



Die Ziele der Stockholm-Konvention

Heideloire Fiedler

Örebro University

School of Science and Technology, MTM Research Centre

SE-701 82 Örebro, Sweden

E-mail: Heideloire.fiedler@oru.se

1. Ziele der Konvention und Implementierungsstrukturen
2. Spezifische Verpflichtungen
 - Zeittafel
 - Annex A und B Verpflichtungsstrukturen
 - Unbeabsichtigte Bildung und Emissionen (Annex C)
 - Umweltmonitoring

BRS Konventionen

- Framework für **Life Cycle Management** von gefährlichen Substanzen und Abfällen $\Rightarrow$ den drei Konventionen liegt „cradle-to-grave“ Ansatz zugrunde;
- Gemeinsame Ziele: Schutz des Menschen und der Umwelt vor gefährlichen Substanzen und Abfällen;
- Gemeinsamkeiten (verwoben):
 - $\Rightarrow$ Gemeinsame Bedrohung: die meisten POPs sind in allen drei Konventionen gelistet
 - $\Rightarrow$ Viele Pestizide werden von allen drei Konvention abgedeckt
 - $\Rightarrow$ Hinsichtlich Abfall: Alle Chemikalien fallen unter die Regularien der Basel Konvention (Artikel 6 – ausdrückliche Erwähnung).

Stockholmer Übereinkommen

Allgemeines Ziel der SC (Objective (Article 1)):

“Mindful of the precautionary approach”, **to protect human health and the environment** from the harmful impacts of **POPs**

- Drei Ziele hinsichtlich der gelisteten Chemikalien in 3 Annexes:
 - Annex A: Ziel = Eliminierung (24) deca-BDE und SCCPs seit 2017
 - Annex B: Ziel = Begrenzung/Limitierung (2)
 - Annex C: “unintentional production” (7) HCBD seit 2017

Verpflichtungen (hinsichtlich der Substanzen)

1) Intentional releases from production and use (Article 3, Annexes A and B)

- **Ende** der **Produktion** und der **Anwendungen** von Substanzen, die in **Annex A** gelistet sind (Möglichkeit der Produktion und/oder Gebrauchserlaubnis für bis zu 5 Jahre)
- **Begrenzung** der Produktion und des Gebrauchs der Substanzen, die in **Annex B** gelistet sind (Möglichkeit für „specific exemptions“ oder „acceptable purposes“)
- **Handelsbeschränkungen** für Substanzen in Annexes A oder B
- **Import**: Erlaubt wenn für umweltfreundliche Entsorgung ($\Rightarrow$ BC) oder für „permitted use“
Export: Erlaubt, wenn für umweltfreundliche Entsorgung (Achtung: Regeln für Nicht-Vertragsstaaten)

2) Unintentional releases (Article 5, Annex C)

- Vertragsstaaten müssen Maßnahmen treffen, um die Emissionen in alle Vektoren zu reduzieren, nationalen/regionalen Aktionsplan entwickeln, Anwendung (Empfehlung) von **BvT/BuP**.

3) Stockpiles and wastes (Article 6)

- Vertragsstaaten sollen **Lagerbestände** und **Abfälle**, die die gelisteten Substanzen enthalten so handhaben, dass Mensch und Umwelt geschützt sind (ESM, environmentally sound management).

Zeittafel mit Aktivitäten/Berichten

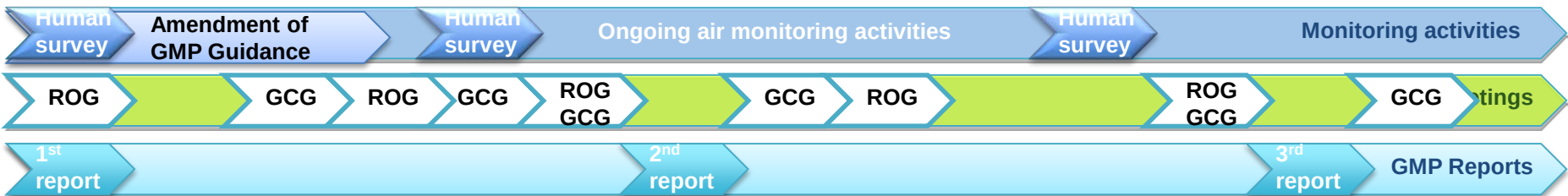


2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

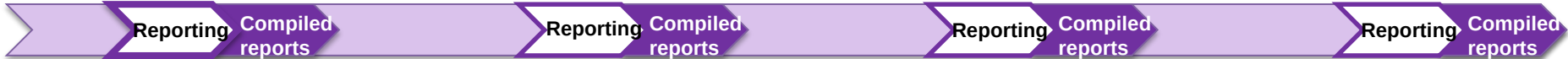
Meetings of the Conference of the Parties



Global Monitoring Plan



Reporting under Article 15



Reporting and Evaluation of progress towards PBDEs elimination



Reporting and Evaluation of the continued need for PFOS



Reporting and Evaluation of the continued need for DDT



Effectiveness Evaluation



Review of progress towards elimination of PCB

- May 2006: COP-2 adopted the format for national reporting on PCB
- July 2007: First national reporting deadline
- May 2009: COP-4 conducted the first review of information in national reports and the first effectiveness evaluation; and established PCB Elimination Network (PEN)
- Oct 2010: Second national reporting deadline
- May 2011: COP-5 conducted the second review of the information in national reports, transferred the leadership of PEN to UNEP
- May 2013: COP-6 adopted the effectiveness evaluation framework
- Aug 2014: Third national reporting deadline
- May 2015: COP-7 conducted the third review of the information in national reports and reviewed the preliminary assessment report on PCB by UNEP leading PEN
- May 2017: COP-8 conducted first effectiveness evaluation under framework adopted at COP-6. Consolidated assessment report on PCB was submitted
COP-8 established the SIWG on PCB to prepare a report for review of PCB at COP-9.
- Aug 2018: Fourth national reporting deadline

COP-8 concluded that the 2025 and 2028 deadlines cannot be met.

Specific exemptions

<http://chm.pops.int/Implementation/Exemptions/SpecificExemptions/ChemicalslistedinAnnexA/tabid/4643/Default.aspx>

Status: November 2017

HF_Ziele der Stockholm Konvention

Chemical	Activity	Specific exemptions
Hexabromocyclododecane [1]	Production	As allowed for the parties listed in the Register of Specific Exemptions in accordance with the provisions of <u>Part VII of Annex A</u> of the Convention
	Use	Expanded polystyrene and extruded polystyrene in buildings in accordance with the provisions of <u>Part VII of Annex A</u>
Hexabromodiphenyl ether and heptabromodiphenyl ether [1]	Use	Articles in accordance with provisions of <u>Part IV of Annex A</u>
Lindane CAS No: 58-89-9	Use	Human health pharmaceutical for control of head lice and scabies as second line treatment
Pentachlorophenol and its salts and esters	Production	As allowed for the Parties listed in the Register of Specific Exemptions in accordance with the provisions of <u>Part VIII of Annex A</u>
	Use	Pentachlorophenol for utility poles and cross-arms in accordance with the provisions of Part VIII of Annex A
Polychlorinated biphenyls (PCB)	Use	Articles in use in accordance with the provisions of <u>Part II of Annex A</u> .
Polychlorinated naphthalenes, including dichlorinated naphthalenes, trichlorinated naphthalenes, tetrachlorinated naphthalenes, pentachlorinated naphthalenes, hexachlorinated naphthalenes, heptachlorinated naphthalenes, octachlorinated naphthalene	Production	Intermediates in production of polyfluorinated naphthalenes, including octafluoronaphthalene
	Use	Production of polyfluorinated naphthalenes, including octafluoronaphthalene
Tetrabromodiphenyl ether and pentabromodiphenyl ether [1]	Use	Articles in accordance with the provisions of <u>Part V of Annex A</u>
Technical endosulfan and its related isomers	Production	As allowed for the parties listed in the Register of Specific Exemptions
	Use	Crop-pest complexes as listed in accordance with the provisions of <u>Part VI of Annex A</u>

Acceptable purposes

<http://chm.pops.int/Implementation/Exemptions/AcceptablePurposes/tabid/793/Default.aspx>

Register erstellt und ständig erneuert

Register für DDT
(nicht relevant für Deutschland)

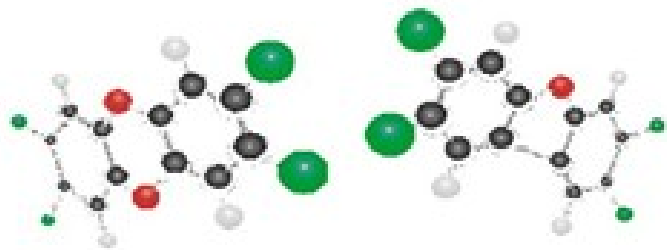
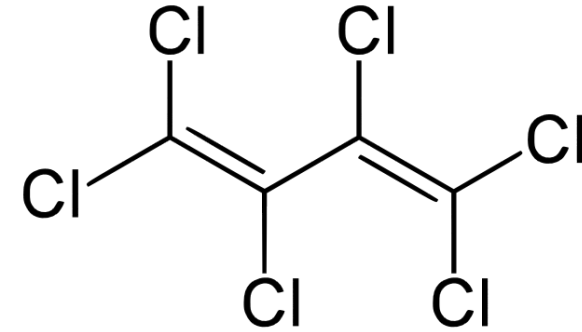
Chemical	Activity	Acceptable purpose
Perfluorooctane sulfonic acid (CAS No: 1763-23-1), its salts ^a and perfluorooctane sulfonyl fluoride (CAS No: 307-35-7)	Production	In accordance with part III of Annex B, production of other chemicals to be used solely for the uses below. Production for uses listed below.
^a For example: potassium perfluorooctane sulfonate (CAS no. 2795-39-3); lithium perfluorooctane sulfonate (CAS no. 29457-72-5); ammonium perfluorooctane sulfonate (CAS no. 29081-56-9); diethanolammonium perfluorooctane sulfonate (CAS no. 70225-14-8); tetraethylammonium perfluorooctane sulfonate (CAS no. 56773-42-3); didecyldimethylammonium perfluorooctane sulfonate (CAS no. 251099-16-8).	Use	In accordance with part III of Annex B for the following acceptable purposes, or as an intermediate in the production of chemicals with the following acceptable purposes: • Photo imaging • Photo resist and anti-reflective coatings for semi-conductors • Etching agent for compound semi-conductors and ceramic filters • Aviation hydraulic fluids • Metal plating (hard metal plating) only in closed-loop systems • Certain medical devices (such as ethylene tetrafluoroethylene copolymer (ETFE) layers and radio-opaque ETFE production, in vitro diagnostic medical devices, and CCD colour filters) • Fire fighting foam • Insect baits for control of leaf-cutting ants from <i>Atta spp.</i> and <i>Acromyrmex spp.</i>

Neue POPs gelistet in Annex A, B oder C

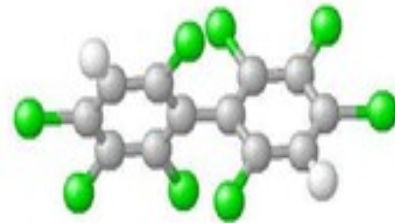
- Polybromodiphenyl ethers (PBDE):
 - Hexabromdiphenylether, Heptabromdiphenylether, Tetrabromdiphenylether, Pentabromdiphenylether gelistet im Annex A (2009; SC-4/14 und SC-4/18): mit specific exemptions für Recycling;
 - **Decabromdiphenylether** (PBDE-209; SC-8/10) gelistet im Annex A mit verschiedenen specific exemptions, die alle spätestens 2030 auslaufen.
- Basel Konvention: „POPs Waste Technische Guidelines“, deca-BDE wird in die bestehende „PBDE TG“ eingearbeitet
(Wie auch alle anderen POPs, wenn neu gelistet: PCN in PCB TG, PeCBz, PCN und jetzt HCBd in „unintentional POPs TG“)
- Stockholm Konvention: „Experten“Gruppen diskutieren noch

Unintentional POPs (Artikel 5, Annex C)

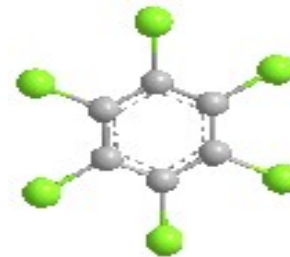
- Implementation – Zeittafel von Quellenquantifizierung bis Elimination
 - **Zwei Jahre** nach Inkrafttreten: Nationaler (regionaler) Aktionsplan
 - **Vier Jahre** nach Inkrafttreten: BvT anwenden
 - **Fünf Jahre** nachdem Aktionsplan entwickelt wurde: Updating



PCDD (75)/PCDF (135)



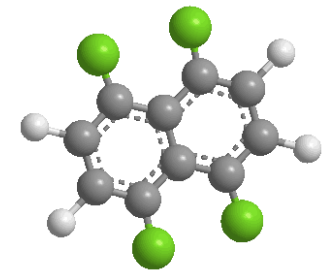
PCB (209)



HCB (1)



PeCBz (1)

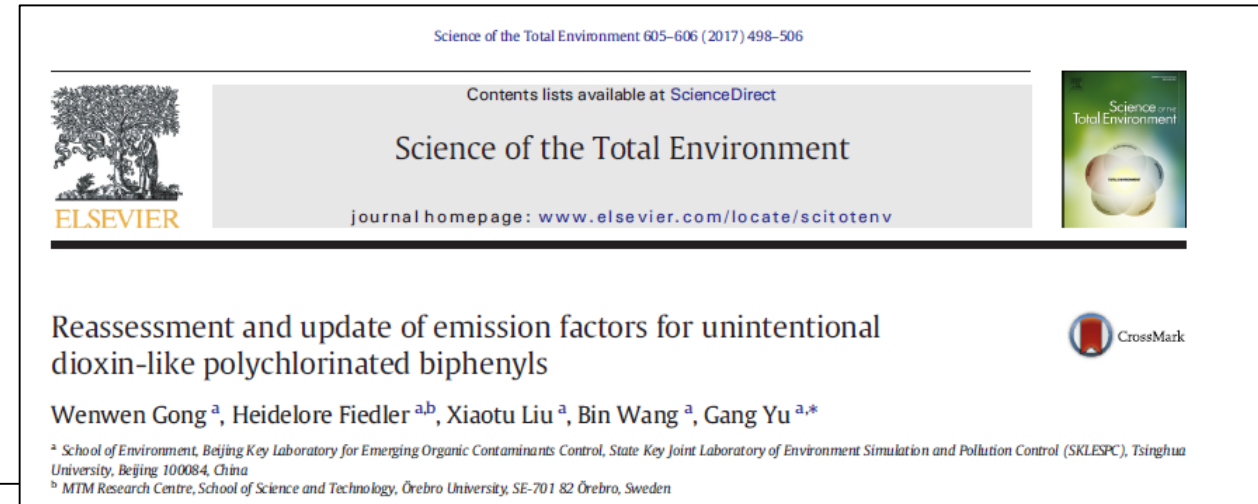


PCN (73)

Projekt “Inventory Methodology of Unintentionally Produced POPs”

Donor: NSFC No. B07, 21561142001 (Tsinghua Universität, UNEP/Örebro Uni)

Emissionsfaktoren



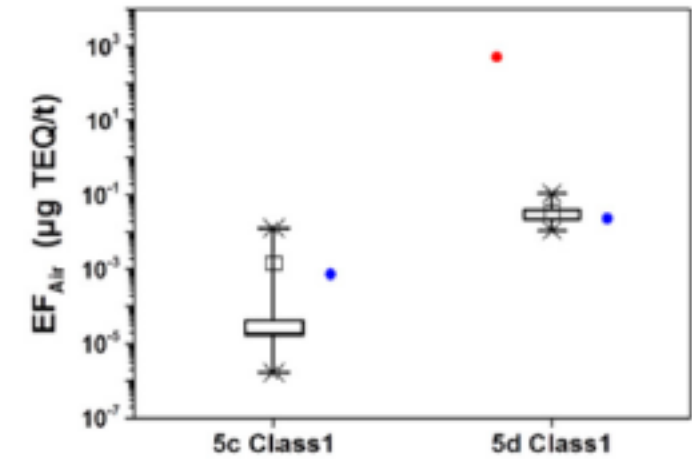
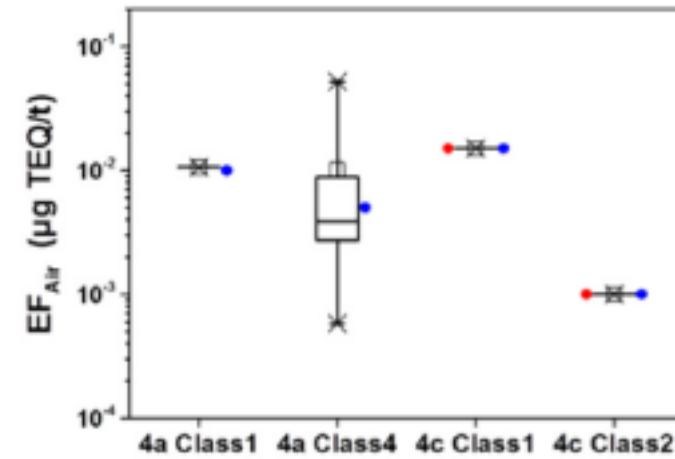
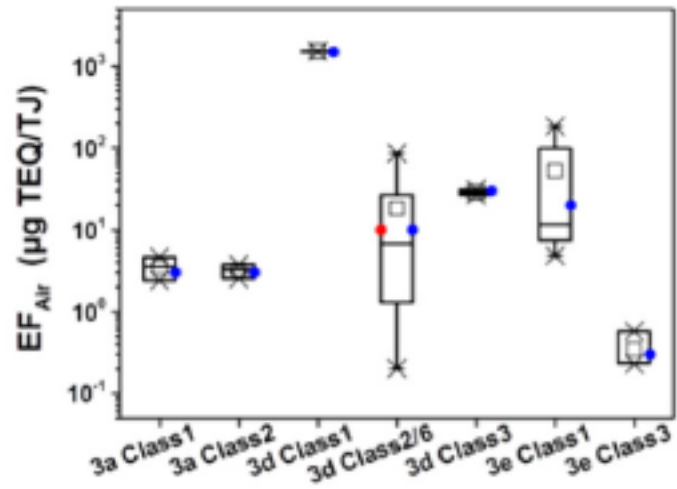
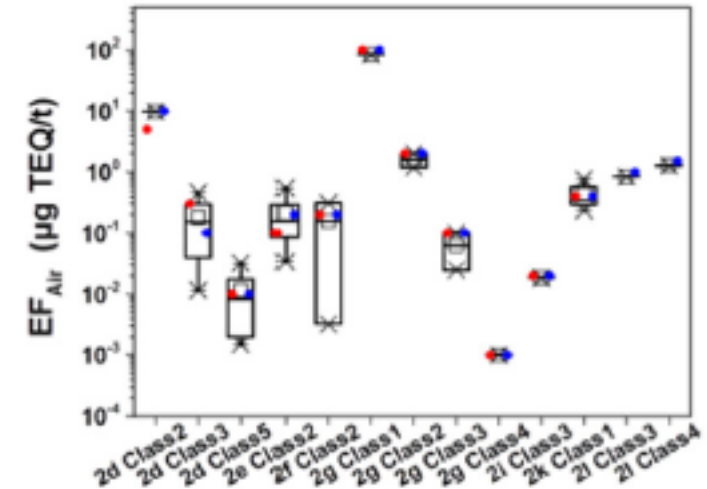
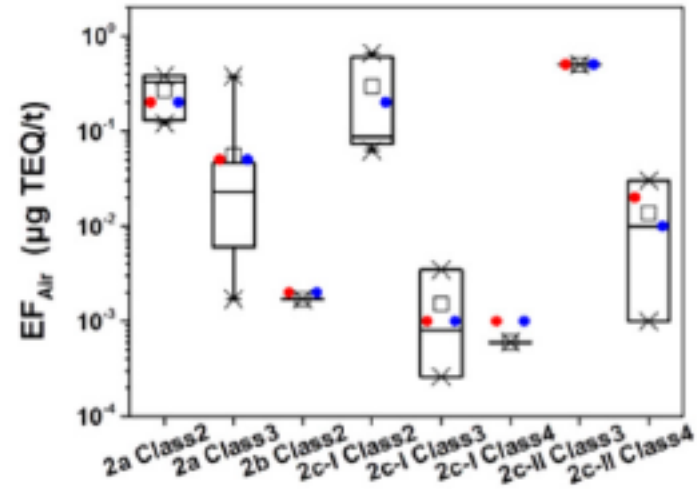
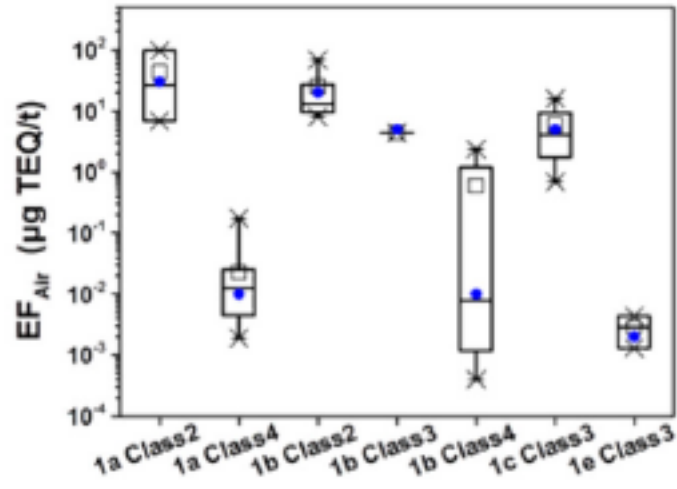
Keine Emissionsfaktoren (EFs) für Indikator PCB (PCB₆) oder anderweitig gruppierte ndl-PCB möglich.

dl-PCB (als TEQ): 286 insgesamt; davon
Luft = 233, Rückstände = 23 EFs,
Produkt = 25 EFs, und Land = 5 EFs

HCB: 206 insgesamt (27 Publikationen); davon: Luft = 149, Produkt = 57 EFs

PeCBz: 78 insgesamt (14 Publikationen); davon: Luft = 39, Produkt = 39

EFs für Klassen/Quellengruppen (SG1-SG5) (dl-PCB)

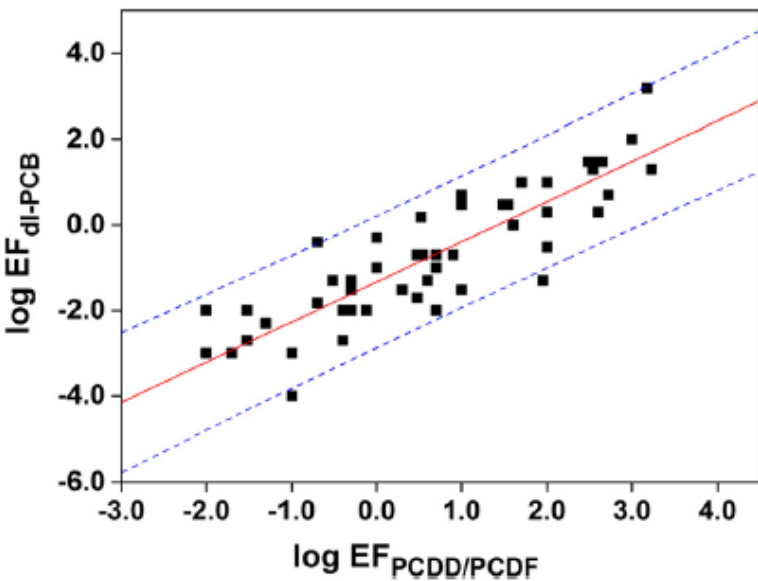


SG 7, Untergruppe Chemikalien (EF_{Produkt})

	Class	EF _{Product} (µg/t chemicals produced)		
		Toolkit		This study
		HCB	HCB	PeCBz
Pentachlorophenol (PCP)	1	—	50000000	—
Pentachloronitrobenzene (PCNB)	1	—	1000000	—
	2	—	50000	300
	3	—	5000	50
2,4-D products	2	—	3000	60000
	3	—	700	500
Chlorinated paraffins (CPs)	1	8900000	8900000	—
	2	7500000	7500000	—
	3	7000	7000	—
p-Chloranil	3	—	50000	30000
Phthalocyanines dyes	1–2	—	5000000	1000000
Dioxazine dyes	1–3	—	5000	3000

**Keine Korrelation erkennbar
zwischen HCB und PeCBz**

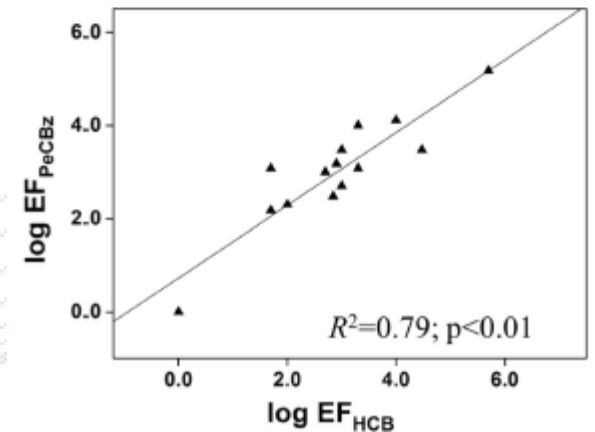
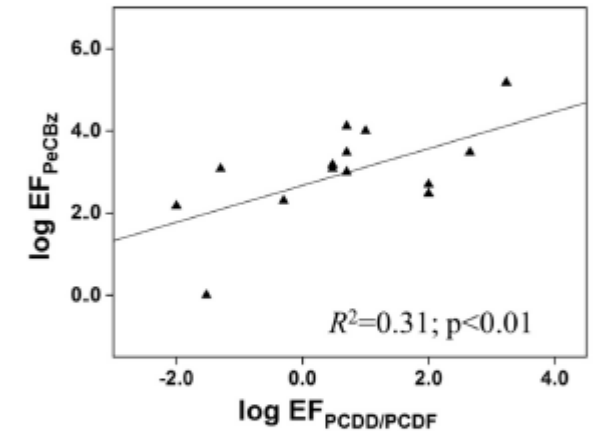
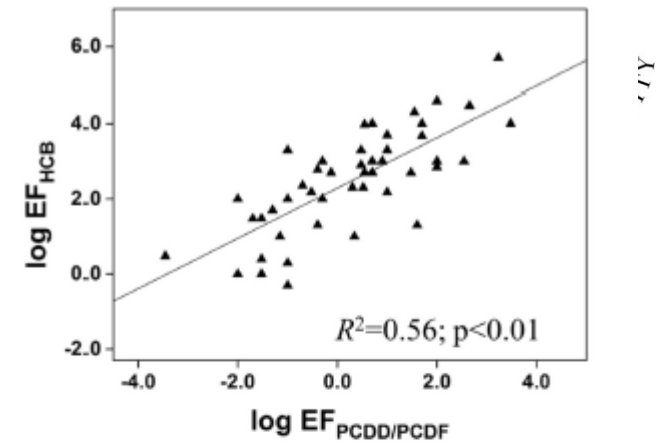
Korrelation der Emissionsfaktoren für dl-PCB, HCB und PeCBz mit EFs für PCDD/PCDF



Auswertungen (Pearson correlation) für dl-PCB, HCB, PeCBz und PCDD/PCDF zeigen statistische relevante Zusammenhänge, die genutzt werden können, wenn erste Emissionsinventare erstellt werden

Annahme, dass die Prozesse, die PCDD/PCDF generieren auch Quellen für die anderen “unintentional POPs” sind und dass die Maßnahmen, die PCDD/PCDF reduzieren auch für die anderen unintentional POPs wirksam sind, wurden bestätigt.

HF_Ziele der Stockholm Konvention



Vergleich der Emissionsinventare für SG1

Group	Cat.	Class	Source categories	EFs Air (ug/t)			Production t/a	TEQ(PCDD/PCDF) Air	TEQ(PCB)/ Air	g HCB/a Air
				TEQ(DF)	TEF(dI-PCB)	HCB				
1			Waste incineration							
	a		Municipal solid waste incineration				61,755,000	209	18.6	8,585
		1	Low technol. combustion, no APCS	3,500				-	-	-
		2	Controlled comb., minimal APCS	350	30			-	-	-
		3	Controlled comb., good APCS	30	3	500	6,023,000	181	18.1	3,012
		4	High tech. combustion, sophisticated APCS	0.5	0.01	100	55,732,000	27.9	0.56	5,573
	b		Hazardous waste incineration				6,339,500	14.6	5.35	4,758
		1	Low technol. combustion, no APCS	35,000				-	-	-
		2	Controlled comb., minimal APCS	350	20			-	-	-
		3	Controlled comb., good APCS	10	5	2,000	1,059,000	10.6	5.30	2,118
		4	High tech. combustion, sophisticated APCS	0.75	0.01	500	5,280,500	3.96	0.05	2,640
	c		Medical waste incineration				542,000	207	2.04	862
		1	Uncontrolled batch combustion, no APCS	40,000				-	-	-
		2	Controlled, batch, no or minimal APCS	3,000				-	-	-
		3	Controlled, batch comb., good APCS	525	5	2,000	394,000	207	1.97	788
		4	High tech, continuous, sophisticated APCS	1	0.5	500	148,000	0.15	0.07	74

Draft comparative inventory (PCDD/PCDF, PCB, HCB)

Source Groups		Annual Releases to Air (g/a)		
Group		g TEQ(PCDD/PCDF)	g TEQ(PCB)	g HCB/a
1	Waste Incineration	434	26	14,382
2	Ferrous and Non-Ferrous Metal Production	2,822	113	435,804
3	Heat and Power Generation		283	359,399
4	Production of Miscellaneous Chemicals		35	314,133
5	Transportation		1.2	21,057
6	Open Burning of Solid Waste		7.8	142,335
7	Production of Chlorinated Hydrocarbons		1.0	195
8	Miscellaneous		0.1	621
9	Disposal			
10	Identification of			
1-10	Total			

Group 7				
Water	Production of Chlorinated Hydrocarbons	20.56		159
Product	Production of Chlorinated Hydrocarbons	136		57,520
Residue	Production of Chlorinated Hydrocarbons	20.4		-
7	Total	177		757,679

Group 9			g TEQ(PCB)	g HCB/a
Water	Disposal		-	-
Residue	Disposal	681	12.8	99,900
9	Total	679	13	99,900

Identifizierung spezifischer Kontaminationen / Quellen wo notwendig ?

- dl-PCB (TEQ):
11% des TEQ_(PCDD/PCDF)
 - HCB: fast 300-fach mehr als PCDD/PCDF
- 54 (x3) Datenpunkte

Empfehlung "Toolkit/BAT-BEP Experten":
Notwendigkeit: 5-Vektor Emissionsinventar für PCDD/PCDF (TEQ-Basis)
Keine Notwendigkeit, Emissionsinventare für andere unintentional POPs zu erstellen.

Beispiel: Reporting Format für PCDD/PCDF inventar

- 10 Source groups (9 quantitativ) (= Format in Artikel 15)
- 5 (release) Vektoren

Referenzjahr und
regelmässige Intervalle
→Trend !

SG#	Source Groups	Annual Releases (g TEQ/a)					Total
		Air	Water	Land	Product	Residue	
1	Waste Incineration	610				1,147	1,758
2	Ferrous and Non-Ferrous Metal Production	2,486	14			2,167	4,667
3	Heat and power generation	1,304				588	1,893
4	Production of Mineral Products	414					414
5	Transportation	120					120
6	Open burning processes	64.0		953			1,017
7	Production of Chemicals and Consumer Goods	0.68	23		174	68.9	267
8	Miscellaneous	44.2				11.0	55.2
9	Disposal/Landfilling		4.53			43.2	47.7
10	Hot spots						0.00
1-10	Total	5,043	41.2	953	174	4,026	10,238
	Grand Total	10,238					
	per release vector	49%	0.4%	9.3%	1.7%	39%	100%

Global monitoring plan (GMP)

UNITED NATIONS  **SC**

UNEP/POPS/COP.7/INF/39

Distr.: General
26 February 2015
English only

 **Stockholm Convention
on Persistent Organic
Pollutants**

Conference of the Parties to the Stockholm
Convention on Persistent Organic Pollutants
Seventh meeting
Geneva, 4–15 May 2015
Item 5 (i) of the provisional agenda*
Matters related to the implementation of the
effectiveness evaluation

**Guidance on the global
monitoring of persistent
organic pollutants**

UNEP/POPS/COP.8/INF/38

Annex

**GUIDANCE ON THE GLOBAL
MONITORING PLAN FOR PERSISTENT
ORGANIC POLLUTANTS**

January 2015
~~January 2013~~

**PFAS analysis in water for the Global
Monitoring Plan of the Stockholm Convention**

Set-up and guidelines for monitoring

Jana Weiss, Jacob de Boer, Urs Berger, Derek Muir, Ting Ruan,
Alejandra Torre, Foppe Smedes, Branislav Vrana, Fabrice Clavien,
Heidelore Fiedler

Chemicals Branch
United Nations Environment Programme (UNEP)
Division of Technology, Industry and Economics

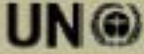
Geneva
April 2015

Sehr wenige Daten zu
"neuen POPs"; PFOS, PBDE.
HCHs gut abgedeckt

JANUARY 2017
SECOND GLOBAL MONITORING REPORT



**GLOBAL MONITORING PLAN
FOR PERSISTENT ORGANIC POLLUTANTS**
UNDER THE STOCKHOLM CONVENTION: ARTICLE 16 ON EFFECTIVENESS EVALUATION

UN  environment 

UNEP/POPS/COP.8/INF/38

Global Monitoring Plan für POPs

- Ziel: POPs Konzentrationen verfolgen, um Veränderungen in Raum und Zeit festzustellen
 - ← Maßnahmen unter der Stockholm Konvention
(Eliminierungen der Quellen → verminderte Exposition von Mensch und Umwelt);
→ "Effectiveness evaluation"
- "Core" matrices
 - Umwelt und Ferntransport: Luft und Wasser (seitdem PFOS gelistet ist)
 - Mensch: Muttermilch und Humanblut
- Matrix-spezifische Analyten empfohlen
 - Summenparameter: TEQ für PCDD, PCDF, PCB (keine weiteren!!)
 - Auswahl von Kongeneren: 6 Indikator-PCB, 6-8 PBDE, 3 Parlar Toxaphene, ...
 - Transformationsprodukte (DDD/DDE, Heptachlorepoxid, Nonachlor, ...)

Update der GMP Guidance

- Neue POPs, die bereits gelistet sind und eingefügt werden müssen:
 - Hexachlorbutadien (HCBD);
 - Pentachlorphenol (PCP);
 - Polychlorierte Naphthaline (di- bis octa-) (PCNs);
 - Decabromdiphenylether (decaBDE; BDE-209);
 - Kurzkettige Chlorparaffine (C₁₀-C₁₃, Chlorgehalt >48%)
- Neue POPs im POPRC
 - Dicofol;
 - Pentadecafluorooctansäure (PFOA, Perfluorooctansäure), ihre Salze und PFOA-verwandte Substanzen;
 - Perfluorhexansulfonsäure (PFHxS), ihre Salze und PFHxS-verwandte Substanzen

Analyten und Matrices

POPs listed in 2015				
	Air	Human Milk	Human Blood	Water
PCNs	Congeners to be defined - see intersessional work	Congeners to be defined - see intersessional work	Congeners to be defined - see intersessional work	-
HCBD	HCBD	HCBD	HCBD	-
PCP	[PCP, PCA] to be defined and evaluate practicality - see intersessional work	PCA	PCA	PCP
POPs listed in 2015				
DecaBDE	BDE-209	BDE-209	BDE-209	-
SCCP (C ₁₀ -C ₁₃) alkanes	See intersessional work	See intersessional work	See intersessional work	-
Chemicals under review				
Dicofol	Stable degradation product could be monitored – intersessional work	Not found	Not found	-
PFOA	PFOA (SIP preferred, but can be measured in XAD as well) - intersessional work	Low levels (blood is the preferred medium) - intersessional work	PFOA - intersessional work	PFOA - intersessional work
PFHxS	PFHxS (SIP preferred, but can be measured in PUF and XAD as well) - intersessional work	Low levels (blood is the preferred medium), could be done together with PFOS - intersessional work	PFHxS - intersessional work	PFHxS - intersessional work

Probenahme Wasser

- 4x pro Jahr (Grab sample)
- Analyten: L-/br-PFOS
PCP ???
- Neue Analyten: PFOA ??
PFHxS ??



Erste Ergebnisse PFOS in Oberflächenwasser

Zusammenfassung: n = 14
Entwicklungsländer in
Afrika, Lateinamerika und
Pazifikinseln

	# Proben	Min ng L ⁻¹	Max ng L ⁻¹	Mean ng L ⁻¹
L-PFOS	14	0.036	1.98	0.57
br-PFOS	14	0.008	0.41	0.12
Summe PFOS	14	0.044	2.40	0.70

Ergebnisse Pilotstudie (2012)

Country	Fiji	Kenya	Mali	Uruguay	Netherlands	
L-PFOS anion	1.1	4.6	5.7	<1.0	9.9	11

PFAS Ergebnisse (Muttermilch, *primiparae*)



Sample Code	L-PFOS	PFOA	PFHxS
6299 Haiti	50	<80	13
5779 Czech Republic	44	<80	<10
6007 Croatia	48	<80	<10
6009 Cote D'Ivoire	65	<80	<10
6298 Niger	<30	<80	<10
6008 Lithuania	44	<80	<10
5780 Georgia	<30	<80	<10
6070 Moldava	<30	<80	<10
140368982 Bulgaria	65	<80	<10
140368974 Romania	77	<80	21

Konzentrationen in
ng/L

MTM* Ergebnisse:
PFOA konnte bisher
nicht nachgewiesen
werden
PFHxS in Nähe der
Bestimmungsgrenze

* Referenzlabor für
UNEP und WHO

GMP warehouse (@Czech SC Centre, Recetox)

GMP Data Warehouse – Data Visualization (/2014/)



[LINKS](#)

VISUALIZATIONS MENU

Data Selection

[Matrix \(/2014/data-selection/render/08a55c8468110789439ef0822268b140/0\)](#)

All Items

[Matrix specification \(/2014/data-selection/render/08a55c8468110789439ef0822268b140/1\)](#)

All Items

[UN Regional Group \(/2014/data-selection/render/08a55c8468110789439ef0822268b140/2\)](#)

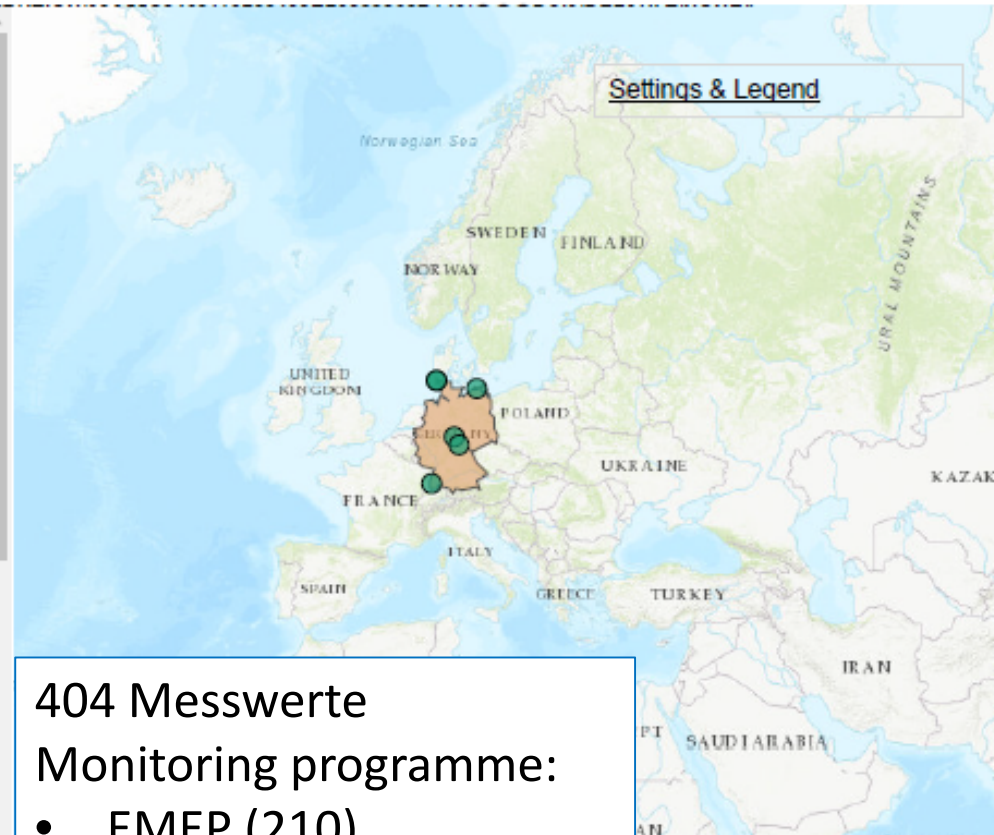
All Items

[Country \(/2014/data-selection/render/08a55c8468110789439ef0822268b140/3\)](#)

Germany

Luftdaten aus UBA POP-DB
→ NILU ⇒ <http://ebas.nilu>
⇒ ⇒ POPs-GMP.org (SC)

SPATIAL



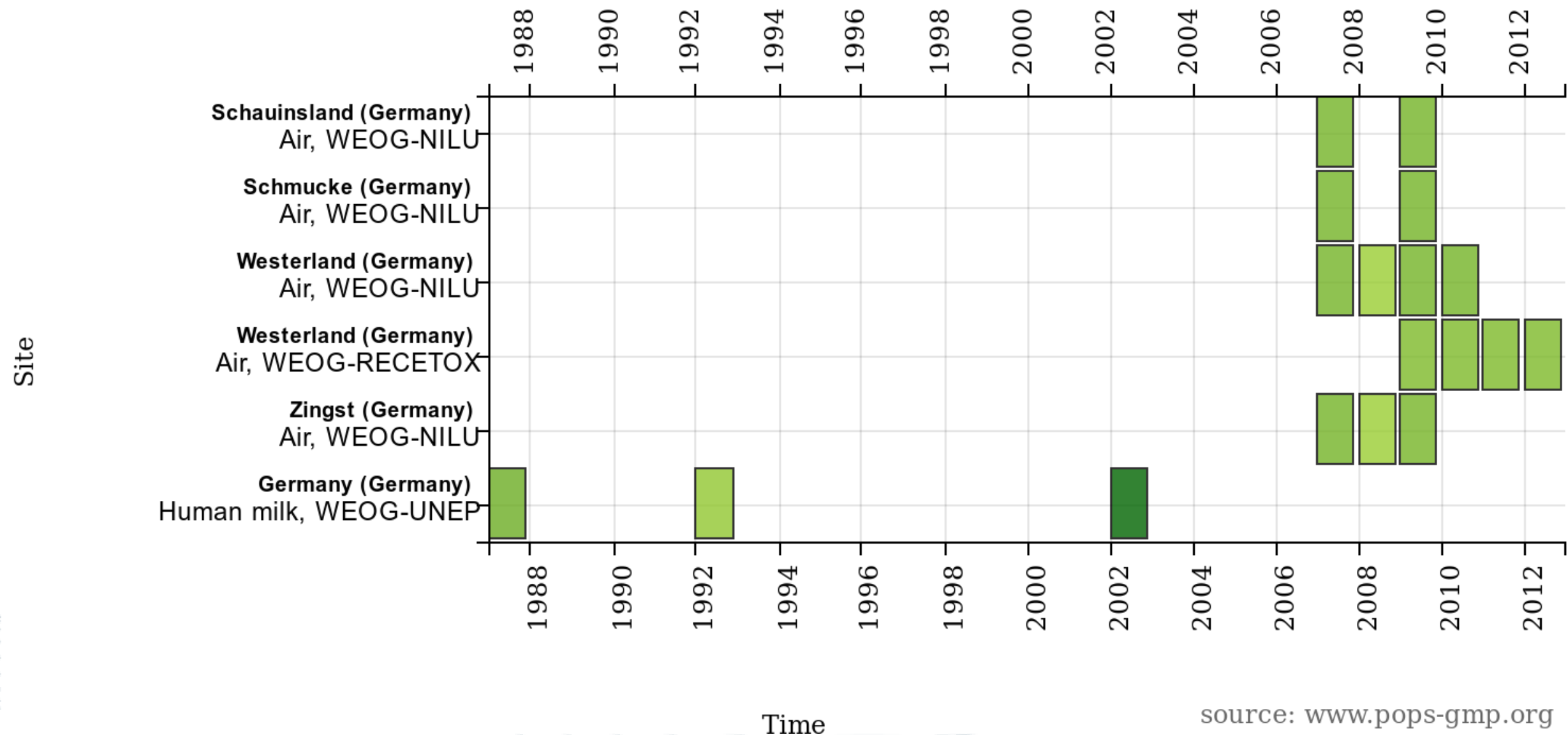
404 Messwerte
Monitoring programme:

- EMEP (210)
- GMP UNEP (122)
- MONET (72)

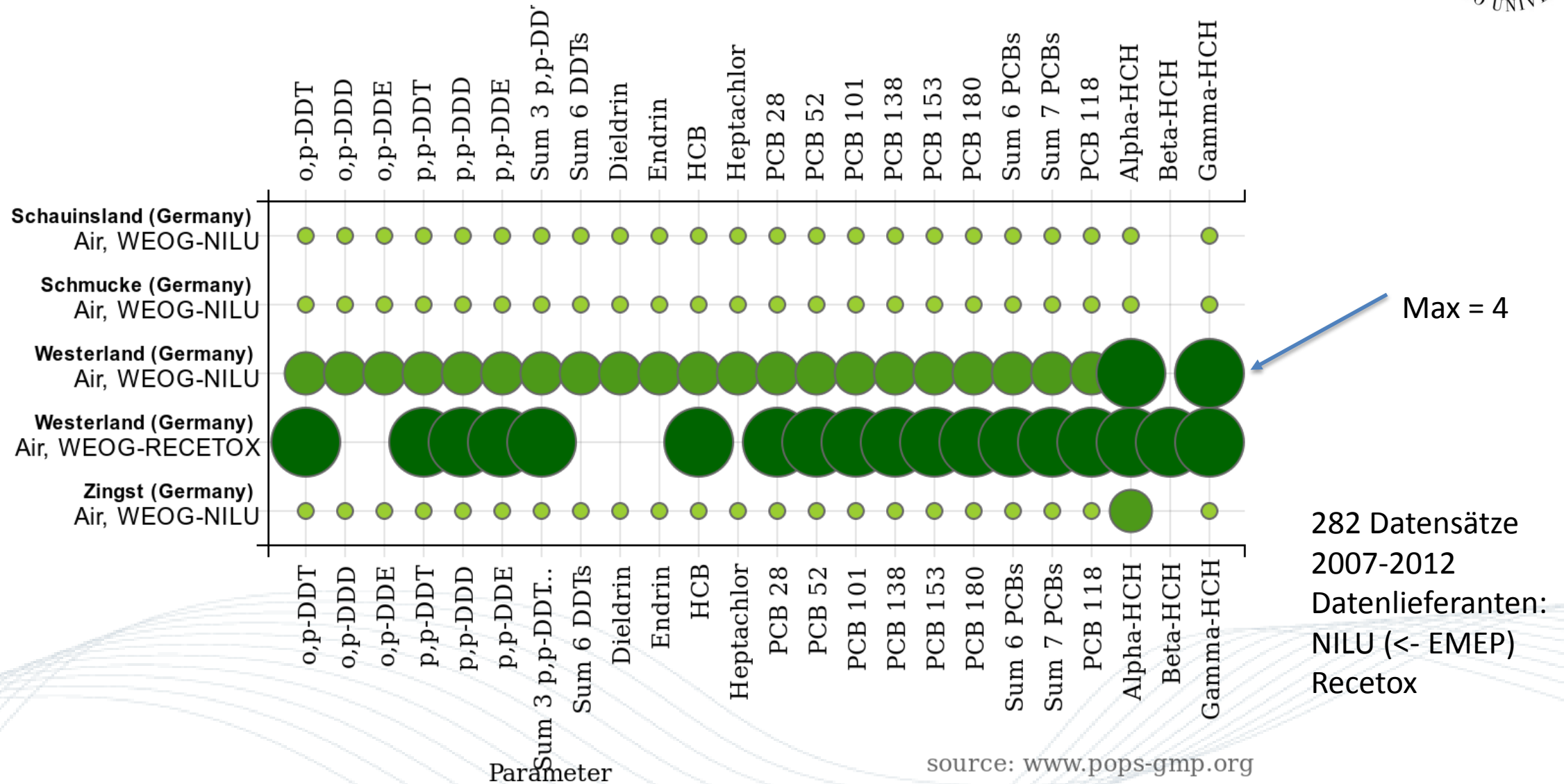
source: www.pops-gmp.org

Row Labels	Werte insgesamt	# Congenere
Air	2169	282
Active	1593	210
Schauinsland	319	46
EMEP	319	46
2007	46	23
2009	273	23
Schmucke	322	46
EMEP	322	46
2007	46	23
2009	276	23
Westerland	622	71
EMEP	622	71
2007	46	23
2008	24	2
2009	276	23
2010	276	23
Zingst	330	47
EMEP	330	47
2007	46	23
2008	24	2
2009	260	22
Passive	576	72
Westerland	576	72
MONET	576	72
2009	180	18
2010	234	18
2011	126	18
2012	36	18
Human milk	383	122
Pooled	383	122
Germany	383	122
GMP UNEP	383	122
1987	28	28
1992	7	7
2002	348	87
Grand Total	2552	404

Daten aus Deutschland in GMP-POPs Datenbank



Luftdaten - Deutschland



Vielen Dank für Ihre Aufmerksamkeit



Ich bedanke mich für Informationen seitens des BRS Sekretariats, insbesondere bei Frank Moser, Carla Valle-Klann und Ana Witt.