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Matters for consideration or action by the Conference of the Parties: effectiveness evaluation

Global project on assessment of existing capacity and capacity-building needs for the analysis of persistent organic pollutants in developing countries

Note by the Secretariat

The annex to the present note contains a submission by the Chemicals Branch of the United Nations Environment Programme's Division of Technology, Industry and Economics on the global project on assessment of existing capacity and capacity-building needs for the analysis of persistent organic pollutants in developing countries. The annex is presented as submitted and has not been formally edited by the Secretariat.

* UNEP/POPS/COP.3/1.

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Annex

Information Paper submitted by UNEP Chemicals:

Global project on assessment of existing capacity and capacity-building needs to analyse POPs in developing countries

UNEP Chemicals Branch, DTIE, is executing the medium-sized GEF-funded Project "Assessment of Existing Capacity and Capacity Building Needs to Analyse POPs in Developing Countries" (for further information, see http://www.chem.unep.ch/pops/laboratory/default.htm). Besides the GEF, the governments of Canada, Germany, and Japan contribute financially to this project. This project addresses country needs for laboratory analysis of POPs and conditions necessary to conduct such analysis in a sustainable manner. The project focuses on the analysis of the 12 POPs listed in Annexes A, B, and C of the Stockholm Convention. The needs for POPs analysis mainly arise from three areas:

1. Effectiveness evaluation of the implementation of the Stockholm Convention (Article 16) as in the Guidance on the global monitoring plan (UNEP/POPS/COP.3/INF/14);
2. Concentrations for PCDD/PCDF (Article 5), for which the BAT/BEP Expert group provided performance levels associated with application of best available techniques (draft guidance UNEP/POPS/COP.3/INF/4);
3. Provisional limit values for "low POP content" (Article 6) for POPs wastes (solid/liquid technical matrices and stack emissions) as established under the Basel Convention for the 12 POPs (for download, see http://www.basel.int/techmatters/index.html and follow language version).

The outcomes of this UNEP/GEF project include:

1. A databank of operational laboratories worldwide according to their capabilities to analyze classes of POPs in different matrices. The data will be stored in a searchable and accessible databank;
2. Recommended criteria for: (a) Sampling, identification, quantification of POPs (analytical data); (b) Operating POPs laboratories in a sustainable manner.

Information from existing POPs laboratories has been collected by a questionnaire that accommodates the above mentioned requirements and is made accessible *via* the Web on the project's website. In April 2007, the databank contains 184 laboratories from 69 countries. The regional distribution of these laboratories is as shown in Table 1.

Table 1: Regional distribution of POPs laboratories (Status: 23 April 2007)

Region	Number of POPs Labs		Region	Number of POPs Labs
Africa	29		GRULAC	44
Asia	38		WEOG	18
CEE	55			

The coverage of POPs and matrices of these laboratories is highly variable and not all laboratories have expertise for all of the 12 POPs or all matrices. From Table 2 it can be seen that most experience exists for DDT (138 labs), chlordane (132), heptachlor (132 labs), indicator PCB (132 labs), and hexachlorobenzene (131 labs), whereas only relatively few laboratories offer to analyze PCDD/PCDF (51 labs) or dioxin-like PCB (67 labs). Among the POPs pesticides, less frequently covered are toxaphene (62 labs) and mirex (63 labs).

Table 2: Summary of frequency of POPs analyzed in 184 laboratories (Status: 23 April 2007)

POP	Frequently Analyzed		POP	Less Frequently Analyzed
DDT	138		PCDD/PCDF	51
Chlordane	132		Toxaphene	62
Heptachlor	132		Mirex	63
PCB	132		Dioxin-like PCB	67
HCB	131			
Aldrin	100			
Dieldrin	97			
Endrin	95			

Among the matrices selected as core data for the effectiveness evaluation, human blood (32 labs), mothers' milk (37 labs) or ambient air (53 labs), respectively, are the least commonly analyzed ones. Instead, much more experience and interest exist for water (146 labs), soil/sediments (135 labs). Frequency of matrices analyzed are compiled in Table 3.

Table 3: Summary of frequency of matrices analyzed in 184 laboratories (Status: 23 April 2007) (Matrices for core data in **bold**)

Matrix	Frequently Analyzed		Matrix	Less Frequently Analyzed
Water	146		**Human blood**	32
Soil/Sediment	135		**Mothers' milk**	37
Food	94		Stack emissions	50
Effluents	92		**Ambient air**	53
Transformer oils	88		Chemicals/products	64
Bivalves/marine mammals	85		Residues	78

In 2006 and until July 2007, the feasibility study of this project is being implemented. Nine laboratories from seven countries and four regions participated. The participating laboratories and their hosting organizations are described in Table 4:

Table 4: Pilot laboratories participating in the feasibility study

Country	*Institute/Department*	*Organization*	*Hosting institution*
China	Dioxin Laboratory	Research Centre for Eco-environmental Sciences (RCEES), Chinese Academy of Sciences	Academic NGO, Academy of Science
Ecuador	Ecotoxicological Laboratory	Equadorian Commission for Atomic Energy (CEEA)	Government, Presidency
	Pesticides Laboratory	Ecuadorian Service for Agriculture (SESA)	Government, Min. Agriculture
Fiji	Institute of Applied Sciences (IAS)	University of the South Pacific	Academic NGO, University
Kenya	Dept. of Chemistry	University of Nairobi (UoN)	Academic NGO, University
Moldova	Lab. of Sanitary Chemical Researches	National Scientific and Applied Centre for Preventive Medicine (NSACPM)	Government, Min. Health
	Center on Soil Quality Monitoring (CSQM)	State Hydrometeorological Service	Government, Min. Environment
Uruguay	Dept. of Chromatography and Mass Spectrometry for Food&Environment	Technological Laboratory of Uruguay (LATU)	Public Institute
Vietnam	Laboratory of Analytical Chemistry	Vietnam-Russian Tropical Center (VRTC)	Government, Min. Defence

The project manager and the pilot laboratories were assisted by two back-up reference laboratories for POPs analysis – MTM Research Centre at Örebro University in Sweden and IVM at Free University Amsterdam in the Netherlands. The workplan in 2006/2007 included inspection tours to the pilot laboratories, a training course at the pilot laboratories, a training course in Amsterdam for laboratories analyzing POPs pesticides or PCB with GC/ECD or GC/LRMS, and in Örebro for dioxin laboratories. National samples from the pilot countries were exchanged and analyzed by the pilot laboratories and the back-up laboratories and finally, an interlaboratory comparison study was undertaken. Two workshops were held where pilot and back-up laboratories met and discussed details of the training and the results of their analyses.

The results are not yet all evaluated but preliminary conclusions can be drawn as follows:

- In general, the basic infrastructure at the pilot laboratories was adequate with respect to housing, space, analytical equipment. However, some had problems to keep more sophisticated equipment (mass spectrometers) running;
- Simple/small equipment is often not available: glassware, short coolers, inadequate joints, very often insufficient quality of solvents. Cheaper equipment often not good quality; Turbovap not available, hot plate, water bath often not available in sufficient number;

- Pilot laboratories found the training and intercalibration study to be very useful to gain experience and it is hoped that the assistance will continue in the future;
- Many laboratories expanded the spectrum of POPs (to include PCB analysis) and of matrices (especially fish);
- Good support from back-up laboratory (responsive and prompt);
- Supplies/consumables received under this project allowed to develop a new method to analyze dioxin-like PCB with the equipment present;
- Major improvements in the pilot laboratories included introduction of new and more efficient clean-up methods and several aspect of QA/QC parameters;
- The back-up laboratory plays an important role in enforcing the QA/QC policies and procedures for pilot laboratory within the program. To continue developing effective working relationship with back-up the laboratory is helpful for pilot laboratory in the future;
- Typically there is no education for technicians; often staff that did not finish university education, learning by doing; B.Sc. most common level. No curricula for non-academic profession existing.
- Conclusions from the interlaboratory study include:
  - Calibration is good in number of labs, and better for PCB than for organochlorine pesticides (OCPs);
  - Errors due to mass versus volume basis reporting may have occurred for the test solutions;
  - Only occasionally some results are within ± 20% of the target values;
  - Errors differ per laboratory: some have a systematic bias for some compounds, some are systematically high for most or all compounds, some are biased in one sample but not in the other;
  - There are some problems of co-elution;
  - Closer inspection of chromatograms may reveal other errors.
- Main issues can briefly be summarized as follows:
  - In the interlaboratory study, the results were better when compared with the national exchange samples (before training was undertaken). However, there is an obvious need for future interlab studies and these should be undertaken in connection with training and targeted advice until the laboratories are at the right level (*e.g.*, to contribute with own high quality data to the Global Monitoring Plan);
  - Typically no Certified Reference Materials (CRMs) used due to lack of knowledge and access;
  - Some laboratories were accredited according to UK Accreditation schemes (UKAS), however, they were not aware of the meaning of a quality chart (analysis of Laboratory Reference Materials (LRMs) and identify drift through each batch of samples);
  - It became obvious that accreditation schemes do not require the same basis;
  - A setup as exists with, *e.g.*, WHO-collaborating centers, may serve as a model to build a framework with proper acknowledgment of participating labs;
  - The gap can be filled more easier than anticipated because efforts are needed in training rather than in investment;
  - In general, the management was supporting, the infrastructure and infrastructure was adequate;
  - Further intercalibration studies should be undertaken and successful participation certificates issued;
  - Databank goes beyond the pilot phase of this project and should be maintained to serve the effectiveness evaluation and other activities of the Stockholm and Basel Conventions but also SAICM.

A first conclusion on the intercomparison study is that the results were not essentially different from those obtained in the 1980s and 1990s in European POP laboratories. Creation of a network (like the example of the QUASIMEME) was considered very attractive for a further training of POP laboratories. Creating an effective network of POP laboratories in different regions would be a major achievement and would, together with a series of interlaboratory studies, lead to better measurements of POPs all through the world. The investments needed to organise such a programme would be relatively modest. The same is true for further investments in laboratories: it is not so much new equipment that is needed, but rather good quality consumables as glassware, stock solutions, and reference materials. All of these only require modest investments.

In the course of the project, the following documents were prepared and are available for download (http://www.chem.unep.ch/pops/laboratory/default.htm):

1. Guidance for Analysis of Persistent Organic Pollutants (POPs), March 2007 (http://www.chem.unep.ch/pops/laboratory/analytical_guidance_en.pdf);
2. Report: Criteria for Sustainability of POPs Laboratories and Their Role at Regional Level: Summary from Three Regional Workshops; April 2007 (http://www.chem.unep.ch/pops/laboratory/Sustainability%20criteria%20and%20role%20of%20POPs%20labs.pdf);
3. Handbook for Databank of Existing POPs Laboratories. To be published in June 2007