Environmental Practices)).

Workshop participants followed with questions, among which the issue of countries that produce POPs but are not party to the Convention. The reply was that the Convention provides for trading rules between parties as well as between parties and non-parties

There was a question on the countries that do not have facilities to destroy POPs. Heidi (UNEP) responded by saying that also landfills need to be controlled since dioxins and furans that may leach into sediments and water.

There was a concern raised that the BAT and BEP does not take into consideration effectiveness and economic situation in the different countries. This was subsequently answered through subsequent presentation, which indicated that country conditions and the geographical areas are taken into consideration when defining BAT/BEP.

It was mentioned that an expert group has been established by the Intergovernmental Negotiating Committee at its Sixth Session (INC-6) and that this group is currently developing guidelines on BAT and BEP. The group met on 06-10 March 2003 in North Carolina, USA, and the second meeting will be held on 8-12 December 2003 in Chile.

## **2 COUNTRY REPORTS ON DIOXINS AND FURANS**

Some countries gave brief presentations on their interest and activities in the field of dioxins and furans. The full text of these presentations is shown from pages 18 to 41.

### **2.1 Burundi**

The country is signatory to the Convention, participates in meetings and intergovernmental negotiation committees, the institute for National Environment and Conservation is the focal point. They have started their NIP, have identified some pesticides but more must still be identified. They used the Toolkit for a preliminary screening and presented a report in accordance with the 10 Main source categories.

## **Main findings**

The main existing sources seem to be:

- Waste incineration (medical waste, pharmaceutical packaging, animal carcasses in small quantity);
- Ferrous and non ferrous metal production;
- Power generation and heating (domestic heating/cooking);
- Production of mineral products is a major source from bricks and tiles production;
- Transport from light and heavy engines using diesel;
- Uncontrolled combustion processes from solid wastes and pharmaceuticals;
- Production and use of chemicals and consumer goods (textile and dry cleaning);
- Disposal (processing from industries, effluents or polluting/medical swabs);
- Hot Spots (pesticides used contain chlorophenols, agriculture uses more pesticides).

## **Constraints and limitations**

- Lack of awareness and understanding of the dangers of dioxins and furans exist in the country;
- No inventory exists;
- Lack of equipment and human capacity.

## **Needs**

- Cooperation of major decision-makers in the country
- Qualified staff to run the project
- Exchange of information with other countries

## **2.2 Egypt**

The NIP has not been completed yet. There is equipment to look at food accumulations of POPs. Egypt has developed a “Hazardous Substance Information and Management System” which includes a database of 5,400 different hazardous chemicals including POPs, risk assessments have been done, and awareness raising accomplished in six ministries in addition to the Civil Defence and Custom Authority, who are involved in the control of Hazardous Chemicals including POPs. The targeted Ministries are: Health; Agriculture; Industry; Interior Affairs; Electricity and Energy and Petroleum).

Eight of the 12 POPs are banned in Egypt and the last four are controlled by Ministry of Industry & Ministry of Health and Population where the permissible limits for PCDD/PCDF emissions from healthcare waste incineration according the Egyptian Environmental law No. 4/1994 are 0.1 ng/ m<sup>3</sup> and the exposure period is 8 hours.

The presenter recalled some of the main characteristics and effects of dioxins and furans as well as the main sources of human exposure.

The country highlighted the main requirements for developing a national strategy for zero dioxin production that comprises of:

- Hazardous substances policy that takes into consideration the entire life cycle of the POPs including; import, production, transportation, treatment and disposal, and looks at the mass balance.

- The recommendation is the phasing out of PCB, burning of waste by using incinerators, and replacing them with landfill sites and autoclaves for medical waste.
- Chlorine based bleaches must be stopped and substituted with peroxides.

## 2.3 Ghana

The country has a multi sectoral co-ordinating team, which is implementing the action plan with five task teams

- Research: responsible for inventory of POPs pesticides
- Health: responsible for examining health issues related to POPs emissions
- Education: Awareness raising, examining and drawing strategies for awareness creation on POPs
- Legal: Examining existing legal frameworks and making recommendations for legal provisions to manage POPs.
- Emission and contamination: responsible for inventorizing dioxins, furans, and PCB. The Focal point for the dioxins and furans is EPA of Ghana.

The country used the Toolkit to identify the main 10 source categories. They looked at each of the categories and the activities are checked and mathematical calculations in accordance with the Standardised Toolkit were undertaken.

The challenge for Ghana is the waste treatment and disposal, which is uncontrolled hence it was difficult to determine leachate generation from the landfill sites.

## 2.4 Kenya

Kenya is a signatory to Stockholm Convention. A National Coordinating Committee was established in June 2002 and a technical committee established to coordinate debate on DDT (DDT is shipped to Finland for destruction).

The country held a National Stakeholders meeting, and targeted priority POPs since not all are important. Officers were trained by FAO to undertake quantitative inventories (pesticides inventories had been done but are incomplete).

They have identified PCB capacity with the help of Nairobi University, KEPHIS.

The main sources seem to be wastes and stockpiles on smouldering of copper wires, open burning of plastics and other solid wastes. It was indicated that Nairobi generates 2000 tonnes of waste per day. Waste is burned openly in an uncontrolled manner; there is a problem of scavenging, recycling of polyethylene plastics. Segregation of medical waste is not done.

Other potential sources are related to:

- The fact that Kenya has the largest pulp and paper industry in East Africa;
- Kenya experiences grassland and forest fires;

- Aluminium is recycled;
- Crude oil refining where money is required to phase out lead, used oils;
- Wood combustion - 80% of the population need wood for fuel/energy;
- Industrial processes – tea factories, sugar industries;
- Transportation - increased diesel vehicles;
- Thermal power generation;
- Lead recycling activities;
- No air pollution control systems;
- Cement factories;
- Textile and leather plants.

The country needs resources to quantify dioxins and furans.

## 2.5 Nigeria

The country has 105 million people of which 71% is rural-based. Petroleum production, mining and agriculture are major economic activities.

In relation to NIP implementation, the country has held its inception workshop, identified the relevant stakeholders and established a National Steering Committee.

With regards to the inventory of dioxins and furans, the country in addition to appointing a National Consultant, has identified relevant stakeholders and held awareness- raising workshops in Kaduna, Lagos and Port Harcourt representing the three zones identified for the inventory. The Toolkit was discussed and adopted at these workshops. Twelve inspectors, as members of the Inventory Task Team were assigned to the three zones to undertake the inventory. Questionnaires were distributed to targeted industries, which included oil refineries, paints, water boards, pharmaceuticals, power generation, textiles, glass, ceramics and pulp and paper.

### Preliminary Results

The main dioxin and furan sources are oil and gas, textiles, paint, water board, transport and glass. Emission to air seems to be the main medium for the pollution.

### Limitations

- Industries' reluctance to provide data because they are not sure what the data will be used for;
- The coverage of inventory zones was too ambitious;
- Inadequate resource allocation, particularly personnel and logistics to cover the extensive area;
- Municipal waste and bush burning as difficult areas to quantify; and
- Poor response by industries.

At the start of the session on Wednesday, 13<sup>th</sup> August 2003, Mr. Celeus Ngowenubusa of Burundi was elected Chairman for the day and Madagascar was the rapporteur. Country presentations continued.

## 2.6 Rwanda

Rwanda is one of most densely populated countries and although it ratified the Stockholm Convention in June 2002, the Convention is not well known in Rwanda issues related to dioxins and furans. Sectoral workshops have been held involving Environment, Health and Agriculture departments.

The country has not carried out a dioxins and furans inventory in line with the Toolkit. Nevertheless, the country has already undertaken activities within the framework of Stockholm convention. These activities are the ratification of convention in June 2002, the designation of the focal point, identification of the potential sources of production of dioxins and furans. It is not an industrial country, but can list the following potential sources:

- Ferrous and non ferrous materials;
- Pesticide stockpiles improperly used by communities;
- Burning of firewood often causing emission of smoke in rural areas, schools, industries and prisons;
- Hospital medical waste treated in incinerators;
- Municipal waste is dumped on a hill and the waste is burnt on dry season. There is a study that is being done to look at another site;
- Emissions from transport;
- Mineral products.

The presenter also indicated certain needs which, must be satisfied for the implementation of the convention:

- Obtainment of the GEF funding to effectively start the NIP in September 2003;
- Regulation adapted for the management of the chemicals;
- Inventory of POPs in general;
- Information and awareness raising of the population at all levels.

## 2.7 South Africa

The RSA (Republic of South Africa) has not carried out yet dioxins and furans inventory according to the Toolkit. However, work on identification of the potential sources of dioxins and furans is very advanced. The quantification has not been undertaken in a manner to produce a national report. The RSA already seems to have worked out outlines of policy for the control of the potential sources of dioxins and furans (plastic bags). In addition, the country possesses incineration facilities that are more advanced than the other countries that have made presentations.

Incineration, municipal and hazardous waste, energy production, coal use, veld and forest fires, textiles, cement,

## 2.8 Gambia

The Gambia indicated that it had ratified the Stockholm Convention in June 2003 and was well into the NIP development process where the following had been accomplished:

- Establishment and holding of several meetings of the National Coordinating Committee;
- Establishment of and holding meetings of the Project Coordination Unit;
- Stakeholders awareness raising and consensus building workshop;
- High level meeting to secure commitment to the outcomes of the stakeholders workshop
- Individual consultations with major stakeholders to raise awareness, request for their priority concerns and engage their assistance in the development of the NIP;
- Information dissemination and awareness raising activities using various media

The representative from Gambia also indicated that establishment of POPs inventories and the assessment of national infrastructure and capacity was just starting. He indicated that 4 task teams had been formulated and these were: One to update the national profile on chemicals management to integrate POPs specific issues; one to undertake a POP pesticides inventory; another to undertake a PCB inventory and assessment and the last one to undertake the unintentional produced POPs inventory and assessment. He listed the major sources of unintentional POPs release as:

- Open burning of municipality waste and medical waste;
- Power generation; and
- Transport sector emissions.

## 3 PRESENTATION OF THE TOOLKIT

Dr. Fiedler made a presentation of the Toolkit for the identification and quantification of dioxins and furans releases. During the presentation the following points were covered:

- Total dioxins release in air;
- The current situation of dioxins and furans inventories;
- The distribution of the emission sources by country;
- Inventories of the European emissions.

She then presented the Toolkit as a document designed to provide assistance to countries in the compilation for data intended for dioxins and furans inventories. The Toolkit provides a framework of work to evaluate the emissions of the PCDD and PCDF. Its use will help the countries to ensure:

- Consistent and comparable national inventories;
- The coverage of all the sources in a country or area;
- The coverage of all the vectors of emissions in particular to air, water, ground, products and residues;
- Identification of the potential insufficiencies of the Toolkit;
- Identification of the amendments which should be carried out;
- The initiation of national programme for the implementation of the convention with regard to the PCDD and the PCDF.

Dr. Fiedler also introduced a screening matrix listing 10 main sources categories. This matrix is derived from previous experience related to PCDD and PCDF. The questionnaires on each

category were also deliberated on. Information on the inventories developed in the Philippines, Lebanon and Thailand were presented and discussed.

Thus, the Toolkit includes:

- An effective method to identify the industrial and non-industrial processes implied in the emissions of dioxins and furans;
- Assists in the collection of information on the processes and their classification;
- A detailed data base of emission factors;
- Guidelines for the collection of inventory data and the presentation of the results.

After her presentation the participants raised questions relating to the Toolkit, the inventories and the dioxins emissions in air, water and soils. Other questions referred to the various types of dioxins and furans, emission factors, the management policies as well as financial assistance that may be available to countries. Some countries also exposed the problems they may meet during the inventories, particularly:

- Quantification of the emissions by the informal sectors;
- Classification of some activities in the 10 categories;
- Insertion of the non-conventional activities in the categorization of the Toolkit;
- The emissions of ash from open air burnings.

In conclusion it was felt that the Toolkit is a very useful means for helping countries in dioxins and furans source inventory within the framework of the development of the NIP. The participants to this workshop would thus be in position to apply it in their respective countries after the training.

#### **4 CATEGORIES OF SOURCES OF PCDD/PCDF IN THE TOOLKIT AND POTENTIAL OCCURRENCE IN COUNTRIES OF THE REGION**

In the following session, the individual main source categories were discussed in detail. Dr. Fiedler introduced each main source category and gave key features and parameters for each of these categories to explain the formation and occurrence of dioxins and furans; she also mentioned factors that would result in a reduction of release of PCDD/PCDF. She indicated that the Toolkit addresses direct releases and PCDD/PCDF present in vegetation, in soils, sediments, in humans, in foodstuffs, or other matrices are not addressed in the Toolkit (see page 12 – English version).

##### **Category 1 – Waste Incineration**

Dr Fiedler presented the waste subcategories usually involved with dioxins emissions during incineration and the environmental media impacted by the emissions. These are: Municipal solid waste, Hazardous waste, Medical waste, Light weight aggregate (e.g. from shredder), Sewage sludge incineration, Waste wood combustion, Animal carcasses and rendering. She also explained how to estimate the level of dioxins emission depending on the type of wastes, the type of burner/incinerator and the flux gas cleaning system.

During the discussions participants raised number of issues that were clarified.

- First the definition of waste incineration in the sense of Category 1 was explained in such a way that under Category 1 in the Toolkit addresses all thermal disposal of waste in a kind of facility or technical equipment. Dr. Fiedler emphasized that the plant can be very

simple and without any control. In contrast, in Category 6, there is no equipment to incinerate the waste; the combustion in Category 6 occurs in the open air.

- The participants were also informed of the different types of incinerators, and what makes the difference between good and bad incineration conditions (temperature, turbulence, residence time; presence/absence of flue gas cleaning equipment, maintenance, *etc.*),
- Participants had many questions related to the disposal of ashes from incinerators and the likelihood of further environmental contamination by these ashes. It appeared that in most countries, these ashes were simply discarded or buried.

### **Category 6 – Open Burning**

The presentation covered the categories and subcategories of uncontrolled combustion processes. These are biomass burnings (forests, grasslands, fields, farming residues) and waste burning and accidental fires.

#### **Synopsis of discussions**

On question on how to calculate dioxin emissions from biomass burning the presenter explained that to estimate the emissions one would need to look at the mass of biomass burnt, the area burnt and the type of vegetation (dense forests vs. grassland for example).

Most of the info to deal within this category can be found in Department of Agriculture. Burning of clean biomass was reported not to be a major source of emission, but the burning after treatment of biomass with chlorinated pesticides or paints, *etc.* (for impacted wood) would be a major contributor.

Most of agriculture harvest residues are burnt as a source of phosphorous in farming to enrich soils. Biomass burning is therefore an important problem in African countries. The types of policy approaches that could lead to change of behaviour in the agriculture communities were discussed. The usefulness of regulatory approaches and educational approaches was discussed. It was mentioned that regulatory approaches were not very efficient at this level but one may want to think of a combination of methods.

On Thursday, 14 August, the workshop participants elected Ms. Volanirina Rabearisoa from Madagascar as chair and Ms. Sittnour Hassan Mohamed from Sudan as rapporteur. Mr. Alfredo Scheller Tsaramody from Madagascar led through the second part of the morning session.

At the start of the session, Ms. Rabearisoa informed the workshop about the activities that have been initiated in Madagascar such as establishment of an information network and that the country has just finished the first part of the inventory.

The chair welcomed the participants from the Gambia who unfortunately were delayed in their arrival due to difficulties with flight connections.

### **Category 2 – Production of Ferrous and Non-ferrous Metals**

- The introduction included a definition on how to differentiate between primary and secondary production processes. In the Toolkit, primary processes are those that extract the metals from the primary ores whereas the secondary processes include the recycling activities where used metals, such as scrap or slags or ashes from other metal industries are being used to produce the metals.

- PCDD/PCDF formation occurs especially when impurities are present in secondary raw materials from the scrap metal industry and formation of PCDD/PCDF occurs during incomplete combustion. Although the temperatures are high in these processes, the reformation of PCDD/PCDF may occur when the flue gases cool down in flue gas cleaning systems. Finally, oils or other organic materials on scrap, can form PCDD/PCDF. Additional carbon is introduced by the fuel, chlorine may be present either as impurity on the scrap such as in waste or lubricating oils, plastics, paints, etc. or through the fuel. The formation of PCDD/PCDF in secondary and some primary production processes of the metallurgical sector is well proven.
- The chairperson mentioned that for some of the processes, such as aluminum and lead, the primary production processes will not be taken into consideration when establishing the inventory since so far, the presence of PCDD/PCDF was not confirmed.
- From the countries present, Egypt and Kenya practice production of various metals, especially iron/steel, aluminum, leads, and copper. Most of the industries are private or are being privatized.
- Some countries recycle lead acid batteries and it was mentioned that this is an activity that needs to be quantified in the dioxin and furan inventories.
- Some countries import ingots and only form or finish the metals. Such activities are not considered in the inventory.
- Madagascar mentioned the import of lead and the use of lead alloys to make electrodes. The major activity in this process is the manufacture of batteries.

#### **Category 4 – Production of Mineral Products**

- The processes in this category are characterized by high temperatures in the production process. The presence of PCDD/PCDF can be explained that raw materials or fuels may contain (inorganic) chlorides that may cause formation of PCDD/PCDF at various steps of the process such as during the cooling phase of the flue gases, at pre-heaters or even in the heat zone. Due to the long residence times in the furnaces and the high temperatures in these processes needed to fabricate the products, the emissions of PCDD/PCDF are generally low.
- Since many developing countries do not have facilities for the disposal of toxic wastes, including PCBs, cement kilns have been used to dispose of these wastes. Upon co-incineration of chlorinated waste, measurements in the USA gave higher emissions of PCDD/PCDF than under normal operation. More than one hundred measurements in Europe at modern cement kilns did not show any increase in the PCDD/PCDF emissions. This result has also been confirmed in a GTZ/Euro Chlor/UNEP sponsored measurement program in Thailand.
- Dr. Fiedler mentioned that the Expert Group on BAT and BEP is developing guidance on BAT and BEP for the cement production. She also mentioned that typically the dry process is considered to be BAT in comparison to the wet process.
- Whereas cement plants always are large installations, brick manufacture is a diffuse activity and may be difficult to quantify. To estimate the annual activity, it was suggested to identify the number of houses constructed during one year and estimate the mass of

brick produced by utilizing the amount of bricks needed to build a “typical” house. The activity will be expressed as tons of brick produced per year.

- In the manufacture of brick, the Toolkit will use the same emission factor for all types of fuel, potentially contaminated fuels included. The part of the PCDD/PCDF originating from the combustion of the fuel to generate the process heat is included in the emission factors. Presently, the two emission factors are based on the absence or presence of flue gas equipment at the plant.
- Madagascar described a local process where graphite is being extracted with liquids from its natural ore. The extract is then concentrated and heated to evaporate the liquid (water). Dr. Fiedler mentioned that this process is not addressed in the Toolkit and that typically extraction and concentration processes of metals such as in gold mining do not have relevance. However, further information is needed especially with respect to the thermal step and the composition of the liquids to better characterize this activity and its potential to generate PCDD/PCDF (it needs to be excluded that an annealing process as known from experiments with fly ash, carbon or graphite in the presence of chlorine and air does not take place).
- The Gambia described a process of lime production whereby oyster shells are burned to ash and then grinded to form lime. This is the only lime production in the country and is not described as such in the Toolkit. It was suggested to apply the emission for lime production without any sophisticated equipment and therefore apply the emission factors for class 1 in category 4b.
- Asphalt mixing is typically performed in small plants. To estimate the national activity it was recommended to base the amount of asphalt needed to build the streets that were constructed during the reference year. It was concluded that the production of tarmac exhibits the same features as the production of asphalt and therefore the production volumes of these two can be put together.

### **Category 3 – Production of Energy, Cooking**

- Dr. Fiedler introduced this category indicating that the emission factors were selected according to the type of fuel – fossil or biomass – according to the type of plant – large central electricity producing units – or small boilers. As a general rule, she mentioned that especially in small installations, solid fuels like wood and coal tend to generate higher concentrations than liquid (Diesel, heavy oils) or gaseous fuels (LPG, methane).
- Power plants producing energy from water, wind or geothermal sources do not have to be included into the national inventory since there is no step of combustion and therefore no relevance for PCDD/PCDF formation.
- The presence of PCDD/PCDF in the power generating sector can be explained since chlorine and carbon are introduced by the fuel and oxygen is present through the combustion air. Additional chlorine can be introduced in these processes when contaminated fuel is burned.
- It was emphasized that the units to characterize the activity in this sector is based on Terajoule. Some indicative heating values for fuels are given in the Annex of the Toolkit; local heating values should be used when available.

- Whereas the estimation of the activity of the large power plants does not seem to cause a problem for the inventory, the diffuse activities for cooking seem to be difficult. Dr. Fiedler explained that other countries have estimated the PCDD/PCDF release according to the main fuel that is used in rural areas and big cities and have estimated how many hot meals are consumed per day or week and how much fuel has been used to prepare these meals. Ghana mentioned that there are many sources of information on fuel use in the countries such as Bureaus of Statistics, Ministry of Industry or Energy, *etc.*

### Category 5 - Transport

- Dr Fiedler introduced this category by highlighting that the emission factors in this category are based on the fuel type that is being combusted in internal combustion engines. In this sense, also generators, that are often used as back-up in cases of power failure, have to be considered. However, the result of this estimation will be included into category 3 – production of energy whereby the emission factor is being taken from this category – mainly subcategories c and d.
- It was explained that the highest emissions from vehicle transport were found when leaded gasoline is combusted in internal combustion engines. The additional chlorine is explained by the addition of halogenated scavengers as anti-knock agents in leaded gasoline.
- Dr. Fiedler mentioned that aircrafts do not have to be considered since the presence of PCDD/PCDF upon combustion of kerosene in aircraft engines has not been documented.
- Dr. Fiedler also suggested that the estimates should be based on national sales data of the respective fuels. Therefore, it will be assumed that sales equals consumption.
- The Gambia proposed another approach by estimating the emissions from the activity in this sector from the recorded import of fuels. Some caution may be given since not all of the fuel imported, *e.g.*, Diesel, may end up in vehicle transport.
- It was noted that the majority of vehicles in our countries are relatively old and there is a likelihood that these emit more pollutants to the environment. The age of the vehicles under consideration vis-à-vis their emission estimate is not covered in the Toolkit and adjustments may be necessary. It was concluded that the annual emission as obtained by application of the Toolkit will be undertaken and increased by a correction factor to account for the age of the vehicles.
- In some situations, it was mentioned, it may be difficult to distinguish between the use of gasoline in 2- or 4-stroke engines. It was suggested that the share between these engines and typical mileage averages should be used to estimate the fuel split share in consumption.
- It was noted that new “motors” such as gas-powered engines, fuel cells, *etc.* may become popular. Presently, these vehicles do not constitute a major part and may be ignored in the first dioxin and furan inventories. Electric cars do not have to be considered since the generation of electricity for these cars was already covered by the estimate within category 3 (mainly subcategories a and b). Presently, for bio-Diesel, the Diesel emission factor should be applied (category 5c, only one class).

### Category 8 - Miscellaneous

- Dr. Fiedler explained that “clean” wood refers to wood that has not been treated with chemicals before being used as a fuel.
- The workshop participants concluded that the traditional way of “smoking“ fish in Africa would better fit into the subcategory of domestic cooking than into the subcategory 8c – smoke houses. The description as given in category 8c does not describe the type of activity that is practiced in Africa and therefore, the emission factors from category 3d (biomass) or 3d (fossil fuel, coal) should be applied. However, the present subcategory 8c should be considered in case that such practice will be introduced in the future.
- Cremation is practiced in a few countries and does not seem to be a major activity in the region. The participants were reminded that the emission factors in the Toolkit refer to bodies cremated and that the emission factor includes the contribution from the fuel and the coffin.
- With respect to dry cleaning residues/effluent, a documented history of use of pentachlorophenol in the textile or leather industries may give an indication for selecting the class 1 emission factor. Imported textiles can be classified only when information about use of PCP can be obtained from the importer. It was suggested that the lowest and the highest emission factor should be applied to identify the possible range of releases.

### Category 9 – Landfill/Disposal

- This category is somewhat retrospective. It was mentioned that the solid wastes that were generated by industrial activities with dioxin relevance were already covered within the individual categories, *e.g.*, the ashes from combustion processes, sludges and ashes from the pulp and paper industry or from the chemical industry.
- Composting is an integral part of waste management, however, it has been shown that only “clean” inputs will guarantee a compost of high quality and low PCDD/PCDF concentrations.
- It was mentioned that Crematory in this category refers to the cremation of humans whereas Category 1g refers to the thermal destruction of animals (either as a whole or parts).

## 5 ISSUES DISCUSSED WITH NO DIRECT RELEVANCE TO THE TOOLKIT OR DIOXIN/FURAN INVENTORY

Several issues were addressed and discussed that are not directly related to the making of the PCDD/PCDF inventory. These issues included:

- Concerns were raised that the handling of clinker may pose an elevated risk to plant workers. An increased exposure to dioxins and furans cannot be expected since these contaminants, if present, would be bound into the clinker and not be subject to release and subsequent exposure of personnel. However, it was recognized that other workplace exposures may exist such as to dust. Adequate clothing, gloves, hard hats and mouth protection should be worn at all times.

- Some time was spent on the pros and cons to dispose of hazardous wastes, *e.g.*, PCBs and chlorinated POPs pesticides in cement kilns. Dr. Fiedler explained that the primary purpose of cement kilns is the production of a high quality clinker that can be marketed. She also mentioned that cement kilns have to be well controlled with respect to the composition of elements such as chlorine, sulfur, certain metals, *etc.* to guarantee continuous operation of the kilns. Thus, cement kilns are not very flexible as to variations in the chemical composition of their input materials. Therefore, consistent long-term supply of secondary feeds and hazardous waste is required to maintain stable conditions in the operation. Any secondary materials introduced into the process should pass counter-current through the hot zone of the kilns to minimize formation and release of PCDD/PCDF.
- If technically suitable cement kilns may be used for the disposal of POPs pesticides or PCBs. They however need to be evaluated in the respective action plans within the NIPs once the pesticide stockpiles or wastes and PCBs are identified and quantified. Besides technical issues the acceptance of the public and national regulation has to be taken into account.
- The participants asked Dr. Fiedler to introduce the question of vehicles running on gas, fuel cells or other energy should be considered BAT to the Expert Group of BAT and BEP.
- Various issues of transport and fate of PCDD/PCDF that are released from the different sources were discussed. Dr. Fiedler explained that the Stockholm Convention considers all POPs as persistent, which would mean that the Convention implies that the chemicals do not degrade or disappear by naturally occurring environmental processes. Especially for the dioxin and furan inventory, clearance processes such as possible UV light destruction or biodegradation that may reduce the mass of dioxins and furans formed and released will not be considered.
- It was also mentioned that the fate of the PCDD/PCDF released from the various sources depends on the composition of the mixture of PCDD/PCDF congeners; *e.g.*, lower chlorinated congeners may preferentially leave the (thermal) source in the gaseous form, especially when emitted at elevated temperature. Such gaseous PCDD/PCDF will then undergo fast atmospheric transport and can be moved long distances before settling down on surfaces such as vegetation, water, land or other surfaces. Upon raising temperature, the PCDD/PCDF will evaporate and be moved further towards colder zones. Such behavior has been described as “grasshopper effect”. The heavier high-chlorinated congeners preferentially would be adsorbed to particles and depending on their size settle down closer to the source.
- In cases of heavy rain, the previously/already emitted PCDD/PCDF will be washed out closer to the source and with run-off end up in surface water such as rivers or lakes. Subsequently movement through the environment will follow the grasshopper effect.
- Measured data have shown that the automobile exhaust emissions do not travel far away from roads/highways. Since the height of emission, the mufflers, are typically close to the land surface, the emitted PCDD/PCDF are deposited close to the source and the impact from vehicle traffic cannot be determined 50, 100 or more meters away from the road. In addition, vegetation such as roadside bushes may absorb PCDD/PCDF emitted through the muffler.

- It was mentioned several times that the Toolkit has been designed to identify and quantify the PCDD/PCDF at the source as is the obligation in the Stockholm Convention with respect to unintentionally generated POPs. Once a source strength is quantified and the source is located, impact and exposure assessment can be developed to estimate risk. The Toolkit can only be a starter for such activities but does not provide the answers. The results of the Toolkit are normalized to TEQ (toxic equivalents) and does not include further information as to the composition of the congeners that are included in the TEQ, the aggregate state of the PCDD/PCDF, the exact time of the release or the exact location.
- Dr. Fiedler also explained that when estimating human exposure, the measured concentrations of the unprepared foodstuffs are used to calculate the daily intake and not the prepared foods, *e.g.*, cooked, grilled, fried, *etc.* Some studies indicate that upon grilling or frying the concentrations in the foodstuffs increase. On the other hand, fat that may contain PCDD/PCDF are released and when not eaten, the intake of the prepared food may be lower than was estimated by the raw foodstuffs.

## 5 CONCLUSIONS AND RECOMMENDATIONS

Following these deliberations the following conclusions and general recommendations were drawn.

- Participating countries agreed to use the Toolkit for undertaking their national inventories of dioxins and furans.
- Countries recognized that the time to perform their initial dioxin and furan inventories may be crucial. Within the NIP, 5-6 months may be allowed to complete the main stages of the dioxin/furan inventory. Based on the results obtained after this period, the prioritization with respect to the dioxin and furan sources needs to be performed and the action plan for dioxin and furan needs to be started.
- Participating countries proposed that UNEP together with other implementing agencies may establish a platform to exchange experiences with the Toolkit. This may also facilitate to agree upon common approaches when making the inventory.
- In organizing the work on the PCDD/PCDF inventory, the following steps were considered important:

## 6 CONCLUSION OF THE WORKSHOP

The workshop participants thanked the organizers of the workshop for making perfect arrangements for the conduct of the workshop, the hospitality of Uganda and especially the efforts undertaken by NEMA. Thanks were extended to UNEP and their resource persons who facilitated at the workshop and to the Canada POPs Fund for providing the funding.

The workshop was closed on Friday, 15 August 2003 at 13:15 hours.

## COUNTRY REPORTS

### 1 GHANA

#### REPORT ON DIOXIN AND FURAN INVENTORIES IN GHANA National Emissions of Dioxins and Furans

#### TASK TEAMS

Research – inventory of POP pesticides and identification of contaminated sites

Health

Education and Awareness Raising

Legal

Emission and contamination-

#### Emission and Contamination

Inventory of PCBs and PCB containing equipment

Inventory of Dioxins and Furan releases

#### Task Team Members

DR. P. O. Yeboah- Chairman

National Nuclear Research Institute (NNRI), Kwabenya, Accra

Prof. J. H. Ephraim- Member

Kwame Nkrumah University of Science and Technology, Kumasi

Dr. S. Osafo Acquah- Member

Kwame Nkrumah University of Science and Technology, Kumasi

Mr. Michael Dade- Member

Volta River Authority (VRA), Akosombo

Mr. John Wattenberg- Member

Electricity Company of Ghana (ECG)-Accra

Mr. John Pwamang- Member

Environmental Protection Agency, Accra

Mr. J. Edmund- Member

Environmental Protection Agency, Accra

#### INTRODUCTION

Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD-PCDF) are environmental contaminants detectable in almost all compartments of the global ecosystem in trace amounts.

They have never been produced intentionally and have never served any useful purpose unlike other POPs like DDT.

They are formed as an unwanted by-product in many industrial and combustion processes. Consequently, it is impossible to eliminate dioxins and furans by prohibition of production and use.

Indirect measures have to be taken to reduce the emissions of PCDD/PCDF into the environment and to minimize human exposure.

These require that sources of PCDD/PCDF are identified and quantified.

## METHODOLOGY

The Standardized Toolkit for Identification and Quantification of Dioxins and Furans Releases developed by UNEP Chemicals was used. The following are the five steps making up the Toolkit: (Standardized Toolkit for Identification and Quantification of Dioxins and Furans Releases UNEP Chemicals Draft 2001)

Step 1: Applying Screening Matrix to identify main source categories

Step 2: Checking subcategories to identify existing activities and sources in the Country

:Step 3: Gather detailed information on the process and classifying processes into similar groups applying a Questionnaire

:Step 4: Quantifying identified sources with default/measured emission factors

Step 5: Applying nation-wide to establish full inventory and reporting using guidance provided

## PROCESS SUB-CATEGORIES THAT ARE CARRIED OUT IN GHANA

### **Municipal Waste Incineration- Sector 1a**

There are no facilities in the country to incinerate municipal wastes

### **Hazardous waste incineration- Sector 1b**

No hazardous waste incineration is undertaken in this country

### **Medical Waste Incineration Sector 1c**

Statistics available indicates that the Korle-Bu and Komfo Anokye Teaching hospitals (KATH) are both using the same simple batch-type incinerators

Weekly quantities incinerated at KorleBu Teaching Hospital= 1500kg

Annual Medical waste burned =  $1500 \times 52 = 78\text{kg}$

Default Emission factor (air) for Uncontrolled batch type combustion, no APC =  $40,000\mu\text{g TEQ/t}$

Potential emission into the air using default emission factor =  $40,000 \times 0.078 = 3.12\text{ mg}$

Default emission factor (residues) for uncontrolled batch type combustion, no APC  $200\mu\text{g TEQ/t}$

Potential emission in residue using default emission factor =  $200 \times 0.078 = 3.9\mu\text{g}$

Weekly rate of incineration at KATH in Kumasi = 750g

Annual incineration rate at KATH at Kumasi =  $750 \times 52 = 0.039\text{ kg}$

Potential emission in air using default factor of =  $40,000 \times 0.039 = 1.56\text{ mg}$

Default emission factor (residues) for uncontrolled batch type combustion, no APC  $200\mu\text{g TEQ/t}$

Potential emission in residue using default emission factor =  $200 \times 0.039 = 1.95\mu\text{g}$

**Sewage Sludge Incineration- Section 1e**

Ghana does not undertake sewage sludge incineration.

**Wood waste and biomass incineration- Sector 1f**

No incineration of wood waste and biomass is undertaken in Ghana.

**Combustion of Animal carcasses-Sector- 1g**

No incineration of animal carcasses takes place in Ghana.

**Iron and ore Sintering-Sector 2a**

There is no iron ore and iron ore sintering in Ghana.

**Coke Production-Section 2b**

Coke is not produced in Ghana.

**Iron and Steel Production Plants and foundries- Sector 2c**

Annual steel production from scraps at Tema Steelworks = 36,000 tons

Annual steel production from scraps at Ferro-Fabrik = 30,000 tons

Annual steel production from scraps at Wahome = 50,000 tons

Total annual steel production from scraps in Ghana = 116,000 tons

Default Emission Factor in air for dirty scrap = 10 $\mu$ g-TEQ/t

Potential emissions in air at in Ghana using default emission factor = 116,000  $\times$  10 = 1.16g

Default emission factor for release in residues = 15  $\mu$ g-TEQ/t

Potential emissions in residues in Ghana = 116,000  $\times$  15 = 1.74g

**Copper Production- Sector 2d**

Copper is not produced in Ghana.

**Aluminum Production- Sector 2e**

Volta Aluminum Company (VALCO) at Tema is involved in primary aluminum production.

There is presently no secondary aluminum production involving the thermal recycling of used aluminum in Ghana.

**Lead Production-Sector 2f**

Lead is not produced in Ghana.

**Magnesium Production-Sector 2g**

Magnesium is not produced in Ghana.

**Other non-ferrous metal production-Sector 2h**

There is no production of other non-ferrous metals in the country.

**Thermal Wire reclamation Sector 2i**

No thermal wire reclamation is undertaken in Ghana.

**Fossil Fuel Power Generation- Sector 3a**

Available statistics indicates the following:

At the Aboadze thermal Plant, 5.2 million barrels of light oil is burnt per year

Conversion rate: 1 barrel = 159 liters

**Fossil Fuel Power Generation- Sector 3a**

Available statistics indicates the following:

At the Aboadze thermal Plant, 5.2 million barrels of light oil is burnt per year

Conversion rate: 1 barrel = 159 liters

Annual consumption of light oil =  $159 \times 5.2$  million liters = 826.8 million liters

Conversion rate: 1L =  $8.5 \times 10^{-4}$  tons

Annual consumption of light oil =  $8.5 \times 10^{-4} \times 826.8 \times 10^6$  tons = 702,780 tons = 702,780,000kg

Conversion rate for light oil: 1Kg = 46 Mj

Annual heating value =  $702,780,000 \times 46 = 32.33$ Tj

Default emission factor for light fuel oil into air = 0.5  $\mu$ g/TJ

Potential emission in air at Aboadze Thermal Plant using default factor =  $0.5 \times 32 = 16\mu$ g

**Biomass Power plants- Sector 3b**

Statistics on biomass power plants in Ghana is not available.

**Landfill/Biogas Combustion- Sector 3c**

Land fill/Biogas combustion is not undertaken in Ghana.

**Household Heating and cooking (biomass)– Sector 3d**

Wood fuel is the bulk of energy consumed mainly for household cooking and water heating in the residential and commercial sector.

**Supporting information:**

National Wood fuel consumption = 17,541.8 GWh/yr

Conversion rate: 1GWh= 3600 GJ

National consumption =  $17,541.8 \times 3600 = 63150.48$ TJ

Default Emission factor virgin wood/biomass fired= 100 $\mu$ g-TEQ/TJ of Biomass Burned in air

Potential emission using default factors= 6.3g

Residue in water using emission factor of 20 $\mu$ g-TEQ/TJ=  $20 \times 63150.48=1.3$ g

**Domestic Heating (fossil fuel)- Sector 3e**

No domestic heating using fossil fuel takes place in Ghana

**Domestic Heating (fossil fuel) - Sector 3e**

Available statistics

Annual consumption of LPG in Ghana = 51,119 tons

Default emission factor in air = 1.5  $\mu$ g TER/t

Potential emission in air using default emission factor =

$1.5 \times 51,119 = 0.076$ g I TEQ

**Mineral production****Cement Production- Section 4a**

Ghana currently has two cement factories at Tema and Takoradi in the Greater Accra and Western Regions respectively. The production process however involves the grinding of limestone, clinker and gypsum. There is no pyroprocessing stage that may lead to the emission of dioxins and furans.

**Lime Production – Section 4b**

A limited amount of lime is produced in the country. Questionnaires have been sent to Battor and Mepe in the Volta Region for information.

**Brick Production – Section 4c**

Identified source of Brick production in Ghana- Winneba, Alajo, Tanoso, Building and Road research Institute (BRRI) have all been served with Questionnaires.

**Glass Production – Section 4d**

The Aboso Glass factory in the Western Region is no longer operational

**Glass Production – Section 4d**

The Aboso Glass factory in the Western Region is no longer operational

**Ceramics Production – section 4e**

Statistics gave the following data for 2002

Annual production of ceramics = 1,100 tons

Default emission factor – 0.2µg TER/t

Potential emission in air using default factor =

$$1,100 \times 0.2 = 0.00022g$$

**Asphalt Mixing – Section 4f**

Available statistics gave the following information:

Asphalt mixing is done on demand

14,000 tons produced in 2002 using a mixing plant with gas cleaning

Default emission factor for release in air: 0.007 µg TEQ/t

Potential emission in air using default factor =

$$0.007 \mu\text{g TEQ} \times 14,000 = 0.000098g \text{ TEQ}$$

Default emission factor for release in residue= 0.06 µg TEQ/t

Potential emission in residue using default emission factor

$$= 0.06 \mu\text{g TEQ} \times 14,000 = 0.00084g \text{ I-TEQ}$$

**Transport****4- Stroke Engines – Section 5a**

leaded fuel without catalyst is used in Ghana.

Statistics gave the following Data:

716 million liters of petrol was used in 2001.

Conversion factor: 1L of petrol= 0.00074 tons

Annual consumption of fuel in 2001 =  $716 \times 10^6 \times 7.4 \times 10^{-4} = 544,160$  tonnes

Assumption 95% fuel consumed by 4-stroke engines =  $0.95 \times 544,160 = 516,952$  tons

Default Emission factor range = 0.1- µg TEQ/t of unleaded fuel without catalyst burned

Potential emission using default factor = 0.52g

**2- Stroke Engines – Section 5b**

Annual consumption of petrol = 544,160 tons

Assumption: 5% of fuel used by 2-Stroke Engines =  $0.05 \times 544,160 = 27208$  tons

Default Emission factor range = 2.5- µg TEQ/t of unleaded fuel without catalyst burned

Potential emission using default factor =  $2.5 \times 27208 = 70mg$

**Diesel Engines – Section 5c**

Statistics gave the following data:

852 million liters consumed in 2001

Conversion factor: 1 L of Diesel = 0.00085 tons

Annual consumption of Diesel =  $852 \times 10^6 \times 8.5 \times 10^{-4} = 274,200$  tons

Default Emission factor range = 0.5-  $\mu\text{g}$  TEQ/t of Diesel burned

Potential emission in air using default factor =  $0.5 \times 274200 = 132$  mg

**Heavy Oil Fired Engines- 5d**

Available statistics = 1,669

Default Emission factor = 4-  $\mu\text{g}$  TEQ/t

Potential emission using emission factor =  
 $4 \times 1,669 = 0.0067\text{g}$

**Biomass Burning – 6a**

Statistics on uncontrolled bush fires is not available

**Waste Burning and Accidental Fires – 6b**

Statistics are hard to find though incidences of Waste burning and accidental fires do occur in the country

**Pulp and Paper Mills – section 7a**

Super Paper Products company has been contacted for information

**Chemical Industry – Section 7b**

There are no chemical industries in Ghana producing Chlorophenols, halogenated organics chlorine production etc.

**Petroleum Industry – Section 7c**

Questionnaires have been sent to the Tema Oil refinery for information

**Textile Plants – section 7d**

Data obtained from the three main textile factories in the country are being analysed

**Leather Plants- Section 7e**

There are no Leather plants in the country

**Drying of Biomass – Section 8a**

Biomass – wood chips, sawdust etc are dried in the sun without the use of any fuel.

Emission due to the burning of wood or treated wood is thus not expected

**Crematoria- Section 8b**

Statistics gave the following information:

360 cremations undertaken nationwide in 2002 with no control Default emission factors: 90  $\mu\text{g}$  TEQ/cremation

Potential emission in air =  $360 \times 90 = 0.032\text{g}$

**Smoke Houses- Section 8c**

Smoking of fish, and meat is a common practice in Ghana. These are small installations where combustion conditions involve virgin (untreated) wood hence minimal potential for dioxin formation.

**Dry Cleaning – Section 8d**

Statistics from the dry cleaning industry in Ghana is very limited to be of any use

Statistics gave the following information

(a) Average annual production of cigarettes by local manufacturers (1999-2002) = 1,400,000,000 pieces

(b) Average annual import of cigarettes for local consumption (1999—2002)= 185,000,000

Assuming that all these are consumed locally

Total annual consumption of cigarettes

= a + b = 1,585,000,000 (1.585 billion) pieces of cigarettes

Default Emission factor = 0.1pg/cigarette or  $1.0 \times 10^{-13}$

Potential emission in air using default factor

=  $1.585 \times 10^9 \times 1.0 \times 10^{-13}$  =

$1.585 \times 10^{-4}$  g = 0.00016g

**Disposal/Landfills – Section 9a**

Statistics on leachate or seepage from waste dumps are not available in the country

**Sewage and Sewage Treatment – Section 9b**

Wastewater arising from human sanitation and households is not well coordinated manholes are used in most residential and industrial concerns. Statistics are thus not available.

**Composting - Section 9c**

Composting is undertaken in the country in an uncoordinated manner and statistics are not available

**Open water Dumping – Section 9d**

Statistics gave the following information:

A. Inflow into the Chemu lagoon = 47,273 m<sup>3</sup> /day

B. Inflow into the Akosombo lake from Akosombo

Textiles limited (ATL) = 60,000 m<sup>3</sup> per month

Inflow into Chemu Lagoon = 47,273 m<sup>3</sup> /day

Conversion rate 0.0038 m<sup>3</sup> = 1Gal = 5 Liters

Total inflow into lagoon = 47,273 × 5/ 0.0038 liters

= 62.2million L/day

Total annual inflows into Chemu lagoon=

$62.2 \times 10^6 \times 365 = 22.8 \times 10^9$  L

Default emission factor in water for mixed

urban waste water = 5 pg TEQ/L

Potential emission into Chemu lagoon using default factors

=  $5 \times 22.8 \times 10^9 \times 10^{-12} = 0.15$ g

**Open water Dumping – Section 9d**

B. Inflow into Volta lake from ATL= 60,000 m<sup>3</sup> /month

= 60,000 × 12 = 720,000 m<sup>3</sup> /yr

Conversion rate 0.0038 m<sup>3</sup> = 1Gal = 5 Liters

Total annual inflows into Akosombo lake=

720,000 × 5/0.0038= 9.5 × 10<sup>8</sup> L

Default emission factor in water for mixed

urban waste water = 50 pg TEQ/L

Potential emission into Volta lake from ATL using

default factors = 50 × 9.5 × 10<sup>9</sup> × 10<sup>-12</sup> = 0.48g

**Waste Oil Disposal (Non-Thermal) – section 9e**

Statistics gave the following data for 2002.

Total Waste oil produced annually in Ghana in 2002

= 26161 tons.

Assumption 30% waste oil subjected to  
combustion by industry.

Waste oils burnt per year = 20% of 26161 = 5232 tons

Default emission factor in air = 4 µg TEQ/t

Potential emission using default factor

= 5 × 5232 = 0.026g

**Production Sites for Chlorinated Organics – Section 10a**

Chlorinated Organics are not produced in Ghana

**Production Sites of Chlorine – Section 10b**

There are no chlorine production sites in Ghana

**Formulation Sites for Chlorinated phenols – Section 10c**

There are no sites for formulating Chlorinated phenols in the country

**Timber Manufacture and treatment Sites. – Section 10d**

Timber manufacturing companies have been contacted for information

**PCB-Filled Transformers and capacitors- section 10e**

Information gathering is in progress

## 2 SOUTH AFRICA

**SOUTH AFRICA COUNTRY PRESENTATION AT THE REGIONAL WORKSHOP  
ON DIOXIN AND FURAN INVENTORY TRAINING  
KAMPALA, UGANDA  
12 – 15 AUGUST 2003**

**PRESENTED BY**

**Thabisa Mbungwana  
Nendy Manzini  
Nomazizi Mdi**

**Overview**

**Introduction**

Background

Sources and impacts

**Status in South Africa**

Generators

Sources

Control

Challenges

Legislation/Gaps

Management Systems (Monitoring, education & awareness)

Solutions

Plastic Bag Regulations

Air Quality Management Bill

Stockholm Convention

**Conclusions**

**Background**

**Sources**

Natural

Veld and forest fires

Volcanoes

Anthropogenic

Combustion (incomplete)

Hospital, municipal, domestic waste burning

Iron and steel plants

Tyre-burning

**Impacts of Dioxins and Furans**

Of the 210 dioxins and furans, only 17 pose potential health effects

Skin disorders such as chloracne

Weight loss

liver problems

birth defects  
cancer  
respiratory diseases

### **Status in South Africa**

#### **Generators**

Major sources are municipal, hazardous and hospital waste incineration  
Inefficient combustion processes (low temp, little oxygen) of organic and inorganic chlorinated compounds

Domestic waste combustion processes also contributors

PVC plastics (polyvinyl chloride) in waste are major contributors if burnt.

Unregulated burning of rubber tyres

Veld and forest fires

Coal burning –

**Majority of the disadvantaged population are in rural areas, use coal as source of energy  
energy production (ESKOM)– 3<sup>rd</sup> largest producer**

Industrial processes – pulp & paper, steel, aluminium, textile, cement

#### **Control**

Currently regulated under Atmospheric Pollution Prevention Act (APPA) of 1965

Regulated through

control of waste streams i.e. what is incinerated

amount of chlorine-based waste incinerated

incineration temperature and mixing-time

abatement equipment such as scrubbers

#### **Challenges**

Only controlled through guidelines which are not legally enforceable

Lack of technologies to measure dioxins and furans

Most generators are government hospitals, and National Environmental Management Act (NEMA) discourages organs of state from prosecuting each other.

Lack of education and awareness

in the case of domestic waste combustion and  
operators of incinerators

South Africa has Signed and ratified the:

Basel

Rotterdam

Stockholm

Had a NIPs inception workshop in January

In the process of formulating the National Coordinating Committee on POPs

#### **Solutions**

The Air Quality Management Bill, which mandates industry to do measurements of their emissions

provides for setting of standards

Plastic bag regulations aimed at reducing production and use of plastic bags

Ongoing research on less expensive methods of measuring dioxins and furans so that it can be possible to do inventories

Awareness and education will also help in waste management

SAFARI project might help us in characterisation and quantification of dioxins and furans in the region

The Toolkit- will assist in Identifying and Quantifying dioxins and furan releases

### **Conclusions**

Although SA does not have an inventory, it is clear from the number and the standard of incinerators that dioxins and furans are a serious problem.

Socio-economic conditions still lead to use of coal by disadvantaged communities

Availability of funds could encourage more research on dioxins and furans

Development of legislation is a great step in trying to address the environmental and health problems associated with dioxins and furans

**Thank you**



### **3 RWANDA**

#### **RWANDA COUNTRY PRESENTATION**

By

MR. NDIZEYE ELIEZER - Focal Point POPs

DR HABIMANA Jean Bosco

**RWANDA**

---

#### **INTRODUCTION**

- \* 26.368 s.q.km
- \* population agricole a 90 %
- \* utilisation des produits chimiques (industrie, sante, agriculture, .... )

#### **DEMARCHES EN COURS**

- \* ratification des conventions relatives a l'environnement a savoir:
- \* convention de vienne et protol de montreal
- \*convention de stockolm
- \*convention sur les changements climatiques
- \*convention de bale et de rotterdam en cours de ratification

#### **SOURCES POTENTIELLES DE PRODUCTION DE DIOXINES ET FURANES**

- \* utilisation et stockage des materiaux en metaux ferres ou non
- \* brulages du bois de chauffage
- \* combustion des dechets municipaux et medicaux
- \* emissions de toute sorte
- \*produits mineraux (briquetterie, tuileries etc...)

#### **CADRE INSTITUTIONNEL ET REGLEMENTAIRE**

- \* loi actualisee sur l'environnement et loi phytosanitaire en cours de promulgation
- \* politique industrielle et politique du commerce interieur actualisees
- \* politique sur l'environnement en cours d'actualisation
- \* mise en place de rwanda environment management authority (rema) operationnel en 2004 (selon prevision)

#### **MISE EN OEUVRE DE LA CONVENTION DE STOCKOLM**

- \* convention deja ratifiee (juin 2002)
- \* designation d'un point focal
- projet d'activites habilitantes disponible et finance par le fem (demarrage septembre 2003)

#### **BESOINS DU RWADA EN MATIERE DE GESTION DES PRODUITS CHIMIQUES**

- \* reglementation adaptee et une politique revisee en matiere de gestion des produits chimiques
- \* inventaire des pops en general

- \* identification et quantification des sources de dioxines et furanes
- \* information et sensibilisation de la population a tous les niveaux

## **CONCLUSION**

Les outputs de l'atelier devront contribuer a renforcer nos capacites nationales en gestion des pops en general et des dioxines et furanes en particulier.

## 4 KENYA

### DIOXINS AND FURANS IN THE KENYAN ENVIRONMENT

by Moturi M.C.Z., Munyao G.M. and Mwai M.W.

Sub-regional Workshop on Dioxins and Furans Inventory Training, Kampala, Uganda, 12-15 August, 2003

---

#### 1. Background:

Kenya signed the Stockholm Convention on 23.5.2001.

Established Kenya POPs Coordinating Office in April, 2002

Formed a National Coordinating Committee in June, 2002

Held a National Stakeholders Workshop in June, 2002

Priority POPs - identified w.r.t SC

Inventory exercise recommended to gauge magnitude of the problem of POPs in Kenya

Inventory Process initiated through training of officers by experts from FAO, UNITAR and UNEP

#### 2. Inventories

Quantification of pesticides in earlier attempts were incomplete

Process being reviewed to update the data

PCBs - national analytical capacity identified, e.g. University of Nairobi, KEPHIS, and others

PCBs inventory - about to start

DDT - a technical committee established to coordinate debate on its use and alternatives in malaria control

Wastes and Stockpiles in some establishments found

Some contaminated sites have been identified in the past

Bad environmental practices e.g smouldering of copper wires, open burning of plastics, etc identified.

#### Dioxins and Furans

Dioxins and Furans are by-products released during the various processes

Possible sources have been identified in the convention.

Priority sources in Kenya being addressed.

#### 3. Probable Sources of Dioxins and Furans- in Kenya

Examples:

Pulp and Paper Industries

Municipal Waste Combustion

Medical Waste incineration

Forest and Grassland Fires

Household wood combustion

Non-ferrous metal industry

Waste oil burning

Industrial Production Processes e.g. Steel, galvanizing, leather finishing

Traffic emissions  
Thermal power generation  
Scrap iron/Aluminium recycling

### 3.1. Waste Incineration

#### 3.1.1. Municipal solid waste

e.g. Nairobi- approx. 2000 tonnes/day

General municipal solid waste is disposed in uncontrolled dump sites, sewage sludge dumped without treatment

Most methods of disposal are through uncontrolled open burning (*Please see questionnaire- Mr.Kihumba*)

Other wastes are openly burnt at backyards

Sorting of wastes rarely practised

Scavengers often target scrap metal and rigid recyclable plastics. The rest is burnt.

Recycling facilities exist for metals and recyclable plastics, is a major industry in Kenya.

Recycling of polythene plastics is minimal and they are commonly burnt at dumpsites and backyards including tetrapack packagings. Volumes to be quantified.

These are also used for lighting stoves, (hence need for enhanced awareness creation on the inherent dangers of the emissions) to women and vulnerable groups.

#### 3.1.2. Medical waste

Partial segregation carried out in some hospitals

A number of hospitals have incinerators for biomedical waste

Other wastes are mixed with municipal waste and often dumped at the uncontrolled dumpsites. However this is now being discouraged e.g. through KEPI.

### 3.2. Pulp and Paper Industries

Largest Pulp and Paper in East Africa, located in Western Kenya (current capacity about 130 tonnes/year)

Uses elemental chlorine for pulping,

Continues to use old technology (hence need for incorporating BATs/BEPs)

### 3.3. Industrial, Grassland and Forest Fires

Frequent industrial accident fires have been reported

Accidental forest fires also occur during the dry season

Data required on frequency of the fires, areas destroyed, and types of trees and vegetation affected

Grassland fires

- accidental and

- intentional for vegetation regeneration/farming purposes- especially the traditional farming methods. This is not a BEP

### 3.4. Non-ferrous metal industry

A number of industries recycle aluminum products to produce aluminum billets (current production capacity- 7400 tonnes/year)

This activity has reduced the visual presence of aluminum cans in the environment, which is a positive attribute.

There is considerable recycling activity of aluminum by the informal sector

Main problem is the disposal of the resulting aluminum dross which is hazardous  
A number of companies use zinc, Cu, and others to galvanize their products

### 3.5. Oil refinery

#### 3.5.1. Crude oil refining

The major oil refinery in the EA region *produces* only leaded gasoline, excess gas flared.  
Requires BAT to enable it produce unleaded gasoline  
Discussions underway to source US\$60m to upgrade facility  
Disposal of sludge is an issue that is not resolved yet. Ongoing POPs inventory will address this.

#### 3.5.2. Used/waste oil

used/waste oil generation (1990)-18000mt/a  
Current recoverable for recycling 5000mt/a  
At least 2 enterprises re-refine waste/used lubricating oils.i.e. 10% of the available.  
These however operate below capacity  
-Due to poor collection and management systems  
Regulations being reviewed - to enforce the various relevant regulations to control indiscriminate dumping of used oils and use as furnace oil especially EMCA. Currently regulations and guidelines are being developed.

### 3.6. Household Fires (Wood combustion)

About 80% of the population is based in the rural areas  
Mostly depend upon firewood for domestic energy needs. Use of paraffin for lighting, cooking is extensive.  
Many institutions use wood fuel

### 3.7. Industrial Processes

A number of tea factories use wood/fuel oil for combustion.  
Many industries do use industrial grade oil for their energy requirements especially tea factories.  
Often there is lack of proper management of the sludge and spillage.  
Need to incorporate BATS/BEPs in production processes through energy efficiency programmes  
Application and adoption of cleaner production is ongoing in a number of factories.

### 3.8. Transportation Sector

The amount of traffic has increased in the recent past after liberalisation of international trade  
Currently about 500 000 registered motor vehicles-( >20,000 new registrations/year)  
The number of petrol-fired public vehicles has drastically reduced being replaced by diesel-fired vehicles  
But the number of private vehicles (petrol) has also increased drastically  
Old transit vehicles from Eastern African Region traverse Kenyan territory- some poorly maintained.  
Unleaded gasoline has been introduced through direct imports as an alternative.  
But the local refinery is yet to be retrofitted to produce unleaded gasoline  
Best environmental practices will play a crucial role in management of other emissions

### 3.9. Thermal Power Generation

Currently 23% of energy is thermally generated

The country relies on both renewable and non-renewable energy sources will use Toolkit to quantify emissions.

-e.g. hydro, geothermal, solar, and wind

Several sugar companies generate power using baggasse

More thermal projects being initiated

A number of companies have stand-by thermal power generators

### 3.10. Crematoria

A number of crematoria are operational in some cities and towns in Kenya.

Burning of animal carcasses

Their emissions may need control

Inventory of crematoria planned

BEPs

### 3.11. Asphalt mixing plant

Most of these plants operate without air pollution control facility

Due to the new environmental legislation, some contractors have attempted to install air pollution control equipment in their plants.

The EMCA 1999 offers economic incentives (disincentives) for retrofitting old plants with cleaner production technologies

### 3.12. Lead production

Main source of lead is from battery manufacturing (Back-up, battery, motor vehicle/dry battery, paint industry,)

One plant recycles lead from used batteries in Athi River. Quantities still unknown.

The plant lacks proper air pollution control systems.

### 3.13. Steel Production

Current production capacity Approx. 1m tonnes/year

Several enterprises recycle scrap iron

Problems associated with steel production include

- Emissions

- Slag

Fabrication of welding machines by SMEs and the informal sector.

### 3.14. Cement Factories

3 Dry process cement plants are operational in the country

Their air control equipment operate at different levels of efficiency

Environmental audits will evaluate the status of the sector.

### 3.15. Other Industries

#### Glass industry

- Operational but adversely affected by imports

#### Textile plants

- 52 Fabric manufacturers with combined installed capacity of 115m M<sup>2</sup>.

#### Leather Plants

- approx. 20 tanneries
- many of them process up to wet-blue stage
- few have finishing facilities

#### Ceramics Plants

### Conclusions

Kenya believes that this workshop will provide the tools necessary to systematically quantify dioxins and furans.

Simple methodologies would be useful in achieving this goal.



## 5 GAMBIA

### NATIONAL IMPLEMENTATION PLAN FOR THE STOCKHOLM CONVENTION IN THE GAMBIA

---

#### ***Geography/Demography***

Location- latitude 13 and 14 degrees N

Coastline -81 km

Area - 11300km<sup>2</sup>

Rainfall- 850-1200mm/year

Population-1.365million (2.2% growth rate)

Population density-128 person/km<sup>2</sup>

#### ***INTRODUCTION***

The National Assembly ratified the Stockholm convention in June 2003

Article 7 of the convention states that:

Each Party shall

(a) Develop and endeavour to implement a plan for the implementation of its obligations under this convention

(b) Transmit its implementation plan to the conference of parties within two years of the date on which this convention enters into force for it; and

(c) Review and update as appropriate its implementation plan on a periodic basis and in a manner to be specified by a decision of the conference of parties.

#### **OBJECTIVES**

Develop a NIP that meets the requirements of the Stockholm Convention and contributes to the effective management of POPs in the Gambia

#### ***NIP Development - Phases***

Establishment of Coordinating Mechanism and Process organization

Establishment of POPs inventories and Assessment of National Infrastructure and capacity.

Priority Assessment and Objective setting

Formulation of national implementation plan; and

Endorsement and submission of NIP

#### **Establishment of Coordinating Mechanism and Process Organization**

Establishment and successful meetings of the National Coordinating Committee

Establishment and initial meetings of the Project Coordinating Unit

Well attended stakeholders Workshop to raise awareness and involve stakeholders

High level Meeting to secure commitment to the outcomes of the stakeholders workshop

Individual consultations with major stakeholders to raise awareness, request their priority concerns and to engage their assistance in the development of the NIP.

Initial information dissemination and awareness raising campaign

Engagement of theater groups to develop sketches and plays to convey messages about appropriate chemicals management by TV, Radio and other traditional means.

### **Establishment of POPs inventories and Assessment of National Infrastructure and capacity.**

The Objectives of this phase is to carry out the following:

Specific assessments, including data generation and gathering required to provide the necessary background information and baseline to allow the Gambia to understand the scope of the POPs issue and to complete the NIP

To identify gaps in resources, capacity and knowledge which prevent the complete assessment of the status of POPs

To identify country needs in terms of technical expertise and other assistance to complete the NIP

To facilitate coordination and integration with national sustainable development, chemical management and pollution control policies

To facilitate coordination with regional, sub regional and international agreements

### **LEGISLATION**

National Environmental Management Act (NEMA) 1994

Environmental discharge permitting regulation 1999

Environmental Protection (Prevention of Dumping) Act (EPA) 1988

Draft Waste Management Bill 2003

### **TASK TEAMS**

Updating of the National Profile

National Profile on chemicals management compiled in late 1990s to reviewed and update to integrate POP specific issues.

POP pesticides inventory and assessment

Assessment of DDT in malaria control

PCB Inventory and Assessment

Unintentional Produced POPs Inventory and Assessment

### **Unintentional Produced POPs Inventory and Assessment**

Open burning Of Municipal Waste and Medical waste

Power Generation

Transport

## 6 NIGERIA

### **NIGERIA COUNTRY REPORT ON STATUS OF INVENTORY OF DIOXINS AND FURANS**

Prepared By:

Federal Ministry of Environment, Nigeria;

for the Subregional Workshop on “National Inventory of Dioxins and Furan Releases”, held in Kampala, Uganda, 12-15 August 2003

---

#### **COUNTRY PROFILE**

##### **LOCATION**

- West Africa Sub-region
- Latitudes 4.16 and 13.52 North; Longitudes 2.40 and 14.32 East

##### **LAND AREA**

- North/South Axis: 1646 Km
- East/West Axis: 1127 Km

##### **CLIMATE**

- Humid Sub-Tropical

##### **POPULATION**

- 105.2 million (NPC, 1996)
- 71% rural-based
- High rate of urbanisation due to significant rural-urban drift

##### **LANGUAGE & COMMUNICATION**

- Official language is English
- Major local languages are Hausa, Ibo and Yoruba and further 250-300 linguistic grps.

##### **SYSTEM OF GOVT.**

- Democracy

##### **POLITICAL/GEOGRAPHIC STRUCTURE**

- 36 States and a Federal Capital Territory (Abuja)
- 774 Local Govt. Areas
- 6 Geopolitical Zones
- 3-tier govt. system: National, State & LG

##### **ECONOMIC SECTORS**

- Agriculture
- Industry
  - oil
  - mining & quarrying
  - manufacturing
- Business Entrepreneurship

##### **PROJECT BACKGROUND**

Dioxins and Furans as part of the Dirty Dozen (12 POPs)

GLOBAL CONCERN TO REDUCE AND ELIMINATE POPs RELEASES AND EMISSIONS

UNEP INITIATIVE

**PROJECT OBJECTIVE**

To identify the sources and estimate releases of dioxins and furans, with a view to reducing and/or eliminating their releases in line with the objectives of the global convention on POPs.

**PROJECT SUPPORT**

## UNEP CHEMICALS

1. Financial - \$11,250.00
2. Technical- Standardized Toolkit for Identification and Quantification of Dioxins and Furans Releases

## FG of NIGERIA

1. Financial - N1.35m
2. In kind – Office space, Office equipment, Meeting/Workshop Halls

**ACTION PLAN**

PRE – INVENTORY ACTIVITIES

ACTUAL INVENTORY

POST INVENTORY ACTIVITIES

SUBMISSION OF REPORT TO UNEP CHEMICALS

PRE-INVENTORY ACTIVITIES

IDENTIFICATION OF RELEVANT STAKEHOLDERS

- Industries/Manufacturers' association
- Regulatory agencies
- Community reps.

APPOINTMENT OF LOCAL CONSULTANT

STAKEHOLDERS' CONSULTATIVE/AWARENESS RAISING MEETINGS

ZONAL SENSITIZATION WORKSHOP

- 3 Zones (Lagos, Port Harcourt and Kaduna)
- Adoption of Standardized Tool Kit

PREPARATION OF INVENTORY QUESTIONNAIRE

- Main elements (Standard questionnaire)

**ACTUAL INVENTORY**

TARGET INDUSTRIES/ RELEASE SOURCES

- Oil & Gas industries
- Paint industries
- Textile industries
- Water Boards
- Pharmaceutical industries
- Pulp & Paper industries
- Glass industries
- Power Generation Plants/Incinerators

METHODOLOGY

- Zonation ( 3 zones )
- Zone 1 : Adamawa, Bauchi, Benue, Borno, FCT, Gombe, Jigawa, Kaduna, Kano, Katsina, Kebbi, Kogi, Kwara, Nassarawa, Niger, Plateau, Sokoto, Taraba, Yobe, Zamfara
- Zone 2 : Lagos, Ogun, Oyo, Osun, Ondo, Ekiti
- Zone 3: Abia, A/Ibom, Anambra, Bayelsa, C/River, Delta, Ebonyi, Edo, Enugu, Imo, Rivers

- Assignment of inspectors to zones
- Questionnaire Administration

Sector	Distribution	Respondents
i. Cement	9	4
ii. Incinerators	8	1
iii. Oil & Gas	7	3
iv. Textile	25	4
v. Paint	12	4
vi. Water Board	37	3
vii. Pharm	9	2
viii. Pulp/Paper	7	4
ix. Iron/ Steel	12	3
x. Transport	15	4
xi. Glass	8	2

Reference to existing/available data e.g.

- Manufacturers' Association of Nigeria (MAN) Directory
- World Bank report on Industrial pollution load

## RESULTS

### EXISTING DATA

ferrous & non-ferrous metal production, power generation and heating, waste incineration  
 production of mineral product, uncontrolled combustion processes & transport  
 production & use of chemicals and consumer goods, disposal and miscellaneous

### LIMITATIONS

Inadequate sensitization of relevant stakeholders especially the industries

Misconception on the use of the data

Poor administration of questionnaire

Inadequate resource allocation

- no. of inspectors assigned
- logistics

Coverage too ambitious

Poor response by industries

### OUTSTANDING ACTIVITIES

- **DATA ANALYSIS AND REPORT WRITING**
- **NATIONAL REVIEW WORKSHOP**
- **DEVELOPMENT OF NATIONAL RELEASE REGISTER**
- **DEVELOPMENT OF NATIONAL REDUCTION/ELIMINATION ACTION PLAN**



## 7 EGYPT

**Ministry of State for Environmental Affairs  
Egyptian Environmental Affairs Agency**

**Sub- regional Workshop on Dioxin and Furan Inventory Training, Kampala, Uganda,  
12-15 August 2003**

by

**Chem. Ahmed Gamal Daoud  
Eng. Eman Mohamed Elmahruky  
Eng. Yasser Badr El Den**

**Hazardous Substances Dept.  
Ministry of State for Environmental Affairs  
Egyptian Environmental Affairs Agency**

---

**Location** Egypt enjoys a unique geographical location. It is an Arab African country, being situated on the northeastern corner of the African continent. It is also partly an Asian country, being linked to Asia by the Sinai Peninsula.

**Country name:** Conventional long form: **Arab Republic of Egypt**

conventional short form: **Egypt**

local long form: **Jumhuriyat Misr al-Arabiyyah**

local short form: **Misr Government type: Republic**

**Capital: Cairo**, which is the seat of government and is the place where most diplomatic missions, have their offices

**Area** Egypt has a total area of about 1002000 Sq. kilometers, of which only 35189 Sq. kilometers, i.e.; 3.6% are populated.

### **Population**

The estimates of population inside Egypt on 1st of January 2001 reached 64.7 millions and on 1st of July 2002 reached 69.5 millions

### **What is Dioxin?**

Dioxins and furans are common names given to a group of persistent, bioaccumulative and very toxic chemicals. These chemical include 75 chlorinated dibenzo dioxins and 135 chlorinated dibenzo furans. The most toxic of these compounds is 2.3.7.8-tetrachlorodibenzo-p-dioxin. The other 209 dioxin and furan chemicals, or congeners, are less toxic than TCDD. For this reason dioxin in the environment is measured and reported in terms of TCDD equivalents.

### **Where does it come from ?**

- The use of chlorine in a chemical process.
- The combustion of a chlorine-containing material (such as plastic).
- Paper mills which use chlorine bleaching in their process
- The production of Polyvinyl Chloride (PVC) plastics.

### **Health effects related to exposure to dioxin.**

- Sperm count in men worldwide has dropped to 50% of what it was 50 years ago.
- The incidence of testicular cancer has tripled in the last 50 years, and prostate cancer has doubled.
- In 1960, a woman's chance of developing breast cancer during her lifetime was one in 20. Today the chances are one in eight.

#### **How are we exposed to dioxin?**

The major sources of dioxin are in our diet. Since dioxin is fat-soluble, it bioaccumulates up the food chain and it is mainly (97.5%) found in meat and dairy products.

In fish alone, these toxins bioaccumulate up the food chain so that dioxin levels in fish are 100,000 times that of the surrounding environment.

#### **How Do We Stop Dioxin Exposure?**

- 1) An immediate halt to the incineration of municipal, hazardous, medical, military and radioactive waste, and any such wastes kilns, or other devices; and incinerated in cement and or aggregate
- 2) An immediate commencement of a phase-out of the industrial production and the use of chlorinated organic compounds (including plastic, PVC).

#### **The national strategy for zero dioxin that would include these actions:**

- Place a moratorium on new dioxin permits.
- Should sunset existing dioxin permits.
- Place a moratorium on all new incinerators
- Phase out the burning of chlorinated wastes at existing incinerators. The use of chlorine and chlorine based bleaches in the paper industry should be eliminated.
- A timetable for the rapid phase out of PVC should be established.

**Dioxins & Furans in Stockholm Convention on Persistent Organic Pollutants (POPs) Unintentionally Produced POPs**• Convention lists 20 source types that have potential for formation and release of unintentionally produced POPs to environment [Annex C Parts II (7 high potential) & III]:

- combustion sources (incinerators, boilers,motor vehicles)
- Thermal source in metallurgical industry
- Pulp production with elemental chlorine
- Some chemical production processes
- Textile and leather dyeing and finishing
- Several waste recovery and disposal practices
- Destruction of animal carcasses
- crematoria

**Goal= continuing minimization and, where feasible, ultimate elimination of total releases of chemicals in Annex C derived from anthropogenic sources [dioxins, furans, HCB, PCBs]**

#### **Parties shall:**

- develop action plans within 2 year of entry into force
- and implement their plans
- 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

**For source categories with potential for comparatively high formation & release of POPs to environment, Parties shall:**

**-for new source,**

- promote and, as provided for in an action plan, require use of best available technique (BAT), and
  - Phase in 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 source, promote use BAT and BEP
- For other source categories (Annex C Part III), Parties shall:
- for new and existing source, promote use of BAT & BEP

**Status of Egypt**

**Hazardous Substances Policy**

“ This policy is to identify and mitigate hazards of chemicals and aiming at the protection of the Egyptian environment and human health from the risks of hazardous substances, whether they are imported or generated inside. This protection covers all stages of production, handling, storing, and safe disposal. In addition, substitution of hazardous by non/less hazardous alternative materials during the production process, whenever possible. This can be achieved through the adoption of cleaner production approach.”

**1-Egypt issued Law number 4 of 1994 promulgating the environment Law and its Executive Regulation**

One of the main objectives of law no. 4 is;

To protect the human health and the environment from the harmful effects of hazardous substances

**This law regulates ;**

- the condition and the order of import, manufacture, trade, export, and use of hazardous substances.
- the state control of all activities.
- The rights and duties of handler of hazardous substances.

**2-International Conventions**

**-Basel convention**

Egypt ratified the convention in 1993

**-Stockholm Convention**

Egypt ratified the convention in 2003

**-Rotterdam Convention**

Egypt is preparing to sign the convention

**3-Establish a national committee for international convention dealing with hazardous substances and waste (Basel, POPs, PIC)**

**4- Establish the Egyptian Hazardous Substances Information and Management System (EHSIMS)**

## UNEP Chemicals' Presentations

### 1 STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS (POPs ): UNINTENTIONAL PRODUCED POPs

By  
Fatoumata Keita-Ouane  
UNEP Chemicals

#### Background: What are POPs?

- organic (carbon-based) compounds
- natural or anthropogenic origin
- resist degradation in environment
- low water + high fat solubility
- bioaccumulate in fatty tissues
- semi-volatile + occur in air, water & soil
- regional and global distribution
- toxic to humans and wildlife

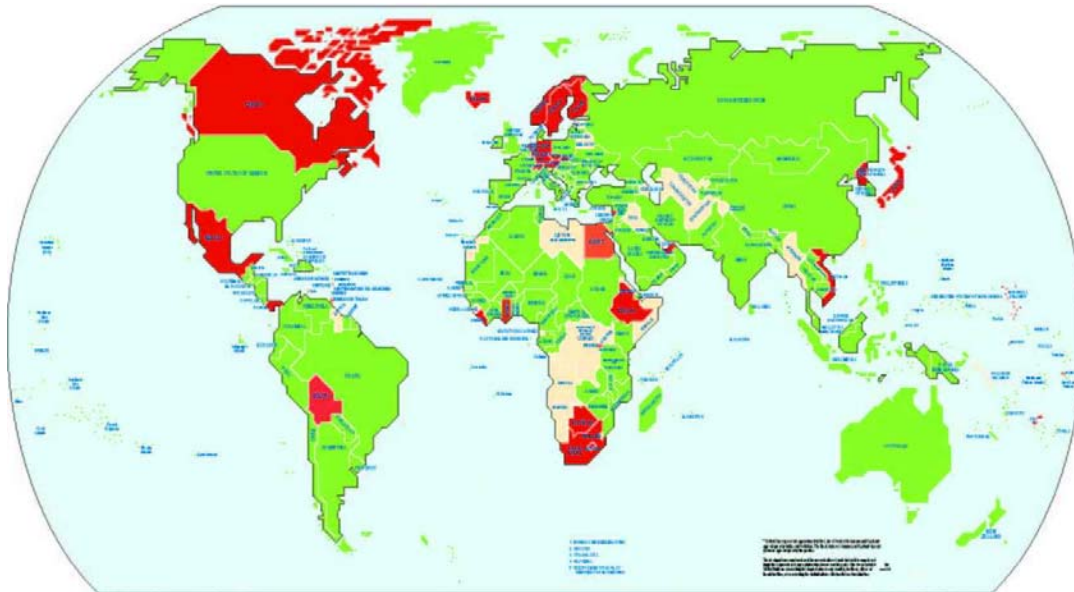
#### The Initial 12 POPs

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

## Stockholm Convention

- Adopted in Stockholm on 22 May 2001
- As of 4 August 2003
- 151 signatories
- 34 Parties

## Signatures and Ratifications



## Overview: Convention

- Stockholm Convention an International legally binding instrument: parties have the intention to be bound legally and not only through political commitment
- The agreement describes the legal obligations of the parties

## Convention Provisions

Four 4 main areas of Convention:

1. General obligations
2. Control provisions
  - Intentionally Produced POPs
  - Unintentionally Produced POPs
  - Stockpiles and Wastes
3. Procedure for adding new POPs
4. Financial and technical assistance

### **Unintentionally Produced POPs**

- Covered in Article 5 and Annex C
- dioxins, furans, HCB, PCBs
- No intentional production, but unwanted by-products
- Primary sources: industrial-chemical, combustion processes
- Secondary sources: reservoirs
- Goal is continuing minimization and, where feasible, ultimate elimination of total releases of chemicals in Annex C derived from anthropogenic sources

### **Unintentionally Produced POPs**

Parties must:

- develop action plans within 2 years of entry into force, and implement their plans
- 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 (including but not limited to the industrial source categories listed in Annex C Part II), 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

### **Unintentionally Produced POPs**

Industrial source categories with potential for comparatively high formation and release:

- Waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge;
- Cement kilns firing hazardous waste;
- Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching;

## **Unintentionally Produced POPs**

Industrial source categories with potential for comparatively high formation and release (cont):

The following thermal processes in the metallurgical industry:

- Secondary copper production;
- Sinter plants in the iron and steel industry;
- Secondary aluminium production;
- Secondary zinc production.

## **Unintentionally Produced POPs**

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

- variety of combustion sources
- chemical production processes releasing unintentionally produced POPs
- waste recovery and disposal practices
- textile & leather dyeing & finishing
- motor vehicles
- destruction of animal carcasses
- crematoria

## **General Obligations**

Report to the COP on:

- measures taken by Party to implement the Convention (specific obligations)
- effectiveness of measures taken
- data/estimates for total quantities of POPs traded and list of States involved

## **General Obligations**

- Develop 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

### **Article 7 - Implementation plans**

1. Each Party shall:

- (a) Develop and endeavour to implement a plan for the implementation of its obligations under this Convention;
- (b) Transmit its implementation plan to the Conference of the Parties within two years of the date on which this Convention enters into force for it; and

#### **Concept - What is a NIP?**

- A planning document explaining how the commitment made will be addressed
- identifies country situation
- sets priorities for initiating future activities to protect health and environment from POPs
- provides framework for a country to develop and implement priority policy and regulatory reform, capacity building and investment programmes

### **Article 7 - Implementation plans**

(c) Review and update, as appropriate, its implementation plan on a periodic basis and in a manner to be specified by a decision of the Conference of the Parties.

### **Article 7: Implementation Plans**

As part of its implementation plan under Article 7:

- Each 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

#### **Concept - What is a NIP?**

A planning document explaining how the commitment made will be addressed

- identifies country situation
- sets priorities for initiating future activities to protect health and environment from POPs
- provides framework for a country to develop and implement priority policy and regulatory reform, capacity building and investment programmes

### **INC-7 Decision on Toolkit**

- Noted revised Toolkit as the guidance for undertaking release reporting for Annex C POPs
- Governments to provide comments on the Toolkit by 31 March 2003 – includes information non D/F
- Secretariat to develop an updated and expanded version of the Toolkit for submission to COP1
- Secretariat to develop a proposal for ongoing review & update of Toolkit

### **Concept - What is an action plan**

Action plans are part of a NIP

Detailed strategic workplans on specific issues

May cover

- Source identification
- Release reduction (of POPs byproducts listed in Annex C)
- development and maintenance of source inventories and release estimates
- measures including the use of best available techniques and best environmental practices

### **National Implementation Plans - Benefits**

The NIP will:

- inform decision-makers and citizens
- provides a framework for prioritizing activities
- Build national institutional capacity to address POPs management and hence chemical management
- Promote scientific knowledge, research capacity

### **Stockholm Convention**

Further information:

- [www.chem.unep.ch](http://www.chem.unep.ch)
- [www.pops.int](http://www.pops.int)
- [chemicals@unep.ch](mailto:chemicals@unep.ch)
- [ssc@chemicals.unep.ch](mailto:ssc@chemicals.unep.ch)

## 2 UPDATE ON BAT AND BEP

By  
Fatoumata Keita-Ouane  
UNEP Chemicals

### **BAT and BEP: Context**

Stockholm Convention:

Article 5 – Unintentionally Produced POPs

Goal is continuing minimization and, where feasible, ultimate elimination of total releases of chemicals in Annex C derived from anthropogenic sources (dioxins, furans, HCB, PCBs)

### **Unintentionally Produced POPs**

For sources with the potential for comparatively high formation & release of POPs to the environment (including but not limited to the industrial source categories listed in Annex C Part II), 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

### **Unintentionally Produced POPs**

#### **Industrial source categories with potential for comparatively high formation and release:**

- Waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge;
- Cement kilns firing hazardous waste;
- Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching;

## **Unintentionally Produced POPs**

### **Potential for high release (cont)**

The following thermal processes in the metallurgical industry:

- Secondary copper production;
- Sinter plants in the iron and steel industry;
- Secondary aluminium production;
- Secondary zinc production.

## **Unintentionally Produced POPs**

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

- variety of combustion sources
- chemical production processes releasing unintentionally produced POPs
- waste recovery and disposal practices
- textile & leather dyeing & finishing
- motor vehicles
- destruction of animal carcasses
- crematoria

### **BAT and BEP**

- Annex C Part V - General guidance on BAT & BEP
- Article 5 paragraph (d) - guidelines on best available techniques and best environmental practices to be adopted by decision of the Conference of the Parties

### **Best Available Technique (BAT)**

Article 5 (f)

"Best available techniques" means the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for release limitations designed to prevent and, where that is not practicable, generally to reduce releases of chemicals listed in Part I of Annex C and their impact on the environment as a whole.

## **Best Available Technique (BAT)**

Annex C Part V

The concept of best available techniques is not aimed at the prescription of any specific technique or technology, but at taking into account the technical characteristics of the installation concerned, its geographical location and the local environmental conditions.

General considerations and measures

## **Best Environmental Practice (BEP)**

Article 5 (f)

"Best environmental practices" means the application of the most appropriate combination of environmental control measures and strategies;

Annex C

The Conference of the Parties may develop guidance with regard to best environmental practices.

## **BAT and BEP Expert Group**

- INC6 established an expert group to develop guidance for Parties on best available techniques (BAT) and best environmental practices (BEP)
- to be approved by COP1
- to be used by Parties in developing and implementing their national action plans for unintentionally produced POPs

## **BAT and BEP Expert Group**

- 15 from developing countries
- 3 from economies in transition
- 18 from developed countries
- 2 IGOs
- 4 ENGOs
- 4 other NGOs
- Co-Chairs
  - Bob Kellam USA
  - Sergio Vives Chile

## **BAT and BEP Expert Group**

1st Meeting 6-10 March 2003 - US

2nd Meeting 8-12 December 2003 - Chile

3rd Meeting – Africa (?)

### **BAT and BEP Expert Group: Issues**

#### Scope

- Development of guidelines and guidance
- groups of source categories
  - Large stationary production processes
  - Non-thermal industrial processes utilizing (free) chlorine
  - Waste management and disposal
  - Diffuse activities

### **BAT and BEP Expert Group: Inter-sessional work**

Assembly and synthesis of information on:

- cement kilns
- open burning
- medical waste incinerators
- pulp and paper production using chlorine
- chemical production
- non-ferrous metal production

### **3 EXISTING DIOXIN INVENTORIES WORLDWIDE AND METHODOLOGY TO ESTABLISH COMPARABLE DIOXIN INVENTORIES**

By  
Dr. Heidelore Fiedler  
UNEP Chemicals, 11-13 chemin des Anémones,  
CH-1219 Châtelaine (GE), Switzerland  
e-mail: hfiedler@unep.ch

#### **PCDD/PCDF Inventories - Present Status**

1999 - UNEP's compilation of dioxin inventories:

- only 15 national inventories available  
(plus 3 countries with very preliminary inventories)
- concentration on Northern hemisphere (ex. AUS)
- only OECD countries
- estimation of emissions to air preferentially
- not all sources considered

Dioxin'2000 ⇒ Inventory from New Zealand

2001 ⇒ Inventory from Hong Kong, SAR

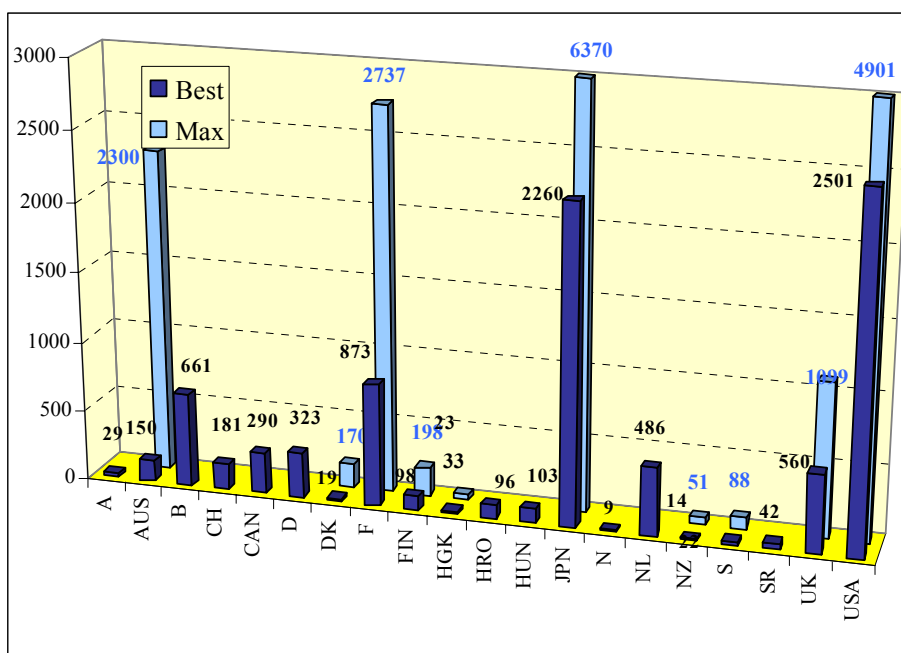
⇒ No harmonized methods to establish inventories

⇒ PCDD/PCDF inventories are not comparable

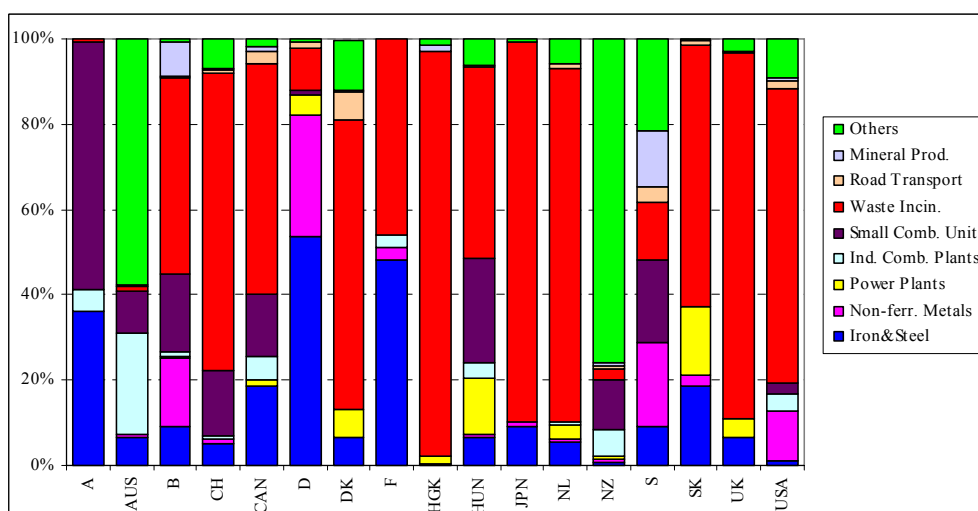
#### **“Global” Emissions to Air**

- Annual emissions to air = 8,900 g I-TEQ  
Upper-bound estimate = 20,000 g I-TEQ/a
- 20 national inventories (but for different years)
- Almost no information on emissions to water, land, with residues and products
- Biased inventories: ALL countries estimate emissions from waste incinerators
- Other sectors, esp. iron and steel, non-ferrous metal industry, ignored by many countries

### PCDD/PCDF Emissions (g TEQ/a)



### Source Distribution per Country



### European Emission Inventory

- 17 Countries. Concentrations in g I-TEQ/a

	1995	2000	2005
Total	3685-6470	2435-4660	1959-3834
of these:			
- Industrial Sources	2793-4165	1589-2516	1135-1786
- Non-ind. Sources	892-2305	846-2144	824-2048

### **Stockholm Convention - Article 5 (a) (i)**

- (a) Develop an action plan ... within two years of the date of entry into force of this Convention .... Designed to identify, characterize and address the releases of the chemicals listed in Annex C ...
- (i) An evaluation of current and projected releases, including the development and maintenance of source inventories and release estimates, taking into consideration the source categories identified in Annex C

### **Toolkit: Methodology to establish complete, comparable PCDD/PCDF Inventories (220 pages + EXCEL file).**

Application finalized in Thailand, Uruguay, Philippines, Vietnam, Brunei, Lebanon, Jordan.  
Underway in Argentina, Cuba, Paraguay

### **UNEP Inventory Toolkit**

- Toolkit (1st edition) consists of
  - Report (220 pages) + EXCEL File
- 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

### **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.

## Common Approach for Inventories

Annual PCDD/PCDF emission estimate:

- Source Strength (Dioxin emission per year)  
= Emission Factor x Activity Rate (1)

or

- Source Strength (Dioxin emission per year)  
= Emission Concentration x Flux (2)

(Emission factor = mass of PCDD/PCDF per ton of feed processed or product produced)

## Calculating Emissions

- Activity rates:
- country-specific
  - economic data, statistics
  - “non-dioxin-like”

- Emission factors:
- identical for same technology
  - default emission factors (provided in Toolkit)
  - own measured data (quality requirements !)

## “Complete” Inventories

- Cover all sources:
- industrial
  - non-industrial

Sources not present in a country: to be highlighted

- Cover all vectors:
- air
  - water
  - land
  - products, and
  - residues.

Some may be identified for assessment only

## 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.

### 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

No.	Main Source Categories	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 releases from this process.

### Category 1 – Waste Incineration

No.	Subcategories of Main Category	Potential Release Route				
		Air	Water	Land	Product	Residue
1	Waste Incineration	X				X
a	Municipal solid waste incineration	X	(x)			x
b	Hazardous waste incineration	X	(x)			x
c	Medical waste incineration	X	(x)			x
d	Light-fraction shredder waste incineration	X				x
e	Sewage sludge incineration	X	(x)			x
f	Waste wood and waste biomass incineration	X				x
g	Destruction of animal carcasses	X				x

### Category 2 – Ferrous and Non-Ferrous Metal Production

No.	Subcategories of Main Category	Potential Release Route				
		Air	Water	Land	Product	Residue
<b>2</b>	<b>Ferrous and Non-Ferrous Metal Production</b>	<b>X</b>				<b>X</b>
a	Iron ore sintering	X				x
b	Coke production	X	x	x	x	x
c	Iron and steel production and foundries	X				x
d	Copper production	X				x
e	Aluminum production	X				x
f	Lead production	X				x
g	Zinc production	X				x
h	Brass and bronze production	X				x
i	Magnesium production	x	x			x
j	Other non-ferrous metal production	x	x			x
k	Shredders	X				x
l	Thermal wire reclamation	X	(x)	x		x

### Category 3 – Power Generation and Heating/Cooking

No.	Subcategories of Main Category	Potential Release Route				
		Air	Water	Land	Product	Residue
<b>3</b>	<b>Power Generation and Heating/Cooking</b>	<b>x</b>		<b>(x)</b>		<b>X</b>
a	Fossil fuel power plants	x				x
b	Biomass power plants	x				x
c	Landfill, biogas combustion	x				x
d	Household heating and cooking (biomass)	x		(x)		X
e	Domestic heating (fossil fuels)	x		(x)		X

### Category 4 - Production of Mineral Products

No.	Subcategories of Main Category	Potential Release Route				
		Air	Water	Land	Product	Residue
<b>4</b>	<b>Production of Mineral Products</b>	<b>X</b>				<b>X</b>
a	Cement production	X				x
b	Lime production	X				x
c	Brick production	X				x
d	Glass production	X				x
e	Ceramics production	X				x
f	Asphalt mixing	X			x	x

**Category 5 – Transport**

No.	Subcategories of Main Category	Potential Release Route				
		Air	Water	Land	Product	Residue
<b>5</b>	<b>Transport</b>	X				
a	4-Stroke engines	X				
b	2-Stroke engines	X				
c	Diesel engines	X				(x)
d	Heavy oil fired engines	X				(x)

**Category 6 – Uncontrolled Combustion Processes**

No.	Subcategories of Main Category	Potential Release Route				
		Air	Water	Land	Product	Residue
<b>6</b>	<b>Uncontrolled Combustion Processes</b>	X				X
a	Biomass burning	X	(x)	X		(x)
b	Waste burning and accidental fires	X	(x)	X		(X)

**Category 7 – Chemicals and Consumer Goods**

No.	Subcategories of Main Category	Potential Release Route				
		Air	Water	Land	Product	Residue
<b>7</b>	<b>Production and Use of Chemicals and Consumer Goods</b>	X	X		X	X
a	Pulp and paper production	x	X		x	X
b	Chemical industry	x	x	(x)	X	X
c	Petroleum industry	x				x
d	Textile production		x		x	
e	Leather refining		x		x	

**Category 8 – Miscellaneous**

No.	Subcategories of Main Category	Potential Release Route				
		Air	Water	Land	Product	Residue
<b>8</b>	<b>Miscellaneous</b>	X	X	X	X	X
a	Drying of biomass	x			x	
b	Crematoria	x				X
c	Smoke houses	x			x	X
d	Dry cleaning		x		x	x
e	Tobacco smoking	x				

**Category 9 – Landfill/Disposal**

No.	Subcategories of Main Category	Air	Potential Release Route			
			Water	Land	Product	Residue
<b>9</b>	<b>Disposal</b>		X	X		X
a	Landfills and waste dumps		x			
b	Sewage/ sewage treatment	(x)	x	x	x	x
c	Open water dumping		x			
d	Composting			x	x	
e	Waste oil treatment (non-thermal)	x	x	x	x	x

### Category 10 – Hot-Spots

No.	Subcategories of Main Category	Potential Release Route				
		Air	Water	Land	Product	Residue
<b>10</b>	<b>Identification of Potential Hot-Spots</b>	Probably 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			X		
d	Application sites of chlorinated phenols	x	X	x	x	
e	Timber manufacture and treatment sites		X	X	x	x
f	PCB-filled transformers and capacitors				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 sites			x		

### Interim and Detailed Inventories

- Screening Matrix ⇒ list of dioxin-relevant processes carried out in the country and numeric values;
- Applying the lowest and the highest emission factor for a source, will give the range of potential emissions;
- At this stage, comments can be invited and gathering of additional information initiated;
- Processes and activities 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 all relevant information for accurately classifying the processes with respect to their PCDD/PCDF releases.

### Example - Waste Incineration

Source Category	EF Air (µg/t)	Flux (t/a)	g TEQ/a
<i>Municipal Waste Inc.</i>			22
No control	3,500	5,000	17.5
Low technol.	350	10,000	3.4
Good comb, APC	30	20,000	0.6
<i>Hospital Waste Incineration</i>			433
Batch, no APC	40,000	10,000	400
Control. batch, APC	3,000	10,000	30
Controlled, APC	525	5,000	2.6
<b>TOTAL Waste Incineration</b>			<b>455</b>

**Uruguay - 2000 (g TEQ/a)**

Category	Air	Water	Land	Product	Residue
Waste incineration	4.8	0	0	0	0.03
Metal production	1.2	0	0	0	1.6
Energy production	1.1	0	0	0	0.2
Mineral products	0.91	0	0	0	0.1
Transport	1.4	0	0	0	0
Uncontrolled comb.	7.7	0	1.8	0	6.1
Chemicals/Pulp	0.004	0.17	0	0.6	0.01
Miscellaneous	0.02	0	0	0	0.004
Waste disposal	0	0.2	0	0.02	0.08
<b>Total</b>	<b>17.1</b>	<b>0.4</b>	<b>1.8</b>	<b>0.6</b>	<b>8.1</b>

**Brunei Darussalam - 2001 (mg TEQ/a)**

Category	Air	Water	Land	Product	Residue
Waste incineration	585	0	0	0	3.9
Metal production	0.09	0.002	0	0	0
Energy production	23	0	0	0	0
Mineral products	19	0	0	43	0
Transport	67	0	0	0	0
Uncontrolled comb.	49	0	31	0	0.8
Chemicals/Pulp	0	0	0	0	0
Miscellaneous	6.7	0	0	0	0.01
Waste disposal	0	23	0	0.05	551
<b>Total</b>	<b>749</b>	<b>23</b>	<b>31</b>	<b>43</b>	<b>556</b>

**Jordan – 2000 (g TEQ/a)**

Category	Air	Water	Land	Product	Residue
Waste incineration	4.0	0	0	0	0.3
Metal production	0.79	0	0	0	1.9
Energy production	0.46	0	0	0	0
Mineral products	0.74	0	0	0	0
Transport	0.77	0	0	0	0
Uncontrolled comb.	47	0	0	0	3.1
Chemicals/Pulp	0	0	0	0.34	0
Miscellaneous	0.001	0	0	0	0
Waste disposal	0.01	0.64	0	0	11
<b>Total</b>	<b>53.6</b>	<b>0.64</b>	<b>0.1</b>	<b>0.3</b>	<b>16.5</b>

**Lebanon – 2000 (g TEQ/a)**

Category	Air	Water	Land	Product	Residue
Waste incineration	12	0	0	0	0.1
Metal production	1.9	0	0	0	4.0
Energy production	0.35	0	0	0	0
Mineral products	0.52	0	0	0	0
Transport	2.5	0	0	0	0
Uncontrolled comb.	21	0	0.06	0	33
Chemicals/Pulp	0.7	0	0	0.02	0
Miscellaneous	0	0	0	0	0
Waste disposal	0.04	0.96	0	0.78	0
<b>Total</b>	<b>38.5</b>	<b>1.0</b>	<b>0.1</b>	<b>0.8</b>	<b>37.1</b>

**Philippines – 1999 (g TEQ/a)**

Category	Air	Water	Land	Product	Residue
Waste incineration	38	0	0	0	3.7
Metal production	8.7	0	0	0	1.9
Energy production	143	0	0	0	14
Mineral products	2.5	0	0	0	0.04
Transport	0.12	0	0	0	0
Uncontrolled comb.	136	0	47	9	4.7
Chemicals/Pulp	0	0.61	0	78	13
Miscellaneous	0.23	0	0	0	0.001
Waste disposal	0	43.2	0	0	0
<b>Total</b>	<b>328</b>	<b>44</b>	<b>47</b>	<b>77.6</b>	<b>38.1</b>

**Thailand – 2000 (g TEQ/a)**

Category	Air	Water	Land	Product	Residue
Waste incineration	247	0	0	0	30
Metal production	20	0	0	0	1
Energy production	40	0	0	0	0
Mineral products	10	0	0	0	0.14
Transport	7.3	0	0	0	0
Uncontrolled comb.	632	0	0	0	292
Chemicals/Pulp	0.4	1.4	0	8.4	382
Miscellaneous	27	0	0	0	0
Waste disposal	-	-	-	-	-
<b>Total</b>	<b>985</b>	<b>1.4</b>	<b>0</b>	<b>8.4</b>	<b>705</b>

**Vietnam – 2000 (g TEQ/a)**

Category	Air	Water	Land	Product	Residue
Waste incineration	3.4	0	0	0	0.8
Metal production	1.1	0	0	0	2.6
Energy production	5.1	0	0	0	43
Mineral products	2.2	0	0	0	0.16
Transport	0.98	0	0	0	0
Uncontrolled comb.	3.0	0	1.05	0	0.52
Chemicals/Pulp	0	0	0	2.0	0.91
Miscellaneous	0.26	0	0	0.07	0
Waste disposal	0	1.5	0	0.2	0.61
<b>Total</b>	<b>16</b>	<b>1.5</b>	<b>1.05</b>	<b>2.2</b>	<b>48</b>

**Releases per Person and Year (TEQ/a)**

Country	Inhab.*mio	Air g TEQ/a	Total	Air µg TEQ/inhab*a	Total
Brunei	0.340	0.749	1.401	2	4
Estonia	1.42	14	29	10	21
Jordan	5.3	53.6	71	10	13
Latvia	3.4	22	55	6	16
Lebanon	3.7	38.5	77.5	10	21
Lithuania	3.6	17	36	5	10
Philippines	84.5	328	534	4	6.3
Poland	38.6	490	1039	13	27
Thailand	62.4	985	1700	16	27
Uruguay	3.3	17.1	28	5	8
Vietnam	78.4	16	69	0.2	1

**Lessons Learned and Outlook**

- Toolkit applicable to estimate releases of PCDD/PCDF in developing countries and countries with economies in transition;
- Provides consistent estimation method for national inventories;
- Allows for priority setting among sources;
- National inventories will be starting points for application of BAT/BEP to reduce releases – and for PRTRs (outside Stockholm Convention);
- Gaps/inconsistencies in national statistics discovered;
- Overall positive responses from stakeholders; links with industries strengthened;
- Commenting period until 31 March 2004 to improve the Toolkit before finalization and submission to COP;
- Toolkit for PCB? HCB?

## **Feedback and Support**

- Toolkit was noted by the INC7 as a guidance for undertaking release reporting for POPs by-products;
- Comments are invited to improve the Toolkit before acceptance by the Conference of the Parties before 31 March 2004 (deadline);
- Sub-regional or national Toolkit training was and is being performed to assist countries;
- UNEP would be the first point of contact for help (hfiedler@unep.ch).

## **Resources**

**All information can be found on UNEP's homepages:**

<http://www.chem.unep.ch/pops>

<http://www.pops.int>

## Appendix 1: Participants List

### Burundi

M Ce'llus NGOWENUBUSA  
Ministère de l'Interieur  
Services Techniques Municipaux  
BP 2845  
Bujumbura  
Burundi  
Tel: +257 (92) 1073 /  
Fax: +257 (22) 6256  
Email: [setemu2003@yahoo.fr](mailto:setemu2003@yahoo.fr)

M Anatole NTAHIMPERA  
Direction Général de l'Agriculture  
BP 114  
Gitega  
Burundi  
Tel: +257 (40) 2086 /  
Fax: +257 (40) 2104  
Email: [ntahimpera2000@yahoo.fr](mailto:ntahimpera2000@yahoo.fr)

Ms Francine NZOSABIMANA  
Institut National pour l'Environnement  
et la Conservation de la Nature  
BP 56  
Gitega  
Burundi  
Tel: +257 (82) 8825 /  
Fax: +257 (40) 3032  
Email: [nzosabimanaf@yahoo.fr](mailto:nzosabimanaf@yahoo.fr)

### Comoros

M Issa ABDILLAH MOHAMADI  
Direction Générale de l'Environnement  
B.P. 41  
Moroni  
Comores  
Tel: +269 (79) 9177 / 73 6388  
Fax: +269 (73) 6263  
Email: [issab\\_mohamadi@yahoo.fr](mailto:issab_mohamadi@yahoo.fr)

M Said HASSANI SAID BAKAR  
Chef de Service Cultures Vivrières et  
d'Exportation  
Direction Générale Développement Rural  
Comoros  
Tel: +269 (73) 2112 /  
Fax: +269 (73) 2112

Dr. Ahamada SAID FAZUL  
Chef de service Laboratoire Biologie  
CHR EI MAAROUF  
Ministère des Affaires Sociales  
et des Réformes administratives  
B.P. 874  
Moroni  
Comoros  
Tel: +269 (73) 3272 /  
Fax: +269 (73) 3272  
Email: [sfazul@yahoo.fr](mailto:sfazul@yahoo.fr)

### Djibouti

M Ali Ainan FARAH  
Coordonnateur National du projet POPs  
Ministère de l'Habitat, de l'Urbanisme,  
de l'Environnement et de l'Amenagement du  
Territoire  
BP 721  
République de Djibouti  
Tel: +253 (35) 1775 /  
Fax: +253 (35) 2580  
Email: [ainanfarah@yahoo.fr](mailto:ainanfarah@yahoo.fr)

M Douale Waiss ABOUBAKER  
Secrétaire Général  
Ministère de l'Habitat, de l'Urbanisme,  
de l'Environnement et de l'Amenagement du  
Territoire  
BP 11  
République de Djibouti  
Tel: +253 (35) 8522 / +253 (35) 0006  
Fax: +253 (35) 1618  
Email: [aboubaker\\_douale@hotmail.com](mailto:aboubaker_douale@hotmail.com)

Mr Hamid MOHAMED ADEN  
Director  
Center for Research, in Information and  
Production in National Education(CRIPEN)  
B.P. 65  
Djibouti  
Tel: +253 (35) 3611  
Fax: +253 (35) 3611  
Email: [cripen@intnet.dj](mailto:cripen@intnet.dj)

**Egypt**

Mr Yasser BADR EL DIN MOHAMMED  
Environmental Researcher  
Hazardous Substances Dept.  
Egyptian Environmental Affairs Agency  
30 Misr Helwan  
El-Zyrae Rd., Maadi  
Cairo  
Egypt  
Tel: +20 (2) 525 6452 /  
Fax: +20 (2) 525 6475  
Email: [lordyasser@hotmail.com](mailto:lordyasser@hotmail.com)

Mr Ahmed GAMAL DAOUD  
Environmental Researcher, Hazardous  
Substances Dept.  
Egyptian Environmental Affairs Agency  
30 Misr Helwan  
El-Zyrae Rd., Maadi  
Cairo  
Egypt  
Tel: +20 (2) 525 6452 /  
Fax: +20 (2) 525 6475  
Email: [agamal\\_74@yahoo.com](mailto:agamal_74@yahoo.com)

Ms Eman MOHAMED LOTFY EL-  
MAHROUKY  
Environmental Researcher, Environmental  
Inspection Unit  
Egyptian Environmental Affairs  
30 St Misr Helwan  
El-Zyrae Rd., Maadi  
Cairo  
Egypt  
Tel: +20 (2) 525 6452 /  
Fax: +20 (2) 525 6475  
Email: [mohamedeman23@hotmail.com](mailto:mohamedeman23@hotmail.com)

**Ethiopia**

Mr Tequam TESHAMARIAM  
Expert  
Environmental Protection Authority  
P.O. Box 23849  
Addis Ababa  
Ethiopia  
Tel: +251 (1) 444 011 /  
Fax: +251 (1) 542733  
Email: [tequam.testamariam@undp.org](mailto:tequam.testamariam@undp.org)

Mr Mehari WONDIMAGHEGN  
Expert  
Environmental Protection Authority  
P.O. Box 12760  
Addis Ababa  
Ethiopia  
Tel: +251 (1) 464 877 /  
Fax: +251 (1) 464 882, Email:  
[mehari95@yahoo.com](mailto:mehari95@yahoo.com)

Mr Mohammed ALI  
Pollution Control Expert  
Environmental Protection Authority  
P.O. Box 59560  
Addis Ababa  
Ethiopia  
Tel: +251 (1) 464 877  
Fax: +251 (1) 464 882  
Email: [mohali17US@yahoo.com](mailto:mohali17US@yahoo.com)

**Gambia**

Mr Adama CHAM  
Program Officer, Environmental Quality and  
Head of Inspectorate  
National Environment Agency  
5 Fitzgerald Street  
P.M.B. 48  
Banjul  
Gambia  
Tel: +220 (22) 3206 / +220 925135  
Fax: +220 (22) 9701  
Email: [nea@gamtel.gm](mailto:nea@gamtel.gm)

Mr Saikou NJAI  
Senior Program Officer  
National Environment Agency  
5 Fitzgerald Street  
P.M.B. 48  
Banjul  
Gambia  
Tel: +220 (22) 4867 /  
Fax: +220 (22) 9701  
Email: [nea@gamtel.gm](mailto:nea@gamtel.gm)

Mr Papa SECKA  
Program Officer  
Hazardous Chemicals & Pesticides  
National Environment Agency  
5 Fitzgerald Street  
P.M.B. 48  
Banjul  
Gambia  
Tel: +220 (22) 4869 /  
Fax: +220 (22) 9701  
Email: [psecka@yahoo.com](mailto:psecka@yahoo.com)

### Ghana

Mr Joseph C. EDMUND  
Programme Officer  
Environmental Protection Agency  
Chemicals Control and Management Center  
P.O. Box M 326  
Accra  
Ghana  
Tel: +233 (21) 664 697 / 8 /  
Fax: +233 (21) 662 690  
Email: [cantoeddie@hotmail.com](mailto:cantoeddie@hotmail.com)

Prof James EPHRAIM  
Professor  
Kwame Nkrumah University of Sciences &  
Technology  
Chemistry Department  
K.N.U.S.T  
Kumasi  
Ghana  
Tel: +233 (24) 207 676 /  
Fax: +233 (51) 60 305  
Email: [egyamkow@yahoo.com](mailto:egyamkow@yahoo.com)

Dr P. O. YEBOAH  
National Nuclear Research Institute  
Ghana Atomic Energy Commission  
Chemistry Department  
P.O. Box 80  
Legon-Accra  
Ghana

### Kenya

Dr Charles MOTURI  
Programme Coordinator  
K.I.R.D.I.  
P.O. Box 30650-00100  
Nairobi  
Kenya  
Tel: +254 (2) 609 498 / 40 /  
Fax: +254 (2) 3760 461 / 607 023  
Email: [zuriels@yahoo.com](mailto:zuriels@yahoo.com)

Mr Gregory Muia MUNYAO  
Ag Snr Assistant Director of Industries  
Ministry of Trade & Industry  
Department of Industry  
P.O. Box 30418  
Nairobi  
Kenya  
Tel: +254 (2) 226 301 / 331030  
Fax: +254 (2) 215 815  
Email: [gmunyao2000@yahoo.com](mailto:gmunyao2000@yahoo.com)

Mr Muitungu MWAI  
Senior Environmental Officer / Deputy  
Coordinator-POPs Project  
National Environment Management Authority  
P.O. Box 67839  
Nairobi  
Kenya  
Tel: +254 (2) 3760 461 /  
Fax: +254 (2) 3760 461  
Email: [kenpopsmwai@swiftkenya.com](mailto:kenpopsmwai@swiftkenya.com)

### Madagascar

Mme Volanirina RABEARISOA  
Point Focal Assistant de la Convention de  
Stockholm sur les POPs  
Ministère de l'Environnement, des Eaux et  
Forets  
B.P. 571  
Ampandrianomby  
Madagascar  
Tel: +261 (20) 22 40908 / 22 59340  
Fax: +261 (20) 22 41919  
Email: [reicl.mada@wanadoo.mg](mailto:reicl.mada@wanadoo.mg)

Mme Haritiana RAKOTOARISSETRA  
Point Focal de la Convention de Stockholm sur  
les POPs  
Ministère de l'Environnement des Eaux et  
Forets  
BP. 571 Ampandrianomby  
101 Antanarivo  
Madagascar  
Tel: +261 (20) 22 593 40 /  
Fax: +261 (20) 22 419 19  
Email: mabearisoav@yahoo.fr

M Alfredo Scheller TSARAMODY  
Directeur de la Technologie et de  
l'Environnement  
Ministère de l'Industrialisation du Commerce  
et du Développement du Secteur Privé  
Madagascar  
Tel: +261 (20) 22 31663 / 22 59370  
Fax: +261 (20) 22 28024  
Email: [tsaramody@yahoo.com](mailto:tsaramody@yahoo.com)

#### **Nigeria**

Mr Abdul-Kazeem BAYERO  
Asst. Chief Environmental Scientist  
Federal Ministry of Environment  
P.M.B. 468  
Garki, Abuja  
Nigeria  
Tel: +234 803 311 3755 / +234 (9) 413 6317  
Fax: +234 (9) 523 4119,

Dr Idris Adamu GOJI  
Assistant Director  
Federal Ministry of Environment  
P.M.B. 468  
Garki, Abuja  
Nigeria  
Tel: +234 803 704 4077/4135973 ext 209  
Fax: +234 (9) 523 41194131394

Mr Ikemefuna ONYEKWELU  
Assistant Director  
Federal Ministry of Environment  
Games Village, P.M. B. 3150  
Nigeria  
Tel: +234 (1) 5234119 / +234 (8) 33 033355 /  
42 103613  
Fax: +234 (9) 5234119

#### **Rwanda**

M Jean Bosco HABIMANA  
Ministère du Commerce, de l'Industrie,  
de la Promotion des Investissements, du  
Tourisme et des Coopératives  
BP 73  
Kigali  
République Rwandaise  
Tel: +250 (57) 6608 / +250 (84) 34241  
Fax: +250 (57) 5465  
Email: habimanajb2001@yahoo.fr

M Ellézer NDIZEYE RUSAKANA  
Point focal de la Convention de Stockholm sur  
les POPs  
Ministère des Terres, de la Réinstallation et de  
l'Environnement  
BP 3502  
Kigali  
République Rwandaise  
Tel: +250 (82) 628 /  
Fax: +250 (82) 629  
Email: [rusakanael@yahoo.fr](mailto:rusakanael@yahoo.fr)

#### **Sierra Leone**

Mr Momodu Alrashid BAH  
Senior Environment Officer  
Ministry of Lands Country Planning and the  
Environment  
Room E 306, Youyi Bldg.  
Brookfields  
Freetown  
Sierra Leone  
Tel: +232 (22) 240 355 / 240 367 /  
Fax: +232 (22) 235 055 / 235 013  
Email: [modbah@yahoo.com](mailto:modbah@yahoo.com)

Mr Edwin BAIMBA  
Environment Officer  
Ministry of Lands, Country Planning and the  
Environment  
3rd Floor, Youoyi Bldg.  
Brookfields  
Freetown  
Sierra Leone  
Tel: +232 (22) 240367 / 76653065  
Fax: +232 (22) 235 055 / 235 013

Mr. Alimamy Fonti KANU  
Principal Crop Protection Officer  
Ministry of Agriculture, Forestry and Food  
Security  
Room E 105, Youyi Bldg.  
Brookfields  
Freetown  
Sierra Leone  
Tel: +232 (22) 241 755 /  
Fax: +232 (22) 240 146  
Email: [alimamyfontikanu@yahoo.com](mailto:alimamyfontikanu@yahoo.com)

### South Africa

Ms Motshisi Glorine GASEITSIWE-  
MANZINI  
Environmental Officer  
Department of Environmental Affairs &  
Tourism  
Private Bag X447  
Pretoria 0001  
South Africa  
Tel: +27 (12) 310 3505  
Fax: +27 (12) 320 0024  
Email: [Mgaseitsiwe@ozone.pwu.gov.za](mailto:Mgaseitsiwe@ozone.pwu.gov.za)

Ms Nomazizi MDI  
Senior Manager, Environmental Affairs  
Department of Tourism, Environmental and  
Economic Affairs  
P.O. Box X20801  
Bloemfontein 9307  
South Africa  
Tel: +27 (51) 400 4810  
Fax: +27 (51) 400 4812, +025704366

Ms Thabisa MBUNGWANA  
Senior Environmental Officer  
Department of Environmental Affairs  
P.O. Box X447  
Pretoria 0001  
South Africa  
Tel: +27 (12) 310 3674  
Fax: +27 (12) 320 0488  
Email: [tmbungwana@ozone.pwv.gov.za](mailto:tmbungwana@ozone.pwv.gov.za)

### Sudan

Mr Adam ALI MOHAMED  
Head, Environmental Contaminant Dept.  
National Chemical Laboratories  
P.O. Box 287  
Khartoum  
Sudan  
Tel: +249 (11) 779 789 /  
Fax: +249 (11) 787 617  
Email: [adamali55@hotmail.com](mailto:adamali55@hotmail.com)

Mr Sittnour HASSAN-MOHMED HASSAN  
Head of Industrial Hygiene Department  
Federal Occupational Health Administration  
Industrial Hygiene Department  
National Health Laboratories  
P.O. Box 287  
Khartoum  
Sudan  
Tel: +249 (11) 793 962 /  
Fax: +249 (11) 787 617  
Email: [Sitnour@yahoo.com](mailto:Sitnour@yahoo.com)

Mr Nagat MAHMOUD ADAM ALI  
Deputy Director  
Ministry of Industry-Quality and Environment  
Dept  
P.O. Box 2184 , Khartoum  
Sudan  
Tel: +249 (11) 799 362 /  
Fax: +249 (11) 78 76 17

### Uganda

Silver Ssebagala  
Uganda Cleaner Production Centre  
P.O. BOX 7184  
Kampala  
Email: [silverbms@ucpc.co.ug](mailto:silverbms@ucpc.co.ug)

Dr. E. Agaba  
Ministry of Health  
P.O. BOX 7272  
Kampala  
Email: [agabafriday@hotmail.com](mailto:agabafriday@hotmail.com)

Gubya Phoebe  
P.O. BOX 700  
Kampala  
Email: [gubya@hotmail.com](mailto:gubya@hotmail.com)

Lynda Biribonwa  
National Environment Management Authority  
P.O.BOX 22255  
Kampala  
Email: [lbiribonwa@nemaug.org](mailto:lbiribonwa@nemaug.org)

Berina Uwimbabazi  
National Environment Management Authority  
P.O.BOX 22255  
Kampala  
Email: [bmbabazi@nemaug.org](mailto:bmbabazi@nemaug.org)

Waiswa Ayazika  
National Environment Management Authority  
P.O.BOX 22255  
Kampala  
Email: [wayazika@nemaug.org](mailto:wayazika@nemaug.org)

Andrew Othieno  
National Environment Management Authority  
P.O.BOX 22255  
Kampala  
Email: [aothieno@nemaug.org](mailto:aothieno@nemaug.org)

### **UNEP Chemicals**

Fatoumata Keita -Quane  
UNEP Chemicals  
15 Chemin des Anemones  
CH-1219 Chatelaine  
Geneva , Switzerland  
Tel: + 4122 979 8161  
Fax + 4122 797 3460  
Email: [foune@unep.ch](mailto:foune@unep.ch)

Dr. Heidelore Fiedler  
UNEP Chemicals  
11-13 Chemin des An'emonas,  
CH-1219 Chatelaine (GE),  
Geneva  
Switzerland  
Email: [hfielder@unep.ch](mailto:hfielder@unep.ch)

## Appendix 2 - Program for the Subregional Workshop "National Inventory of Dioxin and Furan Releases" Kampala, Uganda, 12-15 August 2003

<b>Tuesday, 12 August 2003</b>		
8:00-9:00	Registration	
9:00-10:30	Welcome and Introduction - National Environment Management Authority of Uganda  - UNEP Chemicals  - Ministry of Environment  Objectives of the workshop	Dr. Aryamanya-Mugish, Henry Executive Director Dr. Heidelore Fiedler Scientific Affairs Officer Hon. Minister Lt. General Odongo Jeje Heidelore Fiedler, UNEP Chemicals
10:30-11:00	<b>BREAK</b>	
11:00-12:30	Dioxin and Furan Inventories within the National Implementation Plans of the Stockholm Convention	Fatoumata Keita-Ouane, UNEP Chemicals
12:30-14:00	<b>LUNCH BREAK</b>	
14:00-15:40	Presentations given by the countries on actions to date on dioxins and furans - Burundi - Egypt - Ghana - Kenya - Nigeria - Rwanda - South Africa - Gambia	
15:40-16:00	<b>BREAK</b>	
16:00-17:30	Presentations given by countries on actions to date on dioxins and furans (cont'd.)	
18:00-20:00	<i>Reception</i>	
<b>Wednesday, 23 August 2003</b>		
9:00-10:45	Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases	Heidelore Fiedler, UNEP Chemicals
	<u>Presentation and discussion in detail about the categories of sources</u> Category 1: Waste incineration	
10:45-11:15	<b>BREAK</b>	
11:15-12:30	Category 6: Open Waste Burning	
12:30-13:30	<b>LUNCH BREAK</b>	
13:30-15:30	Category 2: Ferrous and Non-Ferrous Metal Production  Category 4: Mineral Products	
15:30-16:00	<b>BREAK</b>	
16:00-17:30	Category 3: Power generation and heating  Category 7: Production and Use of Chemicals and Consumer Goods  Discussion	
<b>Thursday, 14 August 2003</b>		
	<u>Presentation and discussion in details about the categories of sources (cont'd.)</u>	
9:00-10:30	Category 5: Transportation  Category 8: Miscellaneous  Category 9+10: Disposal/Landfills and Hot spots	
10:30-11:00	<b>BREAK</b>	

11:00-12:30	Examples – work with the questionnaires
12:30-13:30	<b>LUNCH BREAK</b>
13:30-15:30	Identification of country needs
15:30-16:00	<b>BREAK</b>
16:00-17:30	Organisation of the work in the countries
<b>Friday, 15 August 2003</b>	
9:00-10:30	Final discussion and preparation of the final report
10:30-11:00	<b>BREAK</b>
11:00-12:30	Final discussion and preparation of the report
12:30-13:30	<b>LUNCH BREAK</b>
14:00-16:00	Acceptance of the report Conclusion of the workshop

### Appendix 3

**SPEECH BY HON LT. GENERAL JEJE ODONGO, MINISTER OF STATE FOR ENVIRONMENT AT THE OFFICIAL OPENING OF THE REGIONAL WORKSHOP ON DIOXIN AND FURAN INVENTORY TRAINING”, KAMPALA, UGANDA, TUESDAY 12<sup>TH</sup> AUGUST 2003**

---

The Representatives of the United Nations Environment Programme,  
Distinguished Participants,  
Ladies and Gentlemen

On behalf of the Government of Uganda and on my own behalf, I wish to very warmly welcome you all to this Training Regional Workshop, to address issues related to Dioxin and Furan inventories.

I am pleased for having been invited to officiate at this important regional workshop. May I in a special way welcome our visitors from Burundi; Comoros; Djibouti; Egypt; Ethiopia; Gambia; Ghana; Kenya; Madagascar; Nigeria; Rwanda; Sierra Leone; Sudan; South Africa to Uganda. You are all very welcome and do please take time off after the workshop to get to know Kampala and indeed Uganda better.

.As you are all aware, the Stockholm Convention on Persistent Organic Pollutants (POPs), was developed to address the issues of POPs Chemicals worldwide and despite not having entered into force yet, it gives me great pleasure and hope to see activities such as this workshop that are preparing participants, particularly from the African region to implement the provisions of the Convention.

.Some of you might be aware that as a Country, Uganda has not yet ratified or acceded to the Convention. This matter is now before Cabinet and soon Government will take a decision.

.Africa spans a wide diversity of countries, some of which rank amongst the poorest in the world. Many of the countries share similar socio-economic problems such as foreign debt, underdeveloped conditions, inadequate infrastructure, and insufficient financial and human resources to address needs. As a continent, Africa certainly produces and releases the two categories of unintentionally produced pops – dioxins and furans.

Against this background, I find that this workshop of training in use of the Dioxin Toolkit, is very timely and relevant as most African Countries do not have the technical and financial capacity to undertake actual measurement and monitoring of all emissions from all possible sources using highly specialised and expensive equipment.

I am informed that the training obtained in this workshop will:

- (i) Train national experts in the use of the Dioxin Toolkit and in identification and quantification of sources of dioxins and furans;
- (ii) Lead to an agreed common format for the reporting of inventories; and
- (iii) Facilitate cooperation at the sub-regional level

Furthermore, I am informed that the present Toolkit:

- (i) Is comprehensive, easy to read, follow and apply;
- (ii) Approaches the subject in a logical and pragmatic manner;

- (iii) Groups and presents the classes and emission factors on a reasonable and rational basis; and
- (iv) Enables the establishment of internationally comparative inventories.

The Toolkit therefore will assist Countries in their National Implementation Plans under the Stockholm Convention on POPs, if properly used.

It is our desire as a Country to have a simple, flexible and standard Toolkit that will be able to assist countries identify sources and estimate releases of Dioxins and Furans. Use of the Toolkit should lead to the compilation of inventories that are Consistent; Time and Resource Efficient and Accurate enough to identify reliably the major sources as well as the key data deficiencies.

We in Uganda, are particularly thankful to UNEP and in particular UNEP Chemicals, that has played a leading and important role in developing the Stockholm Convention and its commendable and tireless efforts in the area of Chemicals management worldwide.

In Uganda we have recognised that effective implementation of the Stockholm Convention will require the development of skills, knowledge and information on POPs chemicals, their sources and management. The first important step is the need to know what one is producing - hence the need to have a thorough inventory undertaken.

I am aware that worldwide, there are only a few national inventories reporting releases of Dioxins and Furans (15 in total and nearly all from the developed Northern Countries). This therefore makes this workshop very important and central to building our capacity as a developing continent.

I would like to urge you to ensure that the Workshop objectives stated above are achieved.

I trust that you will enjoy your stay in Uganda and that you will find time to visit some of our beautiful places of tourist attraction.

Before concluding, I wish to commend once again the efforts and assistance offered by UNEP Chemicals and the Canadian Government through the Canadian POPs Fund that provided funding for this workshop.

With these few remarks, I would like to thank you once again for having found time to attend this important workshop. The Government of Uganda looks forward to receiving a report of this workshop to enable implementation of some of the key and relevant recommendations. It is now my singular and pleasant duty to declare the Regional Workshop on Dioxin and Furan Inventory for English-Speaking African Open.

**Thank you for listening to me,**

**FOR GOD AND MY COUNTRY.**

## **Appendix 4:** **Opening remarks by Dr. Heidelore Fiedler, UNEP Chemicals**

Honorable Minister Lt. General Odongo Jeje,

Director General Dr. Aryamanya-Mugisha Henry,

Dear colleagues from Anglophone African countries, and dear French-speaking neighbours,

On behalf of UNEP Chemicals, I would like to welcome you very much for this sub-regional workshop, which is jointly organized by UNEP Chemicals, and the National Environment Management Authority of Uganda and financed through the Canada POPs Fund. Unfortunately, it is holiday season in central Europe, the director of UNEP Chemicals, Jim Willis, is not able to attend this workshop but he sends his best regards to all participants and wishes us a successful week.

This workshop is dedicated to the training to make national dioxin and furan inventories to assist countries in the implementation of their national implementation plans under the Stockholm Convention on Persistent Organic Pollutants.

UNEP as other organizations is fully aware that African countries face severe problems such as poverty, economic development, health, and environment such as access to clean water. In this context of competing priorities, chemicals' management and especially the management of persistent organic pollutants may not be the first priority.

On the other hand, most countries from this region are signatories to the Stockholm Convention and although not yet in force, some are Party to the Convention. From the countries present, these are Ethiopia, Rwanda, and South Africa and in addition, Liberia, who could not make it to this workshop. Congratulations to all the Parties to the convention! To date, 34 countries out of 151 signatories to the Stockholm Convention are Party to the Convention. These signatures and ratifications of the Stockholm Convention underline the countries' commitments towards sustainable chemicals' development and meeting the obligations in this Convention.

We find that this workshop is timely and not premature: Countries either have started to work on their national implementation plans under the Stockholm Convention or will start soon. The inventory of dioxins and furans forms an important part within these NIPs and the inventory is the starting point for release reduction or elimination of these unwanted byproducts. This will bring countries closer to the basic goal of the Stockholm Convention, namely reduction of human and environmental exposure from POPs.

In this training workshop we will use the Toolkit, which has been developed by UNEP to identify sources of dioxins and furans and to quantify their releases. Although not perfect, the INC-7 about four weeks ago, recommended the Toolkit to be applied by countries to establish their initial release inventories. By use of the Toolkit, experience will be gained in the application of the Toolkit, weaknesses can be identified and subsequently additions and improvements of this methodology can be introduced to make it better applicable to special country situations.

With this workshop, UNEP Chemicals would like to assist countries in the region on their way from source identification towards reduction and elimination of dioxins and furans and finally to improve quality of life.

In that sense, this workshop presents only a starting point and we will continue our activities to assist countries in their priority setting, in the implementation of best available techniques and best environmental practices.

Your presence here at the opening, Honorable Minister and honorable Director General, is an encouraging sign that Uganda and countries are ready to tackle POPs issues and we certainly very much appreciate your engagements.

I do not want to close without thanking NEMA and especially Mr. Andrew Othieno for the efforts to organize this workshop. I wish all of us an informative, successful and enjoyable week here in Kampala.

Ladies and gentlemen, thank you very much.