



Midterm regional workshop for GMP2 project in Africa 2018, Lusaka, Zambia, 23-25 July 2018

# GMP Data Warehouse: current data content and functionalities

**Kateřina Šebková**

on behalf of the GMP DWH development team

*Research Centre for Toxic Compounds in the Environment*

&

*Institute of Biostatistics and Analyses*

*Masaryk University, Brno, Czech Republic*



# Outline

- Why do we have GMP data warehouse (GMP DWH)?
- Principles beyond GMP DWH
- How to access GMP DWH?
- What is its current content - global information on POP levels
  
- **OBJECTIVE:** provide additional information on a tool for global POPs data access and on its functionalities and use to countries in Africa region

# SCENE SETTING

- POPs monitoring embedded in the Stockholm Convention text (art 16 and 15)
- regional/global POPs monitoring reports serve as one of the key inputs for assessing effectiveness of the Stockholm Convention (follow up of the BRS presentation)
- Two sets of the **Global Monitoring Plan regional reports** (2008 and 2014) - approved by COP4 (2009) and COP6 (2015) available online:  
<http://chm.pops.int/Programmes/GlobalMonitoringPlan/MonitoringReports/tabid/525/Default.aspx>
- but no harmonization of reports (content) and more user friendly tool suitable for 21st century existed in 2011 - BRS requested support to develop an electronic tool to SCRC Czech Republic RECETOX in 2011 and the first proposal was prepared in 2012 and refined further to be inaugurated in 2013 at the COP6 in Geneva.



## Objective of the GMP Data Warehouse:

- Collection, storage, analysis, and visualization of GMP data on POP levels as required by the Stockholm Convention on POPs
- Put global data on POPs together
- Support to ROGs and GCG in compilation of regional/global monitoring reports
- Online presentation of GMP data publicly available 24/7
- Useful to countries
  
- allow for data collection from heterogeneous sources
- also allow input from existing international and national monitoring programmes







## Substances to be monitored: GMP Guidance, chapter 2.2. table 2.2.

	Compounds to be Monitored			
	Air	Human Milk	Human Blood	Water
<b>Initial POPs</b>				
Aldrin	Aldrin	Aldrin	Aldrin	Water has not been recommended as a core matrix for the lipophilic and nonpolar initial twelve POPs; therefore, analysis of surface waters is not recommended
Chlordane	<i>cis</i> - and <i>trans</i> -chlordane; and <i>cis</i> - and <i>trans</i> -nonachlor, oxychlordane	<i>cis</i> - and <i>trans</i> -chlordane; and <i>cis</i> - and <i>trans</i> -nonachlor, oxychlordane	<i>cis</i> - and <i>trans</i> -chlordane; and <i>cis</i> - and <i>trans</i> -nonachlor, oxychlordane	
DDT	4,4'-DDT, 2,4'-DDT and 4,4'-DDE, 2,4'-DDE, 4,4'-DDD, 2,4'-DDD	4,4'-DDT, 2,4'-DDT and 4,4'-DDE, 2,4'-DDE, 4,4'-DDD, 2,4'-DDD	4,4'-DDT, 2,4'-DDT and 4,4'-DDE, 2,4'-DDE, 4,4'-DDD, 2,4'-DDD	
Dieldrin	Dieldrin	Dieldrin	Dieldrin	
Endrin	Endrin	Endrin	Endrin	
HCB	HCB	HCB	HCB	
Heptachlor	Heptachlor and heptachlorepoxyde	Heptachlor and heptachlorepoxyde	Heptachlor and heptachlorepoxyde	
Mirex	Mirex	Mirex	Mirex	
PCB	ΣPCB <sub>6</sub> (6 congeners): 28, 52, 101, 138, 153, and 180	ΣPCB <sub>6</sub> (6 congeners): 28, 52, 101, 138, 153, and 180	ΣPCB <sub>6</sub> (6 congeners): 28, 52, 101, 138, 153, and 180	
	PCB with TEFs* (12 congeners): 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169, and 189	PCB with TEFs* (12 congeners): 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169, and 189	PCB with TEFs* (12 congeners): 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169, and 189	
PCDD/PCDF	2,3,7,8-substituted PCD/PCDF (17 congeners)	2,3,7,8-substituted PCD/PCDF (17 congeners)	2,3,7,8-substituted PCD/PCDF (17 congeners)	
Toxaphene	Congeners P26, P50, P62	Congeners P26, P50, P62	Congeners P26, P50, P62	



## Substances to be monitored: GMP Guidance, chapter 2.2. table 2.2.

<b>POPs listed at COP-4</b>				
	Air	Human Milk	Human Blood	Water
Chlordecone	Chlordecone	Chlordecone	Chlordecone	
$\alpha$ -HCH	$\alpha$ -HCH	$\alpha$ -HCH	$\alpha$ -HCH	
$\beta$ -HCH	$\beta$ -HCH	$\beta$ -HCH	$\beta$ -HCH	
$\gamma$ -HCH	$\gamma$ -HCH	$\gamma$ -HCH	$\gamma$ -HCH	
Hexabromobiphenyl	PBB 153	PBB 153	PBB 153	
Pentachlorobenzene	PeCBz	PeCBz	PeCBz	
c-penta BDE	BDE 47, 99, 153, 154, 175/183 (co-eluting)	BDE 47, 99, 153, 154, 175/183 (co-eluting)	BDE 47, 99, 153, 154, 175/183 (co-eluting)	
c-octa BDE	Optional: BDE 17, 28, 100	Optional: BDE 100	Optional: BDE 100	
PFOS <sup>6</sup>	PFOS, NMeFOSA, NEtFOSA, NMeFOSE, NEtFOSE (linear and sum of PFOS)	PFOS (linear and sum of PFOS)	PFOS (linear and sum of PFOS)	PFOS (linear and sum of PFOS)
<b>POPs listed at COP-5</b>				
Endosulfan	$\alpha$ -, $\beta$ -endosulfan; and endosulfan sulfate	$\alpha$ -, $\beta$ -endosulfan; and endosulfan sulfate	$\alpha$ -, $\beta$ -endosulfan; and endosulfan sulfate	
<b>POPs listed at COP-6</b>				
HBCD	$\alpha$ -HBCD, $\beta$ -HBCD, $\gamma$ -HBCD	$\alpha$ -HBCD, $\beta$ -HBCD, $\gamma$ -HBCD	$\alpha$ -HBCD, $\beta$ -HBCD, $\gamma$ -HBCD	$\alpha$ -HBCD, $\beta$ -HBCD, $\gamma$ -HBCD

+ POPs listed at COP7: Hexachlorobutadiene, PCN, Pentachlorophenol

COP8: SCCPs, deca-BDE

+ candidate chemicals considered - dicofol, PFOA, PFHxS



## Principles:

- Electronic data collection
  - Data providers
    - identified by ROGs
  - Data reported as:
    - Annually aggregated
    - Primary (and later aggregated in GMP DWH)
- Standardized parametric data structure



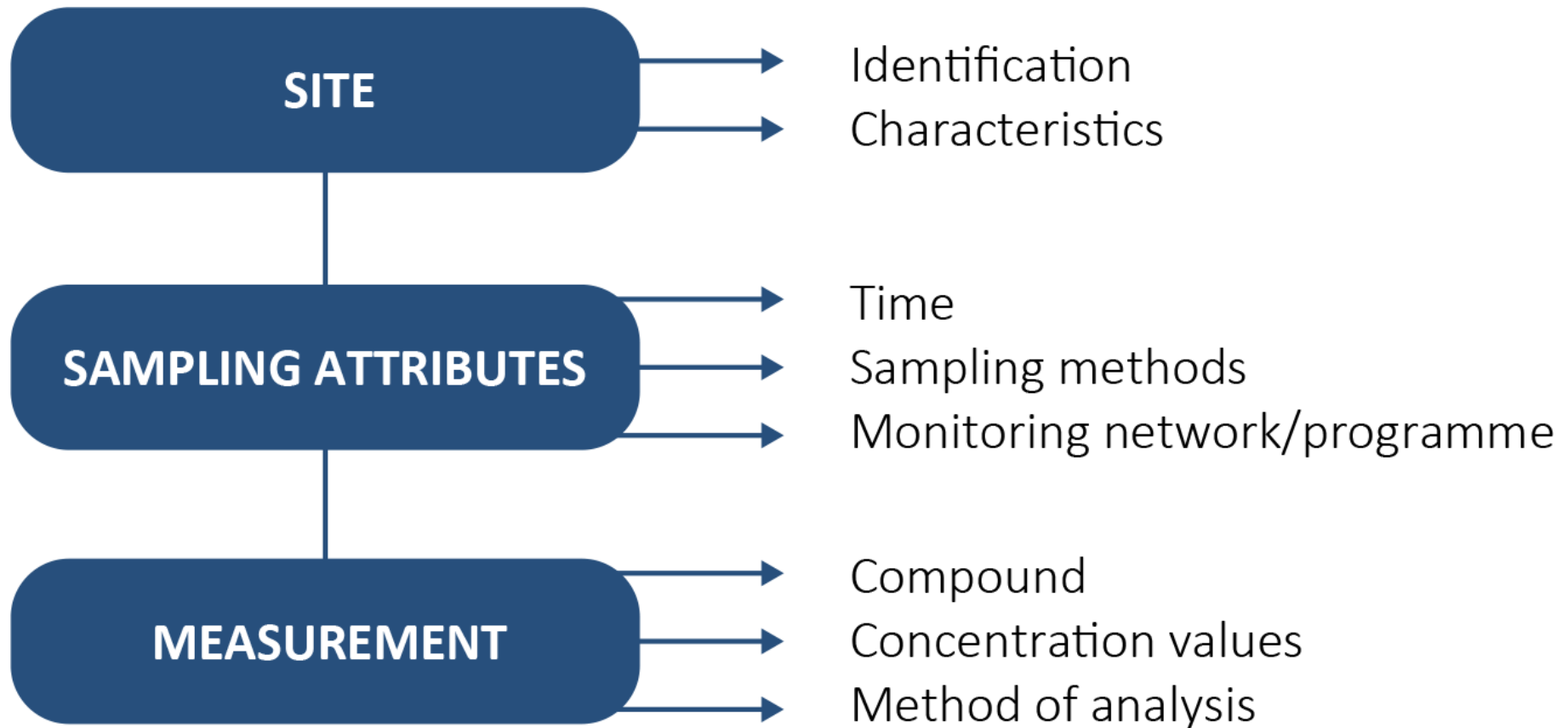
~~PCB 153 was monitored at the Košetice station in 2013. 26 values were collected by means of air-active sampling. Median value was 1.457 pg/m<sup>3</sup>, mean value 1.633 pg/m<sup>3</sup>, maximum concentration reached 4.382 pg/m<sup>3</sup>.~~

~~Air-active monitoring of PCB 153 at the Košetice station was performed in 2013. Median of the total 26 values was 1.457 pg/m<sup>3</sup>. Mean value was higher and reached 1.633 pg/m<sup>3</sup>.~~

Site	Year	Parameter	N	Mean	Median	Minimum	Maximum	Unit
Košetice	2013	PCB 153	26	1.633	1.457	0.506	4.382	pg/m <sup>3</sup>



- All items grouped into 3 hierarchical sections:





## Site

- Site ID (number)
- Site name (text)
- Longitude (number)
- Latitude (number)
- Region (code list)
- Country (code list)
- Site type (code list)
- Potential source type (code list)

## Sampling attributes

- Year (number)
- Start of sampling (number)
- End of sampling (number)
- Type of sampling (code list)
- Type of passive sampling (code list)
- Recalculation (code list)
- Calibration description (text)
- Monitoring programme/network (text)

## Measurement

- Chemical – group (code list)
- Parameter (code list)
- Method (code list)
- LOQ (number)
- No. of values (number)<sup>A</sup>
- No. under LoQ (number)<sup>A</sup>
- Value (number)<sup>P</sup>
- Value (mean) (number)<sup>A</sup>
- Value (median) (number)<sup>A</sup>
- Minimum (number)<sup>A</sup>
- Maximum (number)<sup>A</sup>
- 5th percentile (number)<sup>A</sup>
- 95th percentile (number)<sup>A</sup>
- SD (number)<sup>A</sup>
- Laboratory (text)

<sup>A</sup> – the item is valid for aggregated data reporting only

<sup>P</sup> – the item is valid for primary data reporting only





- GMP DWH is implemented fully on-line and accessible via Internet
- Standard web browsers (Internet Explorer, Mozilla Firefox, Google Chrome)
  - recent versions highly recommended!







## Web portal

- Information on GMP
- System documentation

<http://www.pops-gmp.org/>



## Data repository

- Authorised access
- Data import, processing, validation
- Data approval

## Data visualization

- Public access (since COP-7, 2015)
- Descriptive statistic analysis
- Time trends assessment

<http://visualization.pops-gmp.org/2014/>



<http://www.pops-gmp.org>

POPs GMP data visualization and analysis

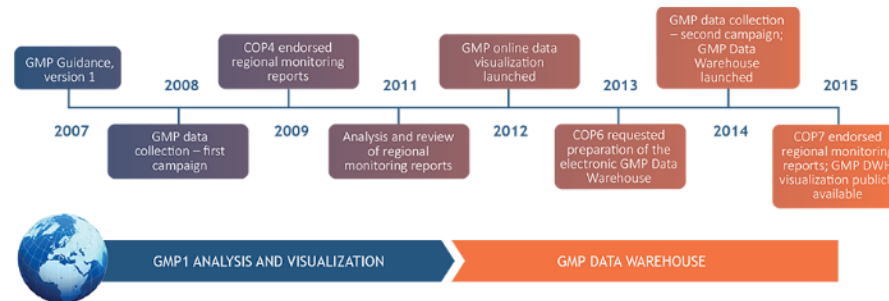


[Home](#) [Background](#) [GMP DWH](#) [Contact](#)

## Global Monitoring Plan on Persistent Organic Pollutants

Welcome to the website supporting the implementation of the Stockholm Convention on Persistent Organic Pollutants. Its Article 16 requires that effectiveness of measures adopted by the Convention to eliminate or significantly reduce POPs releases into environment must be regularly evaluated. To that regard a Global Monitoring Plan (GMP) was established; it aims at collecting comparable, harmonized and reliable information on POP levels in core environmental matrices (air, human tissues (breast milk/blood), and water).

This website is divided into two key parts - [Background](#) providing a reference to the Stockholm convention and content analysis of information available in the first set of GMP regional reports on POPs levels in the environment until 2008 inclusive, focusing on initial 12 POPs. The second part is GMP DWH that holds a [Global Monitoring Plan Data Warehouse](#): online tool to store and visualize global data on levels of POPs in core matrices and thus shows data made available until 2014 inclusive where available.



### Disclaimer

The designations employed and the presentations shown in this portal are possible options, based on expert judgment, for the purpose of providing comparable POPs monitoring data for the effectiveness evaluation of the Stockholm Convention. United Nations Environment Programme (UNEP) or contributory organizations/monitoring programmes cannot be liable for misuse of the information contained in it.

[News and important information](#)

[» Archive](#)



<http://www.pops-gmp.org/dwh>

POPs GMP data visualization and analysis



[Home](#) [Background](#) [GMP DWH](#) [Contact](#)

## Global Monitoring Plan Data Warehouse: online tool to store and visualize data on levels of POPs in core matrices

### Introduction

The POPs Global Monitoring Plan Data Warehouse (GMP DWH) has been developed by the Stockholm Convention Regional Centre in the Czech Republic through the Research Centre for Toxic Compounds in the Environment and the Institute of Biostatistics and Analyses, Masaryk University, Brno, Czech Republic, under the guidance of the GMP Global Coordination Group, and based on Chapter 6 of the Guidance on the Global Monitoring Plan for Persistent Organic Pollutants relevant to data handling ([UNEP/POPS/COP.6/INF/31](#)).

The data reporting model involves compiling and archiving primary GMP data within a “regional data repository” in the GMP DWH for each of the five regional organization groups. In addition, the GMP DWH compiles and archives aggregated data, including supplementary data, in cases where no primary data is made available.

### Attributes of the GMP DWH

The following attributes are embedded in the multi-modular GMP DWH:

- ▶ Fully parametric data sheets - harmonized data and information structure to improve the quality of information reported from particular monitoring activities, supporting their broader comparability;
- ▶ Standardized data structure, handling and outputs - the GMP DWH is designed to work with data from a wide range of heterogeneous sources, such as national monitoring programmes or large international monitoring networks, without compromising incoming information;
- ▶ Compatibility check - GMP DWH contains only completed and validated data records;
- ▶ Regional data repositories- automatic tools for storage, archiving of both primary and aggregated data;
- ▶ Multilayer data validation procedure - compatible data records stored in the GMP DWH are considered by members of the respective regional organization group and validated for further use in the publication;
- ▶ Data visualization- presentation of data in a uniform format;
- ▶ Public access to the data once the validation process and preparation of regional reports is completed.

### Structure and content of the GMP DWH

The GMP DWH is composed of three layers:

- ▶ Data layer for data import, online data collection, data standards (code lists) and archiving.
- ▶ Core layer for data management, validation, recoding, transformation, and background for



### System documents

- [GMP DWH Overview](#)
- [Tools in the GMP DWH](#)
- [User Guide for DATA PROVIDERS and USERS](#)
- [User Guide for DECISION MAKERS and USERS](#)

### Factsheets

- [Factsheet 1 - Overview](#)
- [Factsheet 2 - Tools](#)
- [Factsheet 3 - Data Import](#)
- [Factsheet 4 - Data Management](#)
- [Factsheet 5 - Data Visualization](#)

### Data structure

- [Air](#)
- [Human milk](#)
- [Human blood](#)
- [Water](#)

### Analytical data reporting spreadsheets

- [Air - primary data](#)
- [Air - aggregated data](#)
- [Human blood - primary data](#)
- [Human blood - aggregated data](#)



<http://visualization.pops-gmp.org/2014/>

- Data collection phase
  - Access for authorised users only (ROGs members, data providers, administrators)
  - Support for data validation and approval/rejection by ROG members
- After publication of monitoring reports
  - Public access
  - Analysis of POPs data from global view



<http://visualization.pops-gmp.org/2014/>

GMP Data Warehouse – Data Visualization



SPATIAL DISTRIBUTION DATA SUMMARY TIME DATA  
DISTRIBUTION AVAILABILITY STATISTICS SERIES EXPORTS

## GMP Data Warehouse – Data Visualization

*Global Monitoring Plan (GMP) for Persistent Organic Pollutants (POPs) under the Stockholm Convention*

The GMP Data Warehouse (GMP DWH) is an online tool developed for handling persistent organic pollutants (POPs) monitoring data generated in the frame of the Global Monitoring Plan (GMP) under the Stockholm Convention on POPs.

### Available Tools

GMP Data Visualization 2014 is a tool for consideration of GMP data per region, it allows the following visualizations of available data:

- Map overview
- Data Availability
  - Available data – Parameters
  - Available data – Time
- Summary statistics
  - Trend Map
  - Time Series Analysis
  - Time Series Bar Charts Map
- Data Exports
  - Sites Summary
  - Data Sources Summary
  - Analytical Methods Summary
  - Export of All Data Selected

[Open data selection](#)

### Available tools:

- Spatial distribution
- Data availability
- Summary statistics
- Time series
- Data exports

The purpose of the GMP DWH is to:

• act as regional node for electronic data collection, storage, processing and presentation in regions with limited capacity;  
• support the development of regional monitoring reports and the global report in the frame of the GMP;  
• support the effectiveness evaluation of the Stockholm Convention by compiling and visualizing results of global POPs monitoring activities;  
• provide user-friendly access to the POPs monitoring data to all stakeholders and the broad public.

The DWH provides information on POPs concentrations in ambient air, human tissues (breast milk and maternal blood) and surface water for water-soluble POPs (perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride) collected in the frame of the GMP and validated by the regional organization groups of the five UN regions. These data are presented also in the [regional monitoring reports](#).

# Step-by-step data selection



Stockholm Convention  
Regional Centre for Capacity Building  
and the Transfer of Technology



GMP Data Warehouse – Data Visualization

Regional Monitoring Reports About GMP DWH Contact



SPATIAL DISTRIBUTION DATA AVAILABILITY SUMMARY STATISTICS TIME SERIES DATA EXPORTS

**Sea** 1  
All Items

---

**Site Type** 1  
All Items

---

**Time Range** 1  
All Items

---

**Status** 1  
All Items

---

**Monitoring programme** 1

- AMAP (1778)
- Chemicals in Environment (Ministry of the Environment, Japan) (150)
- China National POPs Monitoring (3003)
- EMEP (2290)
- Environmental Survey of Dioxins (Ministry of the Environment, Japan) (16)
- IADN (3364)
- Kosetice (573)
- Northern Contaminants Program (745)
- POPs Monitoring Project in East Asian Countries (436)
- Toxic Organic Micro-Pollutants Program (2736)

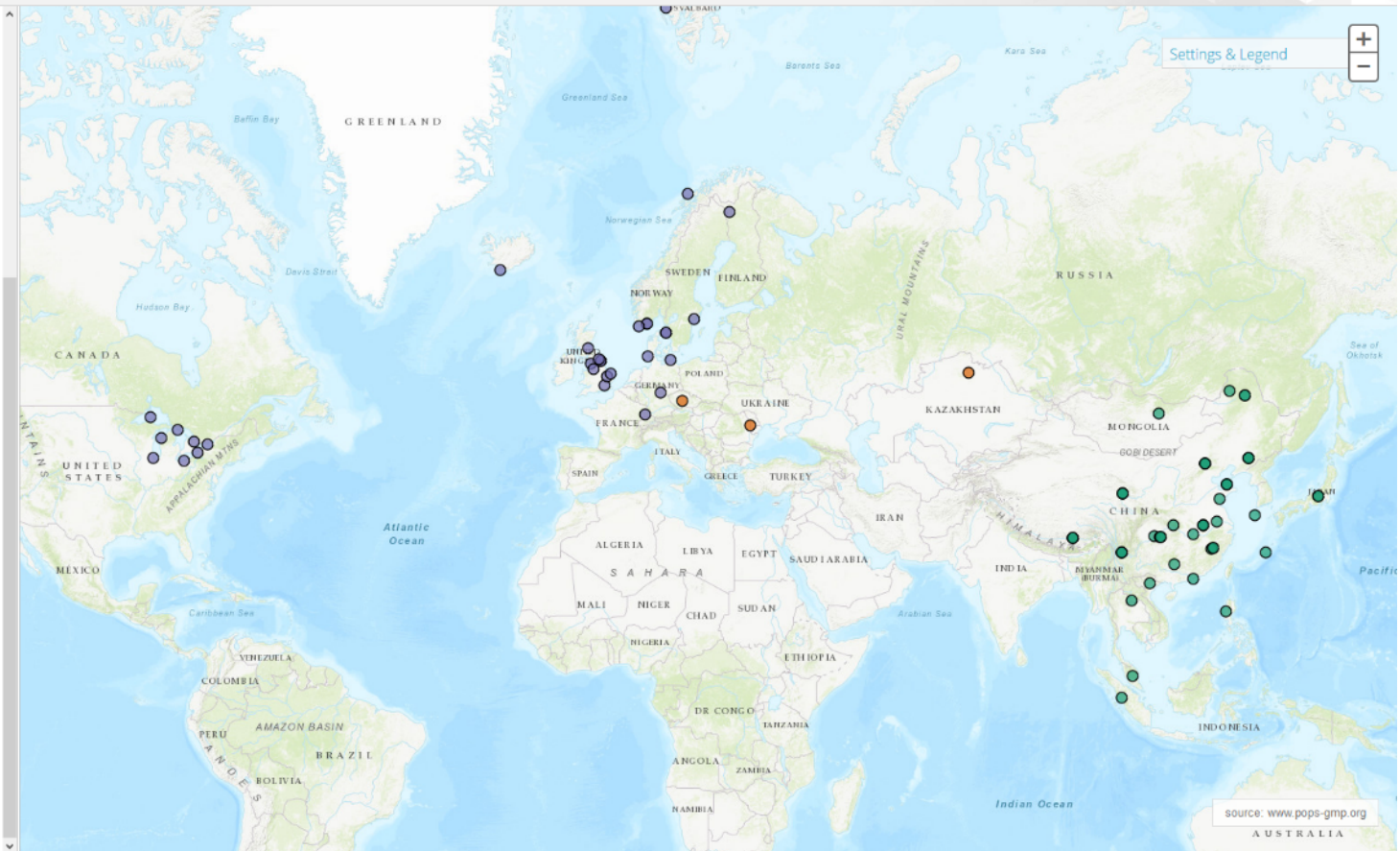
all  none  inverse Back Next

---

**Data Provider** 1

---

**Compound** 1





# Spatial distribution



Stockholm Convention  
Regional Centre for Capacity Building  
and the Transfer of Technology



GMP Data Warehouse – Data Visualization

Regional Monitoring Reports About GMP DWH Contact



SPATIAL DISTRIBUTION

DATA AVAILABILITY

SUMMARY STATISTICS

TIME SERIES

DATA EXPORTS

Data selection

Year:

- Choose an option --
- 1994
  - 1995
  - 1996
  - 1997
  - 1998
  - 1999
  - 2000
  - 2001
  - 2002
  - 2003
  - 2004
  - 2005
  - 2006
  - 2007
  - 2008
  - 2009
  - 2010
  - 2011
  - 2012
  - 2013

Switch basemap

Settings & Legend



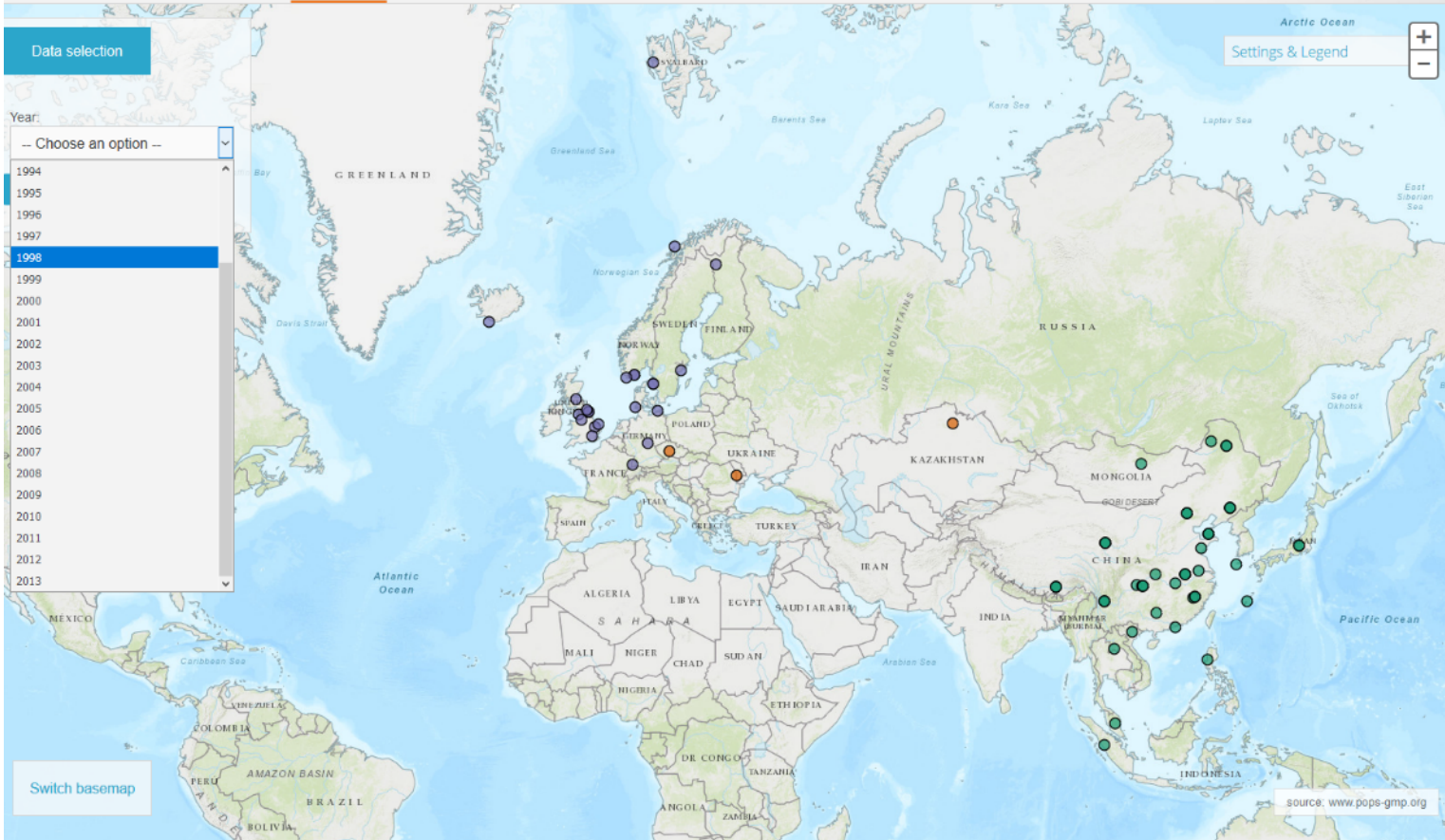
## Site Detail

User can view additional information related to a sampling site. Click on a site (coloured point) to view: site name, latitude, longitude, UN region, country, sea, site type, and sources of pollution (Source type-air, Discharges-water). To leave the Site Detail view, click on the viewed site again.

## Description

The Map Overview displays map with selected sampling sites in a given time interval. Sampling sites are marked by coloured points distinguishing the individual UN regions. Map can be scaled down or up by using the zooming tool. The map is also interlinked with data selection module and displays only data included in the selection.

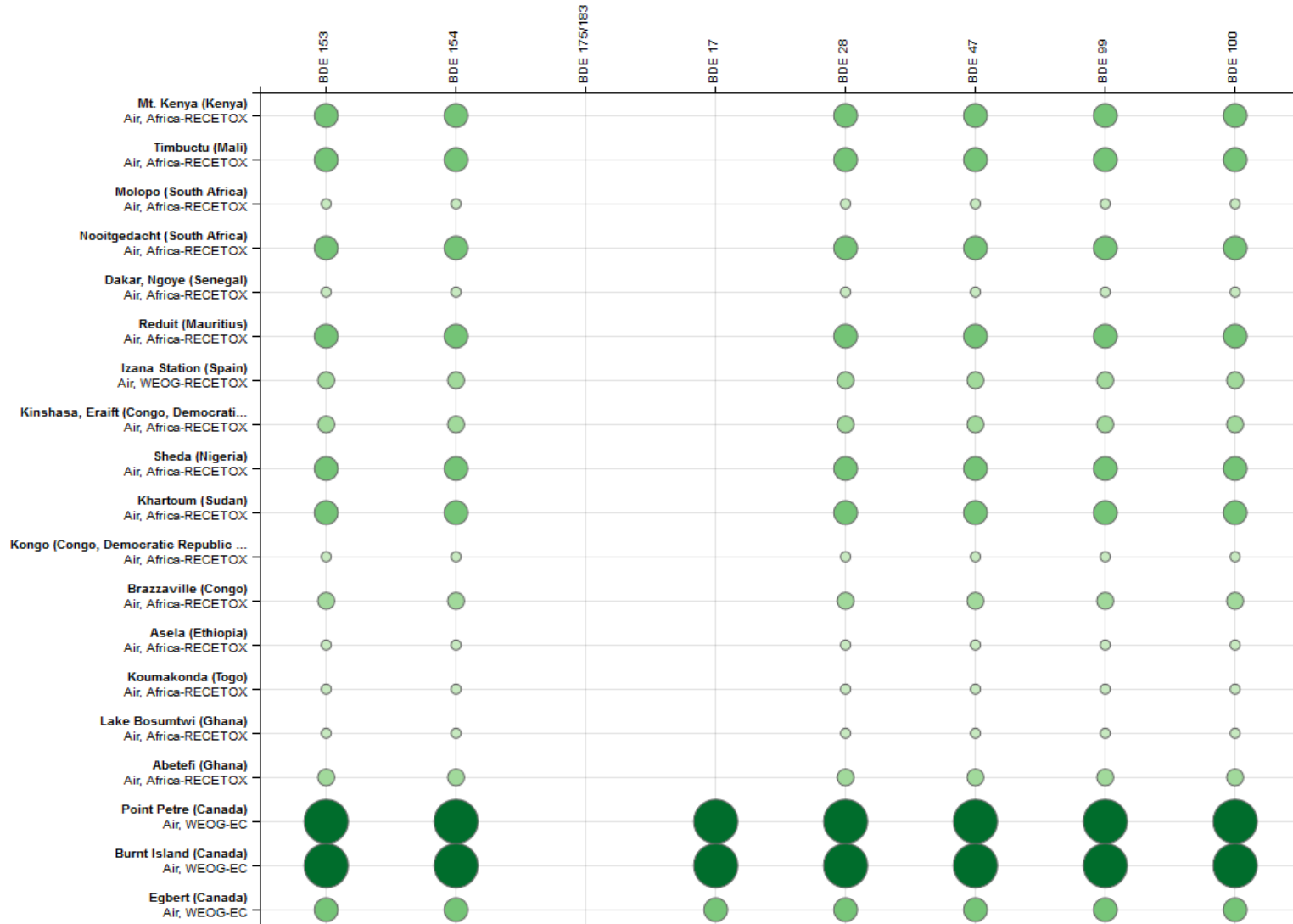
source: www.pops-gmp.org



# Data availability



Stockholm Convention  
Regional Centre for Capacity Building  
and the Transfer of Technology





# Summary statistics



Stockholm Convention  
Regional Centre for Capacity Building  
and the Transfer of Technology



Matrix:

Air

Matrix specification:

Active

Compound:

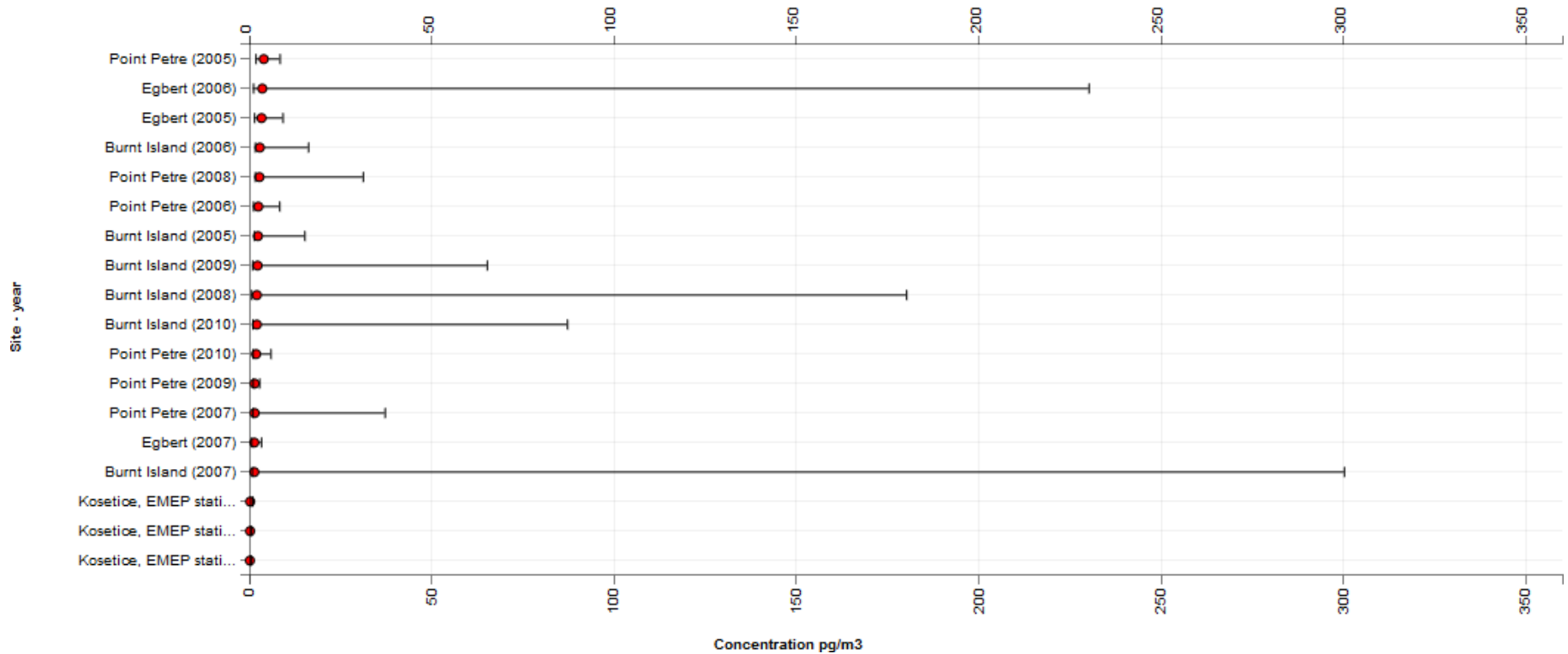
Polybromodiphenyl ethers (PBDE)

Parameter:

BDE 99

Unit:

pg/m3



# Time trends



Stockholm Convention  
Regional Centre for Capacity Building  
and the Transfer of Technology



GMP Data Warehouse – Data Visualization

About GMP DWH Contact



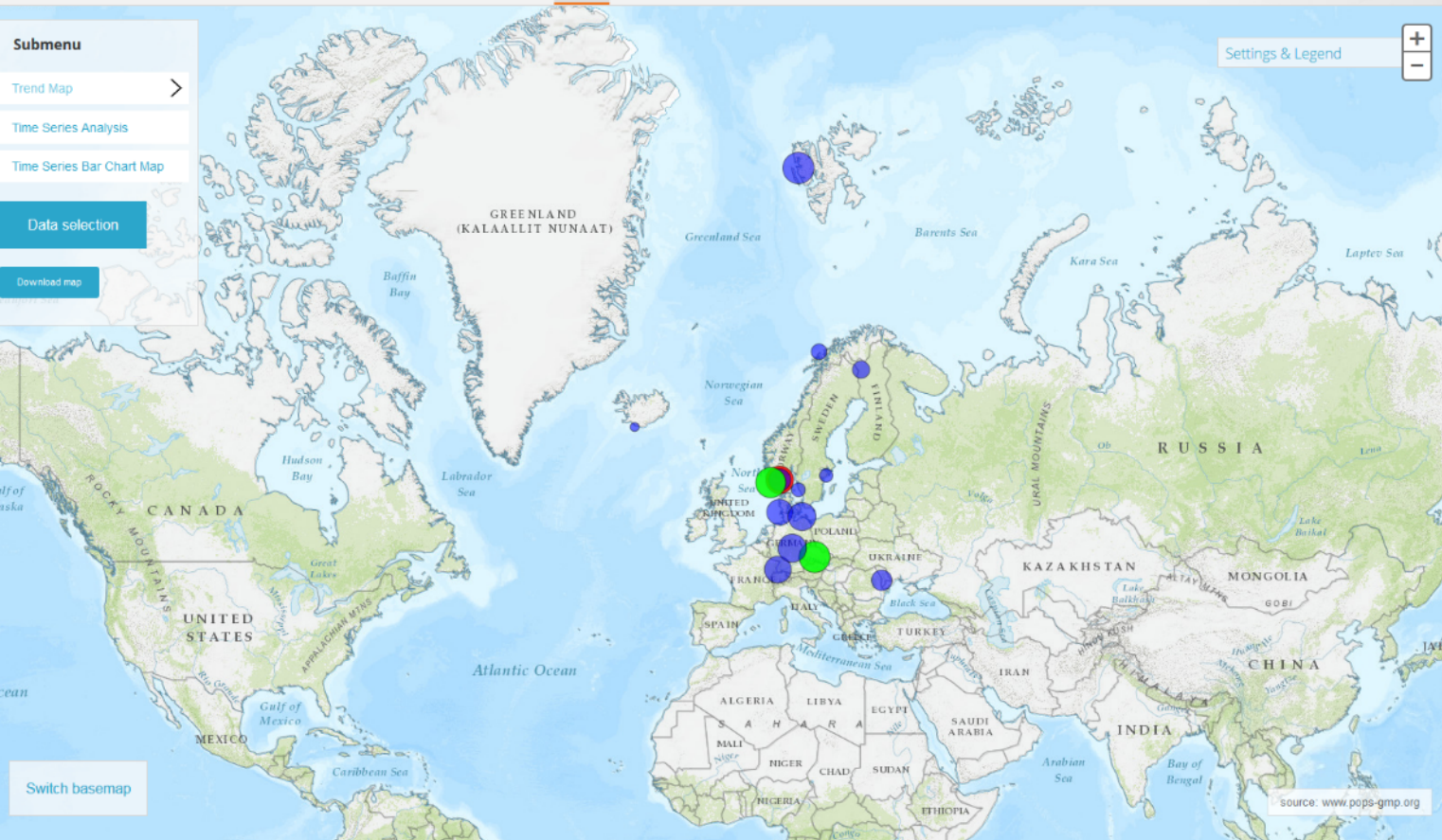
SPATIAL DISTRIBUTION DATA AVAILABILITY SUMMARY STATISTICS **TIME SERIES** DATA EXPORTS

## Submenu

- Trend Map >
- Time Series Analysis
- Time Series Bar Chart Map

Data selection

Download map



## Filters

Matrix: Air

Matrix specification: Active

Compound: Hexachlorobenzene (HCB)

Parameter: HCB

Unit: pg/m3

## Settings

## Site Detail

Switch basemap

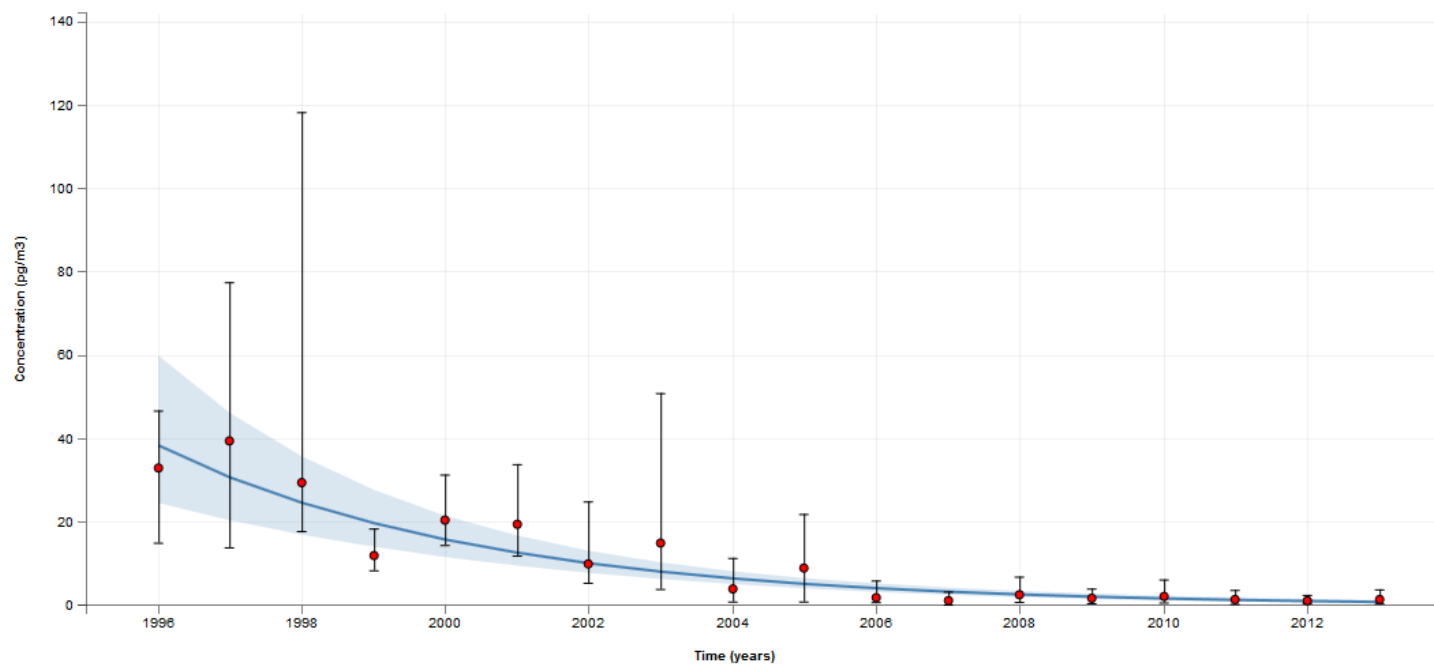
source: www.pops-gmp.org

# Time trends



Matrix:  Matrix specification:  Compound:  Parameter:

Unit:  Site:



## Summary

Mean	11.428 pg/m3
Median	6.5 pg/m3
Minimum / maximum	1.15 – 39.5 pg/m3
5th percentile / 95 percentile	1.1925 – 33.975 pg/m3

## Trend description

Delta	-31.543 pg/m3
Mann-Kendal test	-0.79085 (p = 2.2949E-7)
Daniels test	-0.9257 (p = 0)



## Export Sites

Show  Search:

entries

Site ID	Site Name	Latitude	Longitude	UN Region	Country	Site Type	Data Provider
GMP-A-0000358	Leova II	46,488330N	28,283330E	CEE	Moldova, Republic of		CEE-NILU
GMP-A-0000360	Sevan, Tsovagyug						
GMP-A-0000361	Amberd						
GMP-A-0000362	Artashat						
GMP-A-0000363	Berezinsky nature reserve						
GMP-A-0000364	Visokoie						
GMP-A-0000365	Lazaropole						
GMP-A-0000366	Bujkovci						

## Analytical Methods Summary

Show  Search:

entries

Matrix	Compound	Analytical Method
Air	Aldrin	GC-MS-NCI
Air	Aldrin	GC-MS/MS
Air	Aldrin	GC-MS/MS
Air	Alpha-hexachlorocyclohexane (α-HCH)	GC-MS
Air	Alpha-hexachlorocyclohexane (α-HCH)	GC-MS/MS
Air	Alpha-hexachlorocyclohexane (α-HCH)	GC-MS
Air	Alpha-	

## Data Sources Summary

Show  Search:

entries

Matrix	Matrix Specification	Monitoring Programme	First Year	Last Year	Num. of Compounds	Num. of Sites
Air	Active	AMAP	2008	2009	12	1
Air	Active	EMEP	2009	2010	7	2
Air	Active	Kosetice	1996	2011	20	1
Air	Active	Kosetice - active air sampling	2012	2013	21	1
Air	Active	NOT_CLASSIFIED	2012	2012	8	1
Air	Passive	APOPSBAL	2004	2004	7	1
Air	Passive	GAPS	2004	2009	12	3
Air	Passive	MONET - CEEC	2006	2008	7	54
Air	Passive	MONET - CZ	2003	2014	7	15
Air	Passive	MONET - EU	2009	2013	7	21
Air	Passive	NOT_CLASSIFIED	2011	2012	7	4

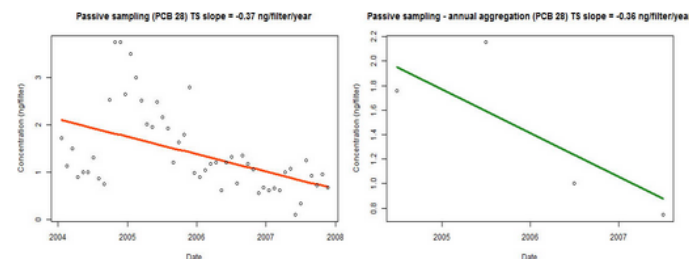


- Figures and maps – exports to PNG
- Data – exports to CSV  
(for further processing in MS Excel and other software)



## Statistical and analytical tools

- R package
- Data aggregation
- Trend assessment



[Hide methodology](#)

[Hide methodology](#)

### Annual aggregation

The process of annual aggregation represents nothing else than searching for one representative value to substitute 1-year segment of the time series. On one hand this process omits and hides certain characteristics of the time series (especially the within-year fluctuations), but on the other hand it also allows to compute some more extensive statistics not to be affected by details - especially the long-term time trends.

As in the previous examples, the selection of the best function used for aggregation of more measurements into one number depends on the distribution of the values. If we search for the central tendency, the most often used mean (intended also by the GMP methodology):

$$\text{mean} = \bar{y} = \sum_{i=1}^n y_i / n$$

is suitable for normal (symmetric in general) distributions, while geometric mean:

$$\text{geometric mean} = \prod_{i=1}^n \sqrt[n]{y_i} = e^{\sum_{i=1}^n \log(y_i) / n}$$

is better in case of lognormal distribution. The nonparametric central tendency is represented by median:

$$\text{median} = \tilde{y} = y_j : P(y_i \leq y_j) = P(y_i \geq y_j)$$

Nevertheless, not only the central tendency is important for characterization of the one year period of measurements. We can use other functions to get the information about spread and distribution of the values. E.g., maximum tell us about the highest concentration through the year, which could be of high importance, or the number of individual measurement describes the design of pollutant monitoring. Therefore, there is an option to input your own function into the R example.

Find more at: <http://www.genasis.cz/time-series/>

## Current GMP DWH content

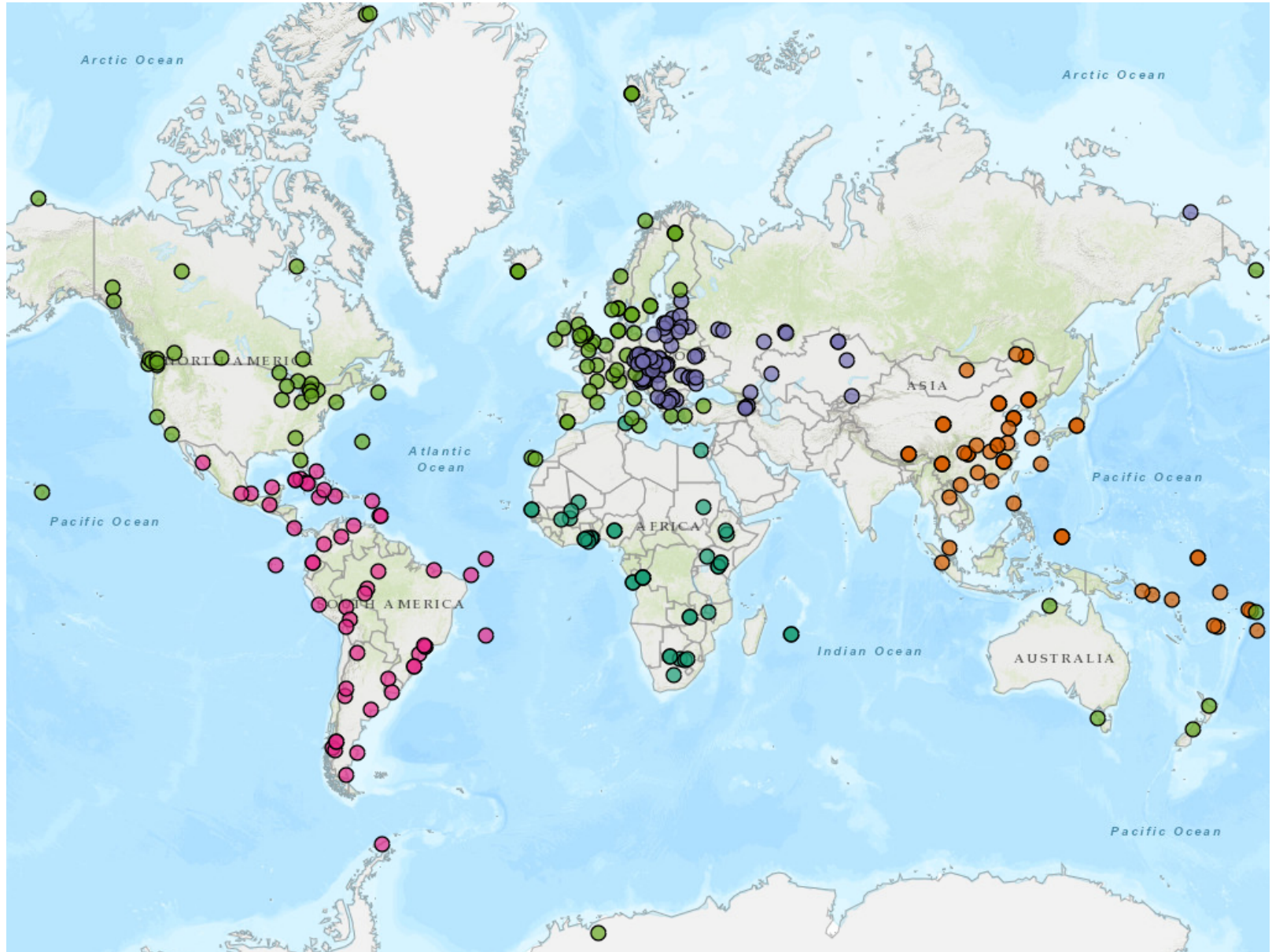
- mirrors **POPs data** shown in the most recent GMP regional reports (published for COP7 in 2015)
- **global data in GMP core matrices**
- **until 2014** where possible
- REMINDER: data are **annually aggregated!**



# Sites – air



Stockholm Convention  
Regional Centre for Capacity Building  
and the Transfer of Technology





# Sites – air in GMP DWH



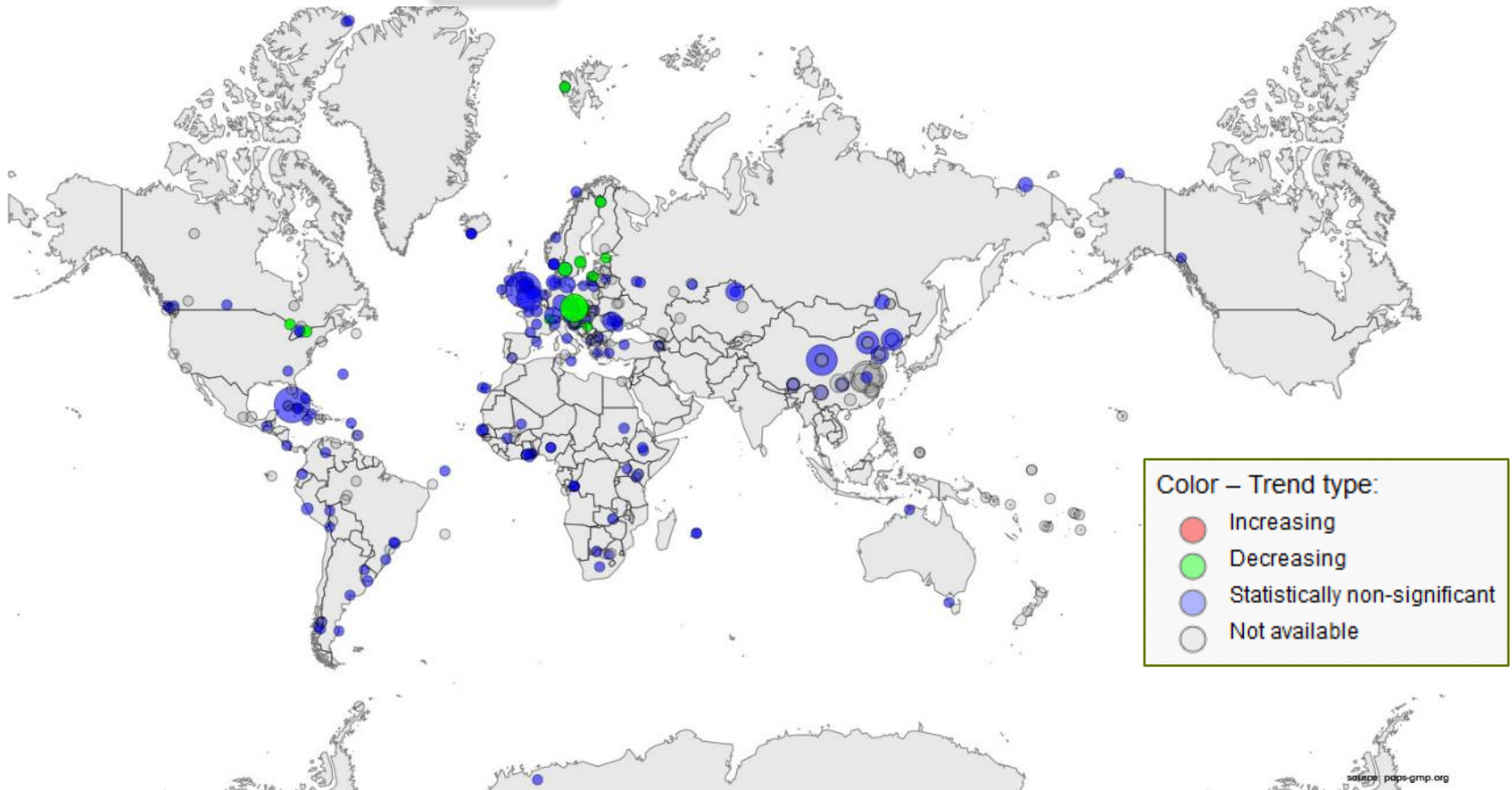
Monitoring programme	Africa	Asia & Pac.	CEE	GRULAC	WEOG	Total	Year	Africa	Asia & Pac.	CEE	GRULAC	WEOG	Total
AMAP			1		4	5	1990					1	1
EMEP			2		16	18	1991					4	4
Dioxins Survey (Japan)		1				1	1992					7	7
GAPS	7		3	14	42	66	1993					8	8
GAPS-GRULAC				11		11	1994					9	9
GMP UNEP	11	14		16		41	1995					12	12
Chemicals Environ. (Japan)		1				1	1996			1		13	14
China Nat. POPs Monitor.		37				37	1997		1	1		14	16
IADN					5	5	1998		2	1		14	17
Košetice			1			1	1999		2	1		13	16
LAPAN				13		13	2000		2	1		14	17
MONET	23		76		23	122	2001		2	1		14	17
Northern Contam. Program					1	1	2002		2	1		14	17
POPs East Asia		8				8	2003		2	1		16	19
TOMPS					8	8	2004		2	5		23	30
<b>Total</b>	<b>41</b>	<b>61</b>	<b>83</b>	<b>54</b>	<b>99</b>	<b>338</b>	2005	4	2	7	9	45	67
							2006	4	2	37	6	43	92
							2007	2	12	42	5	52	113
							2008	18	21	29		25	93
							2009	3	5	39	7	79	133
							2010	24	22	36	24	46	152
							2011	21	15	32	31	35	134
							2012	8	12	31	13	29	93
							2013	2	5	22	1	14	44
							2014			9			9

# Example – PCB 153 (air)



## Air

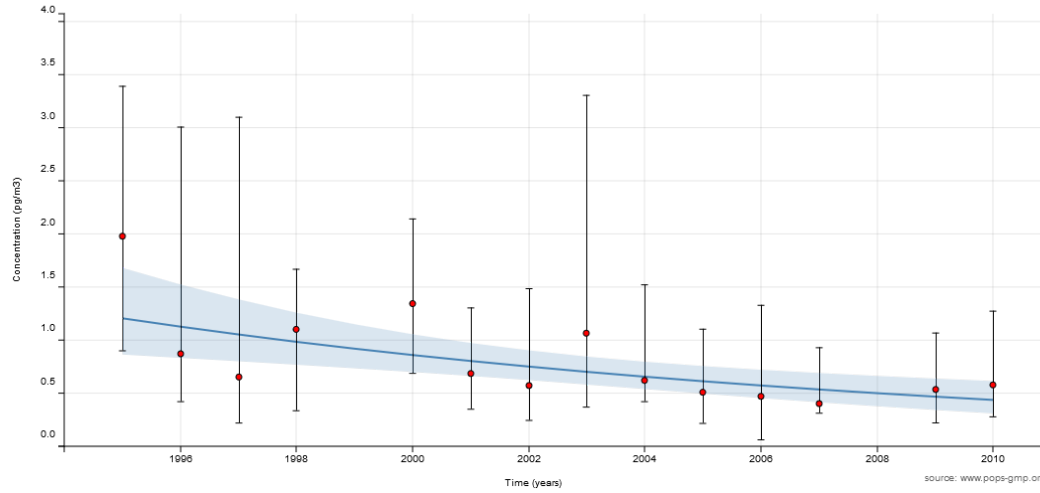
Time series	Africa	Asia & Pac.	CEE	GRULAC	WEOG	Total
≥ 10 years	0	0	5	0	7	12
7–9 year	0	0	12	0	7	19
4–6 years	5	0	15	0	23	43
2–3 years	21	9	11	27	33	101



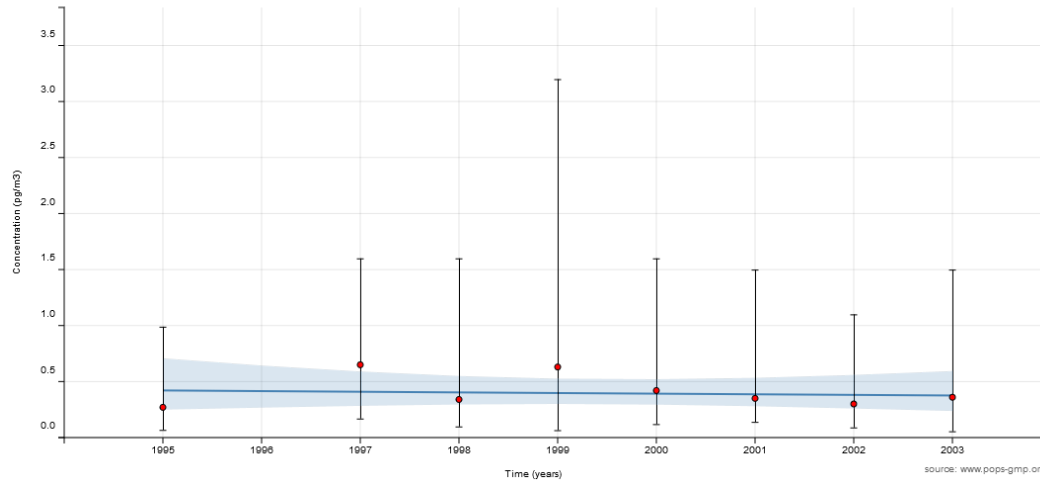
# Example – PCB 153 (air)



## Aspvreten (SWE)



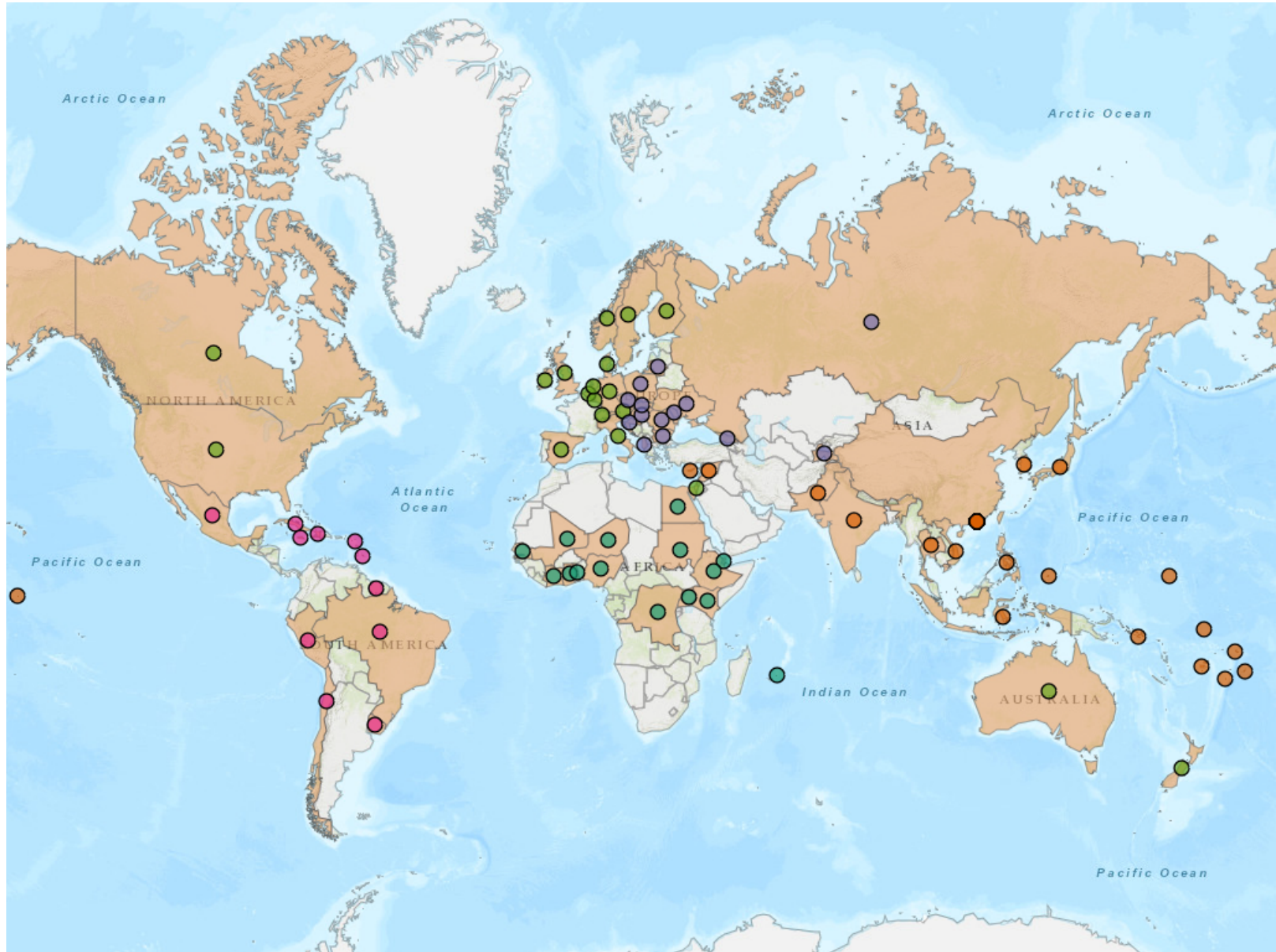
## Egbert (CAN)



# Countries – human milk



Stockholm Convention  
Regional Centre for Capacity Building  
and the Transfer of Technology



# Countries – human milk



Stockholm Convention  
Regional Centre for Capacity Building  
and the Transfer of Technology



Monitoring programme	Africa	Asia & Pac.	CEE	GRULAC	WEOG	Total	Year	Africa	Asia & Pac.	CEE	GRULAC	WEOG	Total
GMP UNEP	15	20	14	11	19	<b>79</b>	1987		4	3		12	<b>19</b>
China Nat. POPs Monitor.		27				<b>27</b>	1992		1	8		8	<b>17</b>
<b>Total</b>	<b>15</b>	<b>47</b>	<b>14</b>	<b>11</b>	<b>19</b>	<b>106</b>	2000					1	<b>1</b>
							2001	1		8	1	7	<b>17</b>
							2002	1	3	1		6	<b>11</b>
							2003					1	<b>1</b>
							2004				1		<b>1</b>
							2006	1	3	3		3	<b>10</b>
							2007		23			2	<b>25</b>
							2008	1	2		2		<b>5</b>
							2009	7	3	4	1	1	<b>16</b>
							2010	2			1	3	<b>6</b>
							2011	2	36		6	1	<b>45</b>
							2012	1			2	1	<b>4</b>
							2014			2		1	<b>3</b>

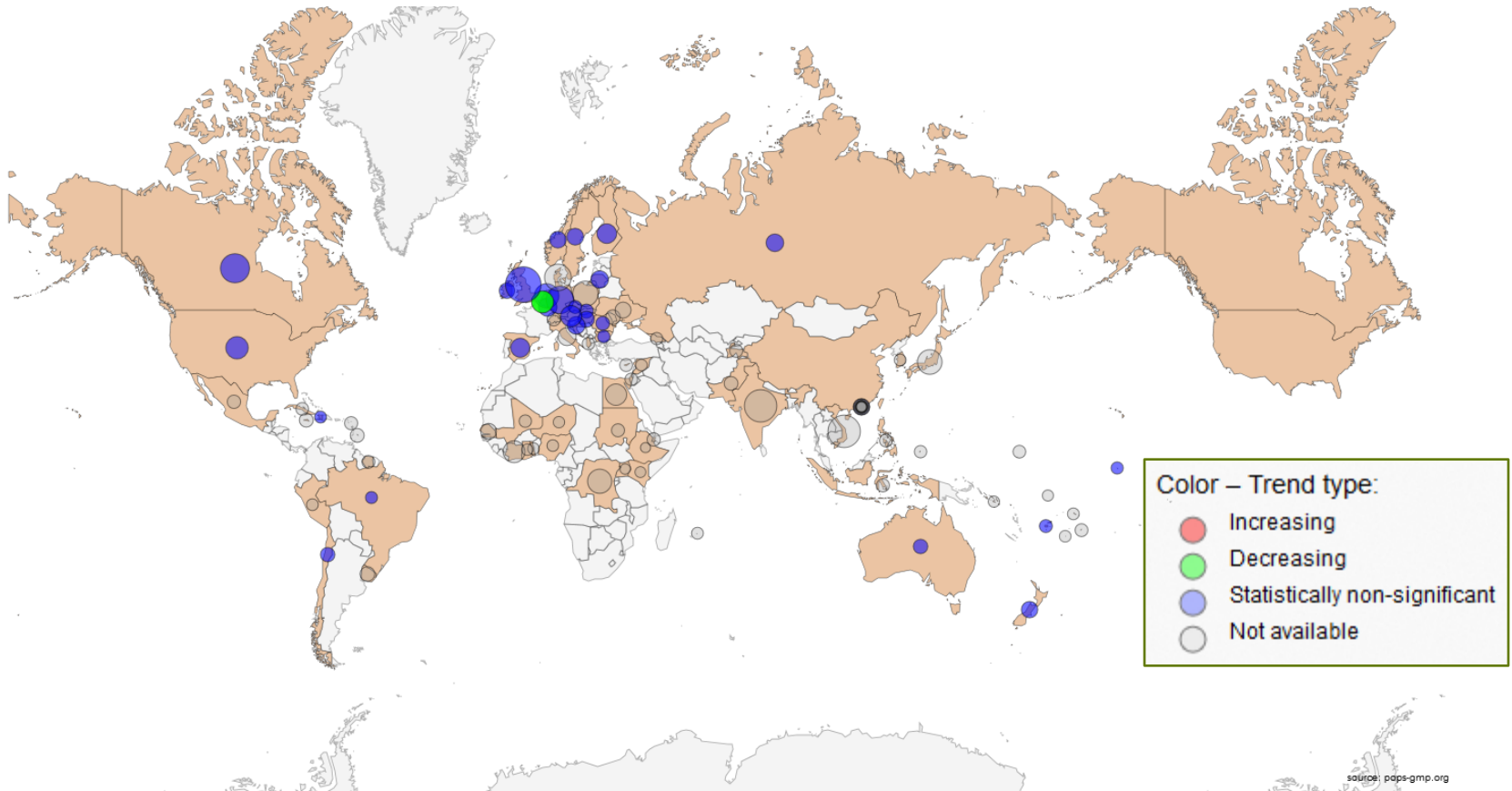
# Example – PCDDs WHO 2005 TEQ UB



Stockholm Convention  
Regional Centre for Capacity Building  
and the Transfer of Technology



Time series	Africa	Asia & Pac.	CEE	GRULAC	WEOG	Total
5 years	0	0	0	0	1	1
4 years	0	0	1	0	2	3
3 years	0	2	4	0	5	11
2 years	0	1	3	3	7	14





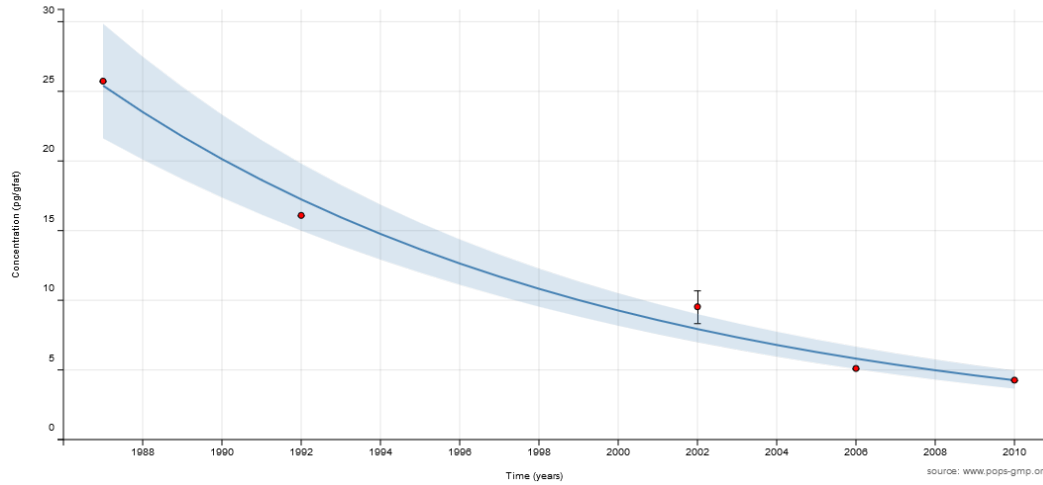
# Example – PCDDs WHO 2005 TEQ UB



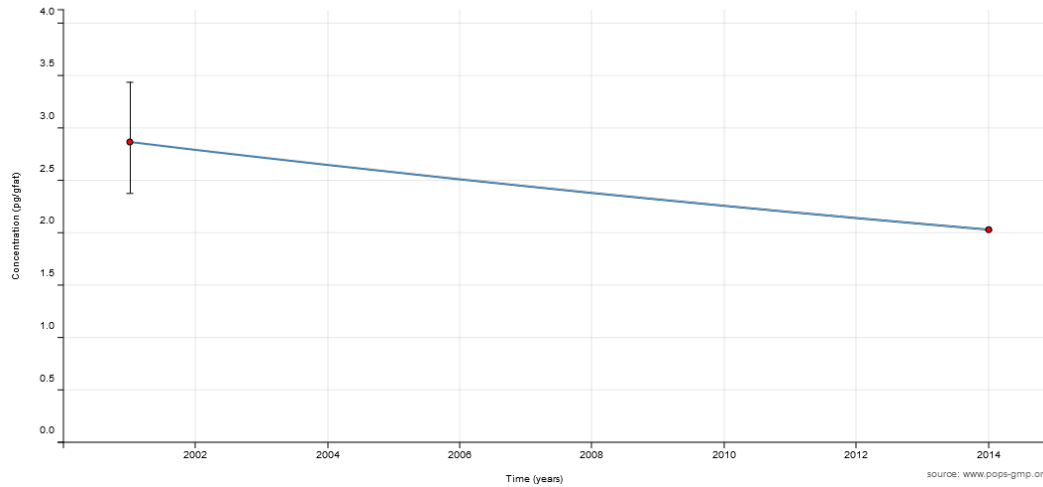
Stockholm Convention  
Regional Centre for Capacity Building  
and the Transfer of Technology



## Belgium



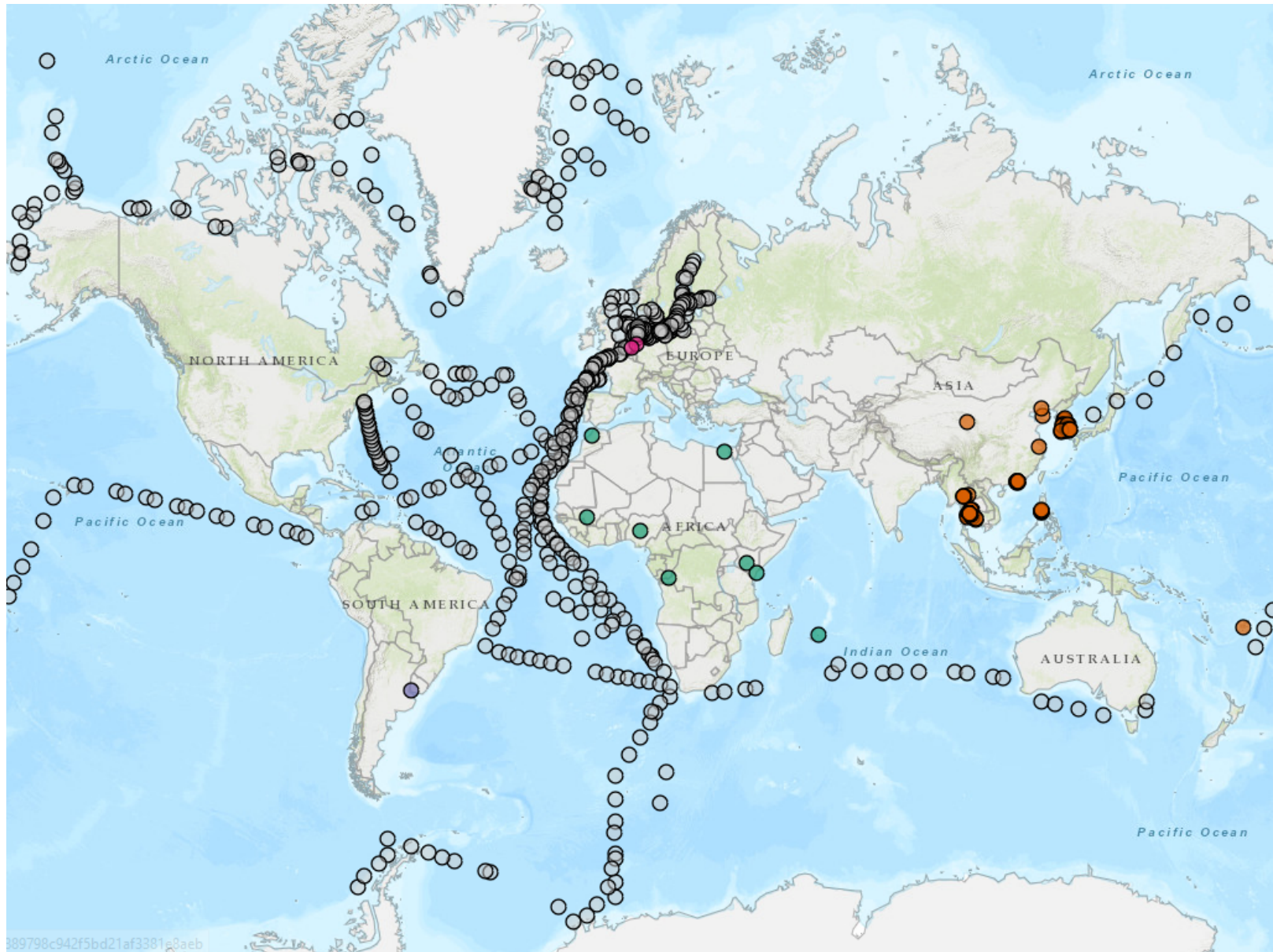
## Bulgaria



# Sites – water



Stockholm Convention  
Regional Centre for Capacity Building  
and the Transfer of Technology



389798c942f5bd21af3381c8aeb



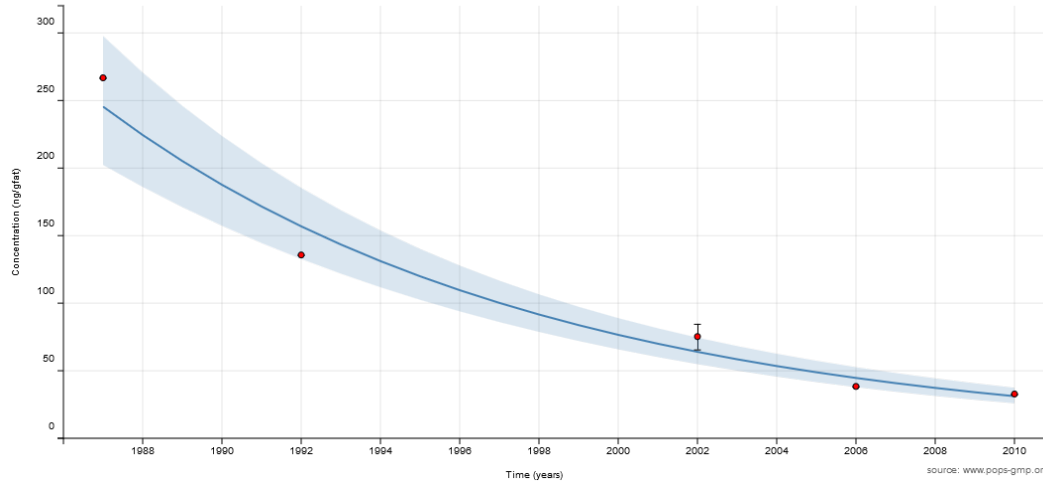
# Example – PCB 153 (human milk)



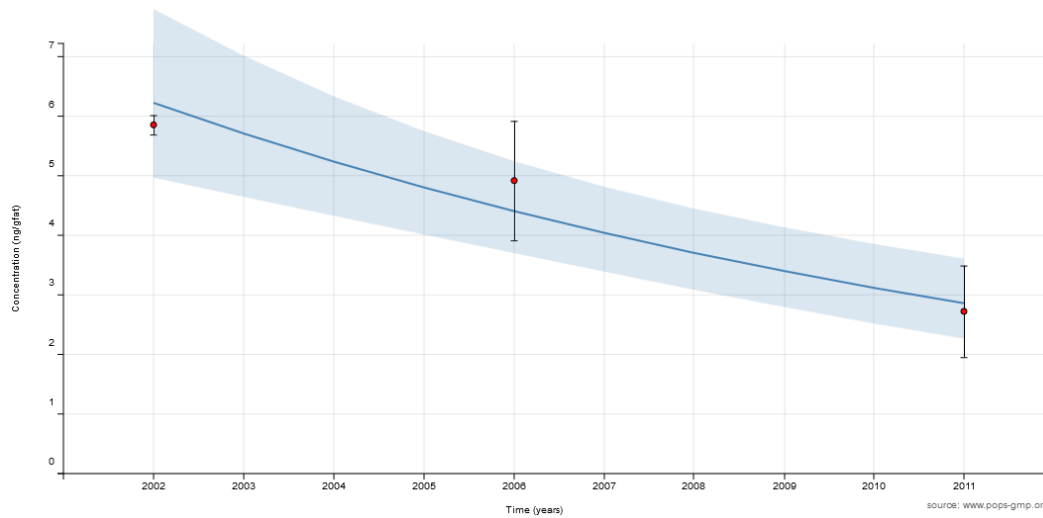
Stockholm Convention  
Regional Centre for Capacity Building  
and the Transfer of Technology



## Belgium



## Fiji





THANK YOU FOR YOUR KIND ATTENTION

[www.pops-gmp.org](http://www.pops-gmp.org)

GMP DWH HELP DESK: [gregor@iba.muni.cz](mailto:gregor@iba.muni.cz)