

## Criteria for the selection of persistent toxic substances for the development of the Data Base on Persistent Toxic Substances and Heavy Metals

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In the framework of the DDS/OAS-developed project on “Strengthening of trade-related capabilities for the Environmental Management”, a Data Base on Persistent Toxic Substances and Heavy Metals is being built. This objective requires the selection of a menu of substances that can be considered in the data base. This, in turn, requires the developing a series of indicators that reflect such choice.

### Basic criteria

The first consideration consists of bearing in mind the characteristics of a Persistent Toxic Substance, which have already been considered in the GEF/UNEP project “Regionally Based Assessment of Persistent Toxic Substances” (200-2003).

Such characteristics are as follows:

1. They are organic or organometallic substances
2. They are bioaccumulable substances
3. They are persistent substances
4. They are toxic substances
5. Such substances can be transported to far-off places and be detected in regions where they have never been used.

The definition for each of such categories can be found in the Stockholm Convention (annex D).

**Bioaccumulation:** The bioaccumulation or bioconcentration factor must be above 5000; or, if data are insufficient, the Log Kow must be above 5, or the existing information must justify consideration of the substance.

**Persistent:** The average life in water is above 2 months; average life in soil above 6 months; average life in sediments above 6 months, average life in air above 2 days, or evidence that the chemical product is in any way sufficiently persistent to justify its inclusion.

**Potential for long-distance transportation:** The measured levels of the chemical product in places situated far from the release source may be a cause for concern, or surveillance data show that the long-distance transportation is effective through any mechanism (air, water, migrant species). Such potential can also be assessed by considering the results of simulation models.

**Adverse effects:** Evidence of effects adverse to human health or the environment that justify its inclusion. Toxicity and ecotoxicity data indicating potential damages to human health or to the environment.

### Other criteria

Other national and international agencies (Environment Canada, UNECE) have included new substances in the list of toxic and bioaccumulative persistent compounds (PB&T, as per its English acronym) by using the analogy criterium, as in the case of PBDEs, polychloronaphtalens, chlorinated benzenes, and chlorinated paraphines, which are isolated and analyzed by using the toolkits used for the traditional POPs. However, it is recognized (Muir y Howard, 2006) that a large majority of the substances widely traded (> 1 on/year) are not measured in the environment, and their emissions and destination are unknown. These very authors indicate that any unidentified POPs will probably be found in the listing of traded chemical substances or as products of the

degradation of such substances. One such example is the discovery of the global distribution of PFOs, which is a product of the degradation of the perfluorineoctanesulphonates and alcohols used in the perfluorinated polymers.

As to the quantities used, some agencies, such as the OECD, use the criterium of high-level-produced chemical substances, or “HPV Chemicals” (> 1000 tons/year). In the United States, the “Inventory Update Rule” of the Toxic Substances Control Act (TSCA) considers the report of substances manufactured or imported in quantities over 4.5 tons/year. Muir and Howard (2006) advance general classification criteria that should be considered to identify an organic substance that might be a source of long-term concern as a persistent toxic substance.

- Production volume. The substance has to be found in a sufficiently reasonable quantity to be detected in environmental samples so as to allow an evaluation of the exposure; a quantity in the 4000 ton/year range is suggested, which, in theory, for a volatile substance evenly distributed in the low troposphere, would entail a concentration of 1 ng/m<sup>3</sup>, a quantity measurable through passive and active air sampling.
- Usage profile. The substance has to be used in a manner that allows its release in the environment; however, it is hard to foresee this feature, since evidences of it can be hard to find.
- Physicochemical features that make the substances resistant to degradation, bioaccumulable and transportable to far-off places, either as parental products or as metabolites (Log K<sub>ow</sub>, Log K<sub>ow</sub>).

**Table 1** shows the criteria used by several international organizations to consider a substance as toxic and persistent. The last row includes the criteria suggested for the Data Base on Toxic Persistent Substances and Heavy Metals. Such criteria are basically identical to those used for a POP, the only difference being that they indicate values for acute and chronic toxicity for a substance to be incorporated, based on the criteria used by Environment Canada (CEPA toxic).

**Table 1** Screening criteria for the identification of persistent toxic substances (from Muir & Howard, 2006)

Organization	Long-distance transportation			Persistence t1/2 (days)			Bioaccumulation		Toxicity
	Measurement in remote areas	PV (Pa)	AO t1/2 (d) (average life in the atmosphere)	Water	Soil	Sediment	FBC/FBA	Log Kow	
UNEP	Yes	or<1000	2	>60	>180	>180	5000	5	Risk profile
UNECE	Yes	or<1000	2	>60	>180	>180	5000	5	Risk profile
Canada	Yes			>180	>180	>360	5000	5	CEPA toxic
USEPA TSCA PBT				>180			5000		Toxicity data
USEPA TSCA Release control				>60			1000		Toxicity data
OSPAR				NIB			500	4	NOEC < 0.1 mg/L
REACH Annex XII and EU Technical Guidance Document PBTs				>40 (fresh) >60 (marine)		>120 (fresh) >180 (marine)	2000		Chronic NOEC < 0,01 mg/L or CMR EDE
REACH Annex XII and EU Technical Guidance Document vPvBs				>60		>180	5000		Not applicable
BDD STP y M.P. in the Americas	Si		>2	>60	>180	>180	5000	5	LC50 (EC50: 1 mg/L(acute) NOEC <0,1 mg/L (chronic) <sup>1</sup>

<sup>1</sup> Lowering of the toxicity NOEC level to 0.01 mg/L and persistence in water (< 40 d) is suggested for pesticides

These criteria are generally shared, with some small variations, by various international and national agencies. The Canadian system, for instance, includes as toxic substances a number of complex mixes, such as cellulose- and industrial-process effluents, in addition to individual compounds, as well as some products.

#### Criteria used

The proposal for the Data Base for Persistent Toxic Substances and Heavy Metals, however, consists of starting from a menu of substances that share such features; e.g. the 12 POPs of the Stockholm Convention, and eventually the POPs-candidates discussed in the so-called "POPs Review Committee". In addition, the listing incorporates chemical substances, industrial- and agricultural-use products relevant for the Region, such as Polychloronaphtalenes, Chlorpiriphos, Methyl-Mercury, among others.

Additionally, a number of compounds that do not necessarily meet the above-mentioned requirements, but are intensively released in the environment over vast geographic areas, such as the Polycyclic Aromatic Hydrocarbons (PAHs) and currently used pesticides, such as Endosulfan, Chlorotalonil, Chlorpirifos, Diazinone, Bromacil. Such substances have a high level of incidence in vast contaminated extensions. Organometallic substances are also included, such as Methyl Mercury.

The main substances evaluated in the UNEP/GEF project "Regionally Based Assessment of Persistent Toxic Substances" were the POPs and some additional compounds depending on the importance of the substances for each of the regions (Central America and South America). Table 2 includes a menu of such substances, besides the already-mentioned ones.

**Table 2:** Substances considered in the Regional Reports for Central- and South America developed by UNEP (2001-2003)

Substance name	Classification
Atrazine	Plaguicide
Pentachlorofenol	Plaguicide
Phtalatos	Industrial-use product
Nonilphenols and octilphenols	Industrial-use product

Additionally, international agencies are considering substances recognized for meeting the requirements for being STPs, such as the dicofol pesticide, the polychloronaphtalenes, and the hexachlorobutadiene. We should also consider that the data base initiative involves the inclusion of a number of heavy metals. They are not formally defined as STP, but are included here because they belong to the global chemical concern agenda; namely,

- Lead
- Mercury
- Cadmium

#### **References**

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DRAFT Procedure Governing the Determination of whether a Contaminant is a “Toxic Substance”

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