Overview of the outputs and outcomes of the UNEP/GEF POPs GMP project

Presentations – Day 2

Final meeting of the UNEP/GEF POPs GMP projects
in the Africa region

Casablanca, Morocco 28-30 November 2023

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GMP Data Warehouse and the 4th cycle of the GMP implementation - upcoming challenges

Head of the National Centre for Toxic Compounds and of
the Stockholm Convention Regional Centre in the Czech Republic (SCRC)
RECETOX, Faculty of Science, Masaryk University, Brno, Czech Republic

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Final Meeting of the UNEP/GEF project "Support in the Implementation of the Global Monitoring Plan for Persistent Organic Pollutants (POPs) in the countries of the African Region ", Casablanca, Morocco, 28-30 November 2023

ABOUT
Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology in the Czech Republic

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Stockholm Convention Regional Centre

- Hosted by the RECETOX + uses its capacity
- established in 2007
- endorsed in 2009 + successfully evaluated in 2013, 2015, 2019 and 2023 (mandates extended for additional 4 years)
- provides support to the Stockholm Convention on POPs contracting Parties (countries) in its geographical region of the Central and Eastern Europe and beyond*.
- chemicals management and management of wastes containing toxic chemicals by providing training, capacity building, expertise support in a number of fields

* *We cover issues related to chemicals management, exposome research, monitoring, legal and institutional arrangements and governance including synergies. We support the work under Basel, Rotterdam, Stockholm and Minamata Conventions, SAICM and new Global Chemical Framework and negotiations of the Science Policy Panel (UNEA resolution 5/8) and also partly the INC process for the plastics treaty (UNEA resolution 5/14). For GEF-GMP2 project we provided PAS materials for Asia, Pacific and Africa + training*

RECETOX, host of the SCRC Czech Republic, in Brief

The RECETOX is a leading Czech research institute covering a broad range of basic and applied research on toxic compounds in the environment and their effect on human health.

Functions of RECETOX:

- Research activities
- Education programmes
- Open-Access Research Infrastructure
- Science to Policy and Society platforms (National Centre for Toxic Compounds, **Stockholm Convention Regional Centre for Capacity Building and the Transfer of Technology**)
- Application of research results

RECETOX
Faculty of Science
Masaryk University
Brno, Czech Republic

Modern campus and state of the art facilities in Brno Bohunice

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WHO European region + global support

WHO Collaborating Centre for Chemical Exposure and Risks

- RECETOX officially endorsed in January 2023 for 4 years

Proposed workplan and topics…

- assistance and technical support on assessment of exposure to chemicals of public health concern with the main focus on human biomonitoring
- addressing emerging and other policy issues relating to chemical safety
- laboratory capacity building

About GMP DWH = Global Monitoring Plan Data warehouse

Work mandated by decision SC-6/23, carried in accordance with

Chapter 6 of the Guidance on the Global Monitoring Plan for Persistent Organic Pollutants relevant to data handling (UNEP/POPS/COP.6/INF/31) in the period 2012-2014.

Supervision by

Stockholm Convention Secretariat under the guidance of the GMP Global Coordination Group and Regional Organization Groups

Performed by

Stockholm Convention Regional Centre in the Czech Republic hosted at RECETOX through the RECETOX research infrastructure, Masaryk University, Brno, Czech Republic with support of the EU iGOSP project of ERA Planet

Past summary

Global Monitoring Plan Data warehouse (**GMP DWH**) launched first version in 2011, upgraded in 2014 (via SC 6/23) for second reporting round, available on **www.pops-gmp.org** until 1 June 2022

Present….

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SCRC CZ at the COP 10 in Geneva – 5 June 2022

- **Side-event „Trends in POP levels globally and how could they contribute to solving the triple planetary crisis?“**
  - 80 delegates from all around the world
  - presenters: Rainer Malisch, Ramon Guardans, Kateřina Šebková and Abiola Olanipekun
  - How does pollution influence climate change and biodiversity (loss)
  - 20 year of tracing POPs in humans
  - **Official launch of the GMP Data Warehouse for GMP3 cycle and presentation of data including GEF GMP2 project results**

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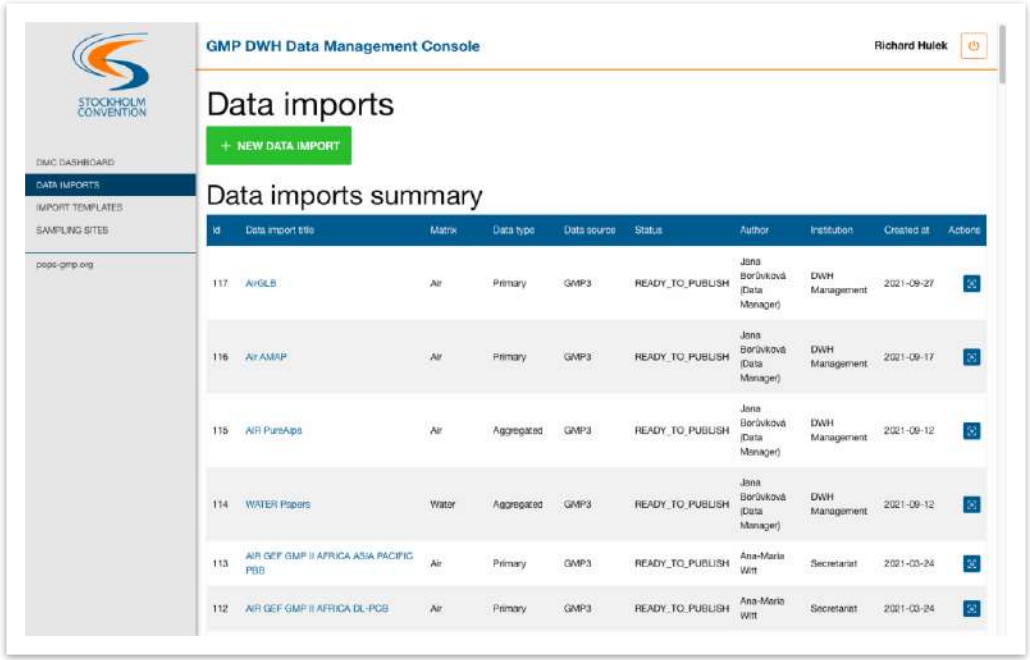
Summary of the GMP data warehouse visualizations

https://www.pops-gmp.org

- visualization available 24/7 online free of charge to all stakeholders and the broad public
- core matrices of the Stockholm Convention on POPs (air, human tissues, water)
- fully harmonized data and information structure
- POPs data format: annually aggregated concentrations
- largest pool of global POPs data available on one place
- user-friendly access

- GMP DWH updates defined by the Stockholm Convention - 6 year interval
- current content up to third regional reports (GMP3) - the latest information is 2022, the "oldest" data are 1960s or 1980s, depending on a matrix and a chemical.

GMP DWH consists of:



GMP DWH Data Management Console
https://dmc.pops-gmp.org
authorized access for experts only at the moment of data imports (next in 2025-6)

Everyone can browse

GMP DWH Data Visualizations
https://www.pops-gmp.org
once approved by ROG experts and officially released, then available 24/7

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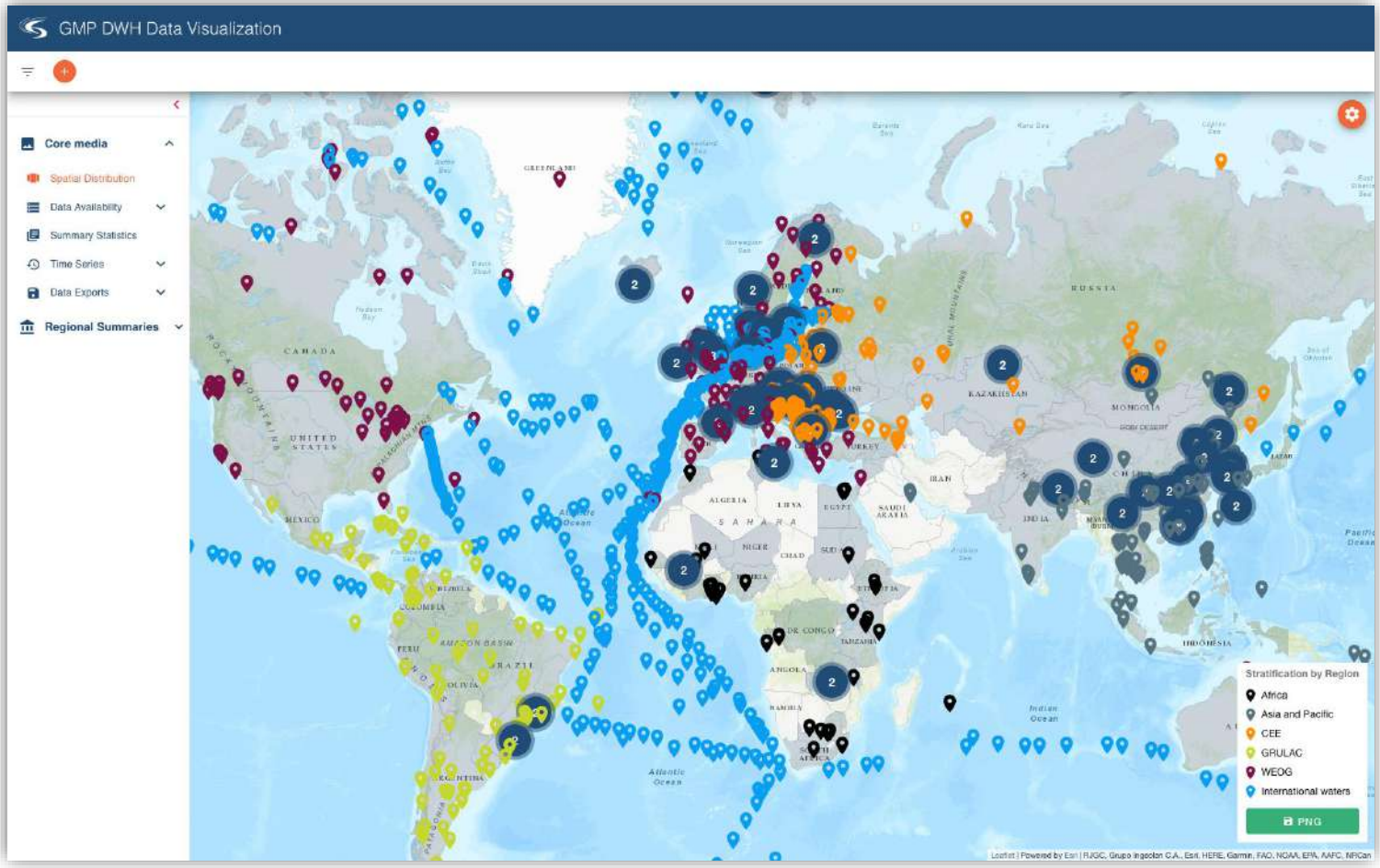
GMP DWH Data Visualizations



Spatial Distribution Module

https://data.pops-gmp.org/2020/all/#/gmp3/spatial-distribution

FORMAT: 5 modules

- Spatial distribution
- Data availability
- Summary statistics
- Trend analysis
- Data exports

CONTENT

4 core media
30 listed chemicals (POPs)
314 chemical parameters
111 monitoring networks/projects
126 countries
779 sites + a total of 1159 water sites and ocean cruises
time range: 1967-2021/2

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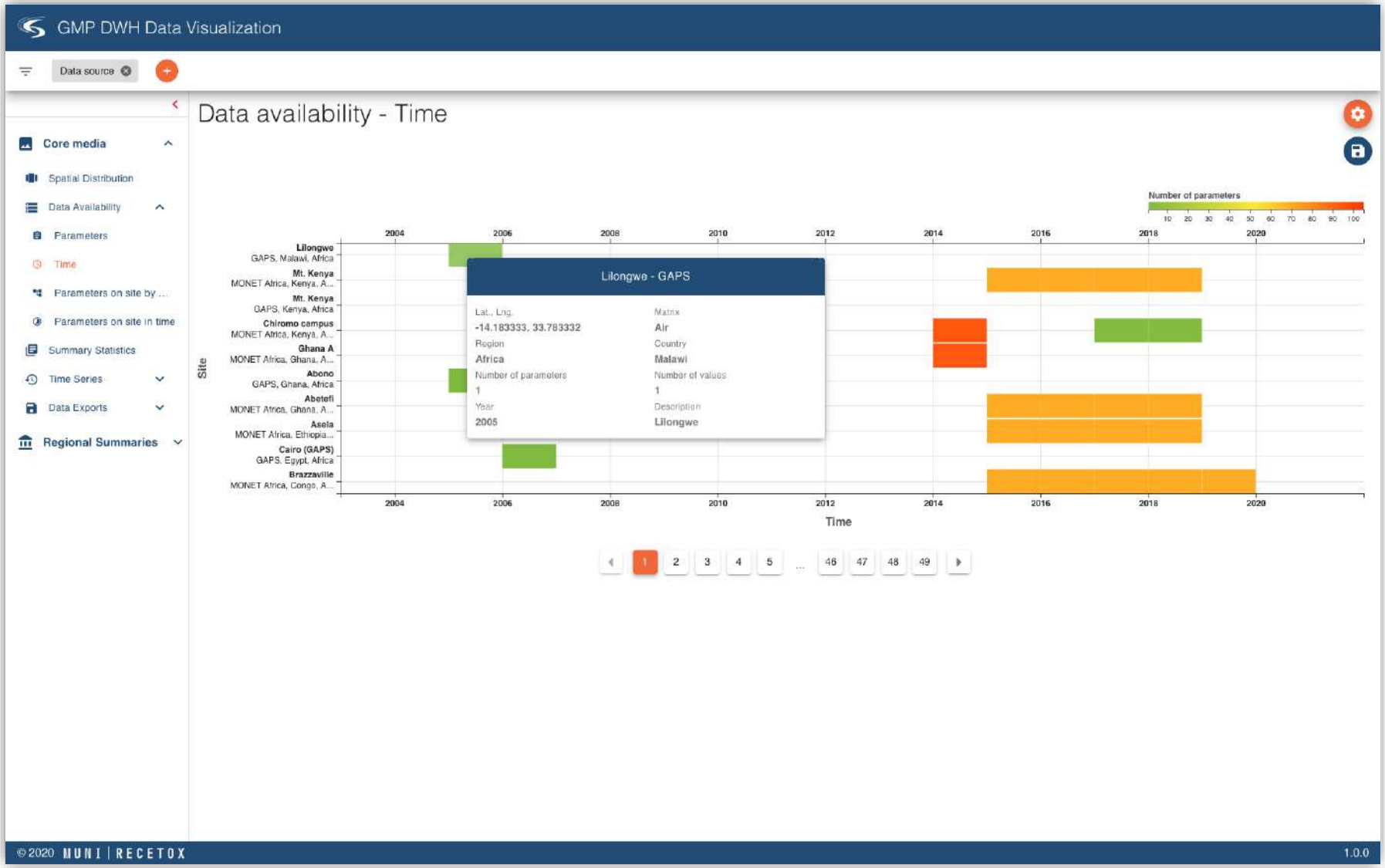
Data Availability Module



Data Availability Module
- time series
- chemical parameter
- matrices on site
- parameters on site in time

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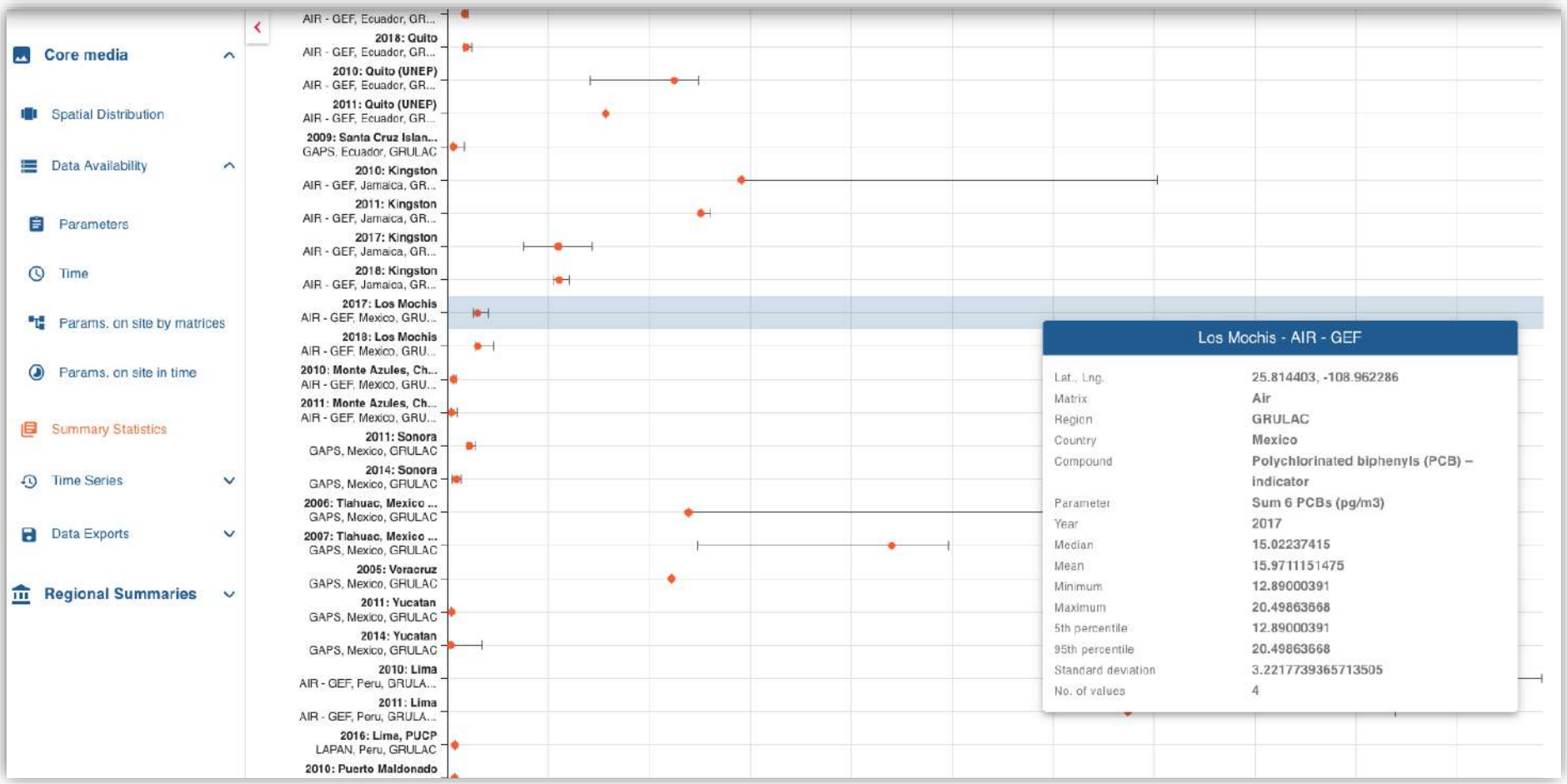
Summary Statistics Module



Summary Statistics Module
multiple sites or single site (per parameter)

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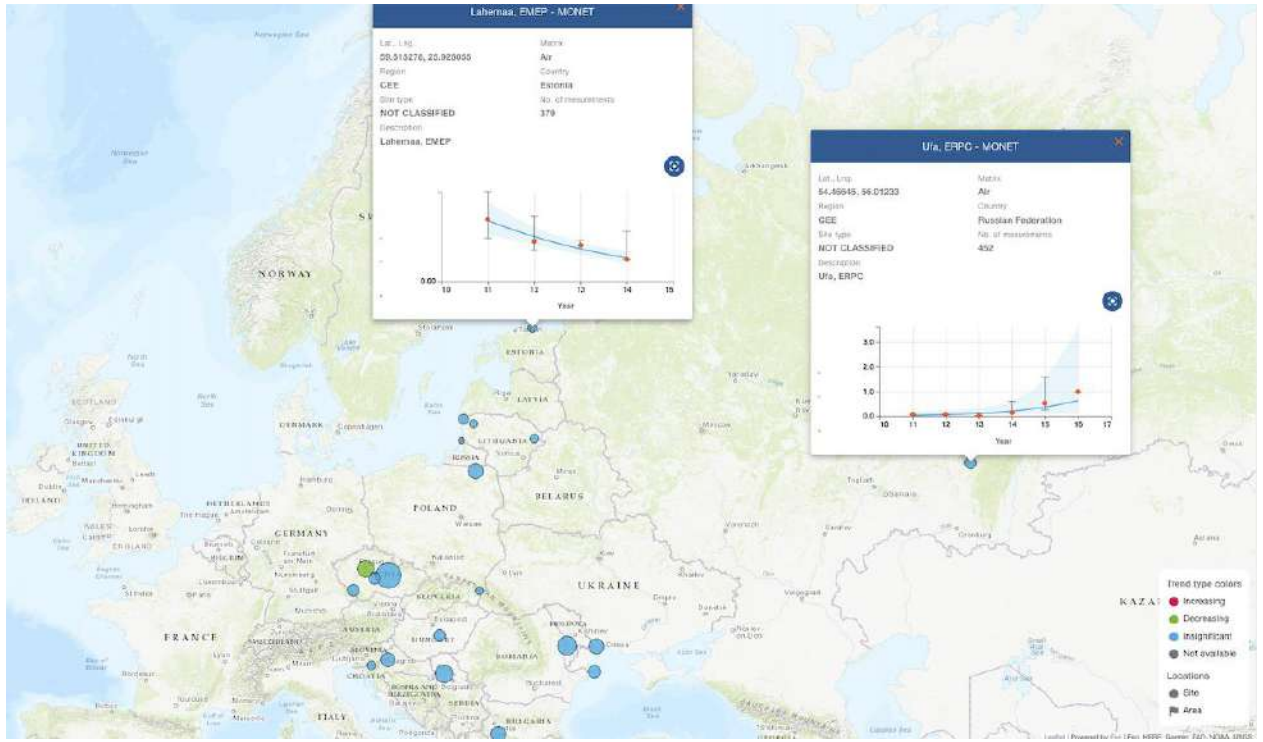
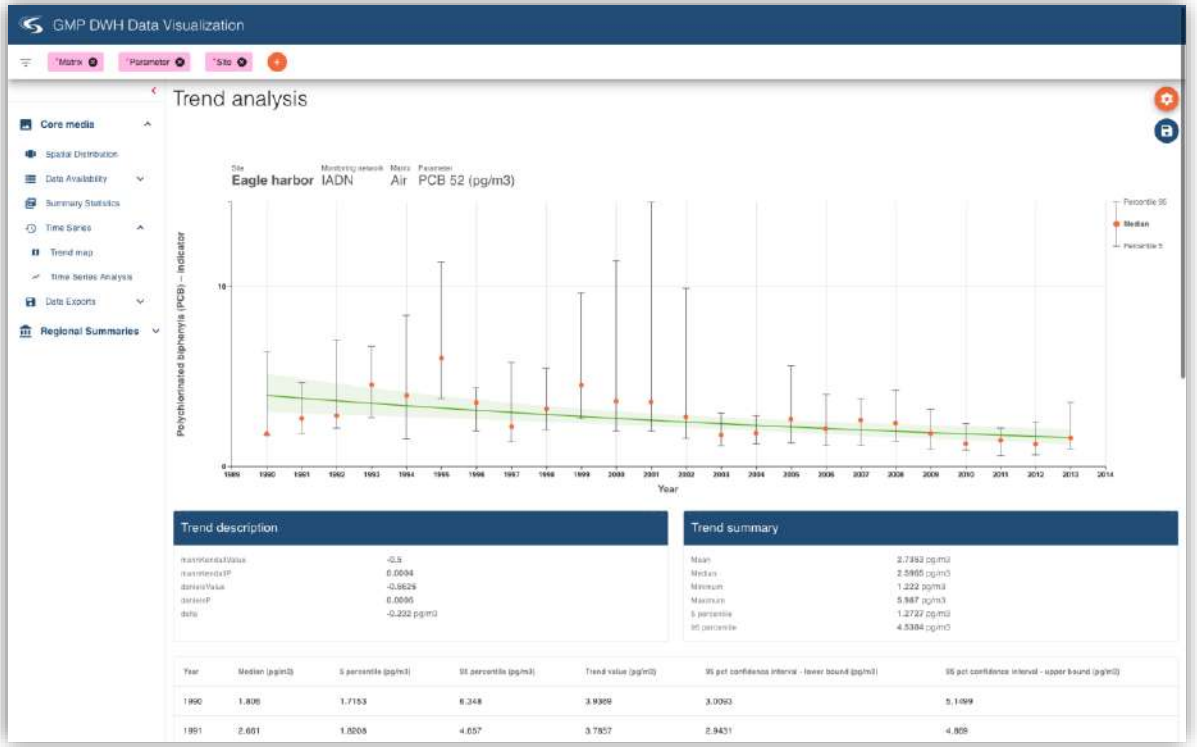
Trend analysis



Trend analysis
multiple sites in map, detail on a site



Trend analysis module
single site, trend characteristics and description

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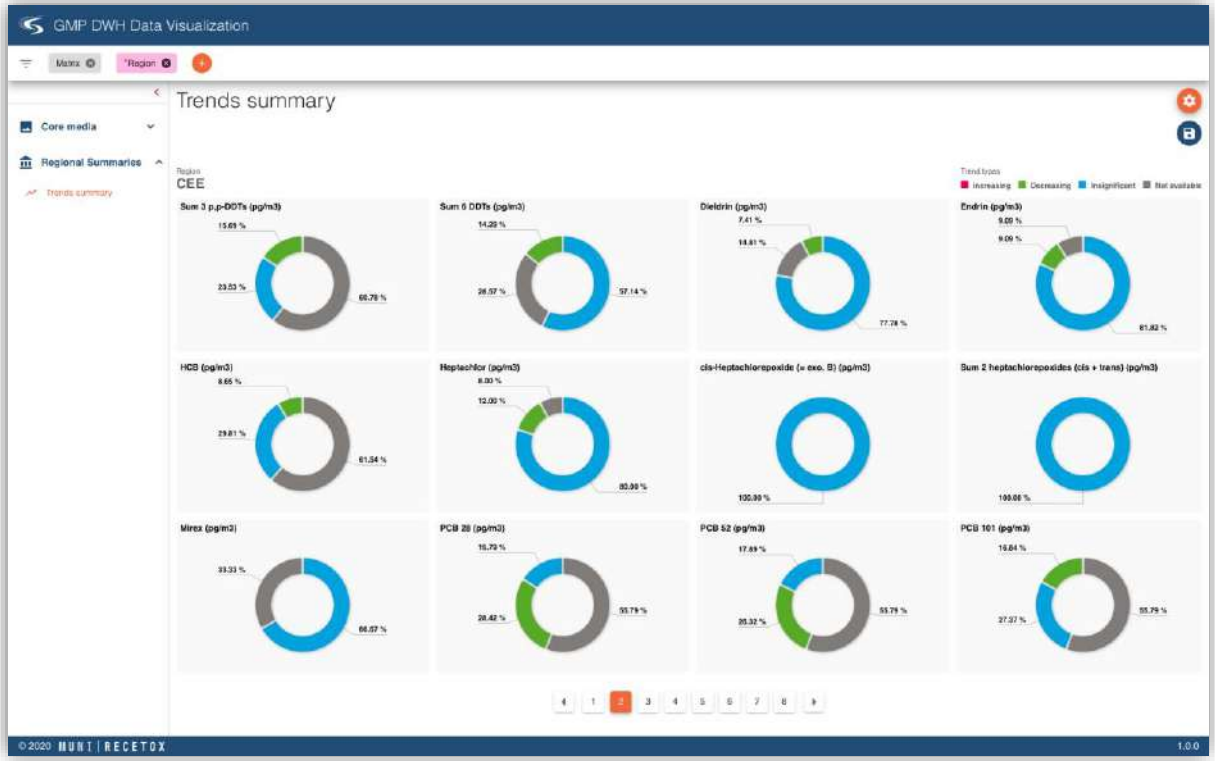
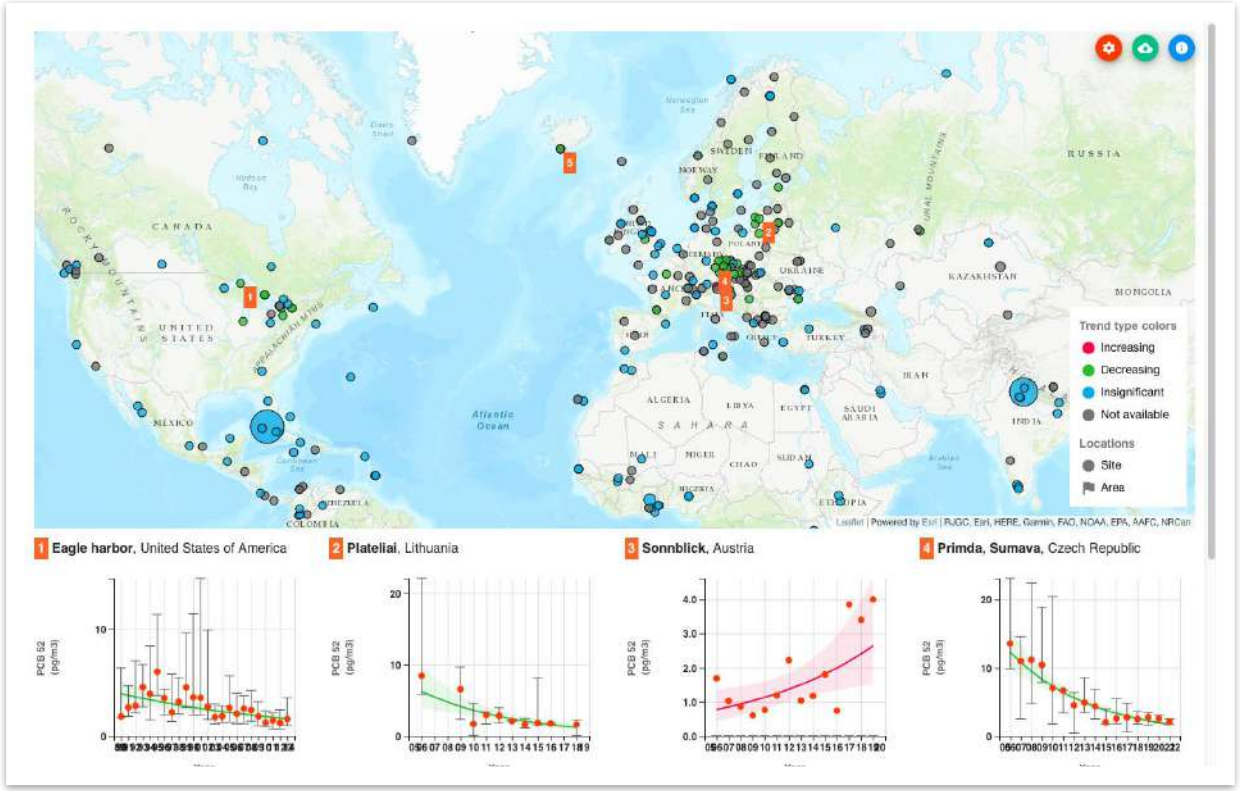
GMP DWH for decision makers - new maps and charts



GMP DWH Visualizations
Trend analysis - Regional Summaries



GMP DWH Data Visualizations
trend in maps and trend exports

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trend maps and charts are shown in several regional POPs monitoring reports and in the global one, too

GMP DWH present and future

Further work was mandated by COP 11 (May 2023) in line with Global Monitoring Plan - roadmap/implementation plan

Expectations

- GMP DWH to continue provide a repository/visualization on POPs monitoring activities
- support elaboration of GMP4 regional reports (due for SC COP13 in 2027) with additional dataset on POPs globally covering 2020-2025/6)
- preparation of the GMP4 global report (due for SC COP14 in 2029)
- IT technology for data management console (DMC) and visualizations re-fit will be needed for 2025
- coverage of GMP guidance document as updated (latest update for COP10 in 2022, but will be updated prior 2025)
- new POPs data imports to start 3Q/2025 the latest

Challenges

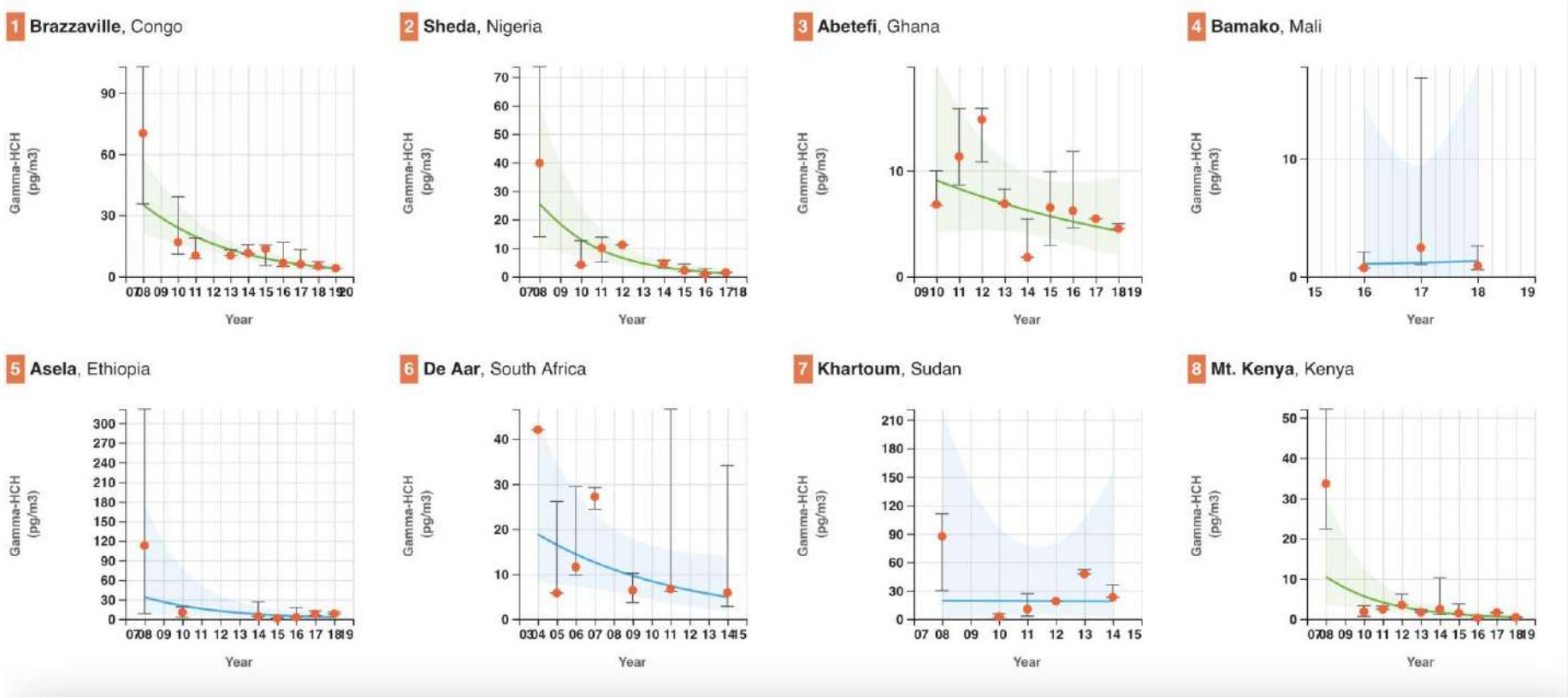
- data availability for (some) core matrices?
- continuation of some multi regional activities - air - i.e. MONET or GAPS - confirmed,
- for others unclear

MONET Africa (all sites since 2008)

MONET Africa in 2019

GMP DWH challenges for Africa

- data availability for (some) core matrices?
- trend availability (www.pops-gmp.org)
- continuation of activities?



Thank you for your kind attention!

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Contribution of the UNEP/WHO human milk survey to understanding human exposure to POPs

Geneva, 29 November 2023

Yuki Minato, Luc Ingenbleek, Elaine Borghi

Monitoring Nutrition and Food Safety (MNF)

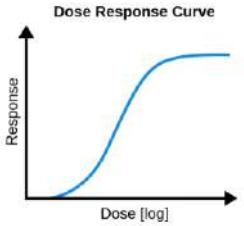
Department of Nutrition and Food Safety (NFS)

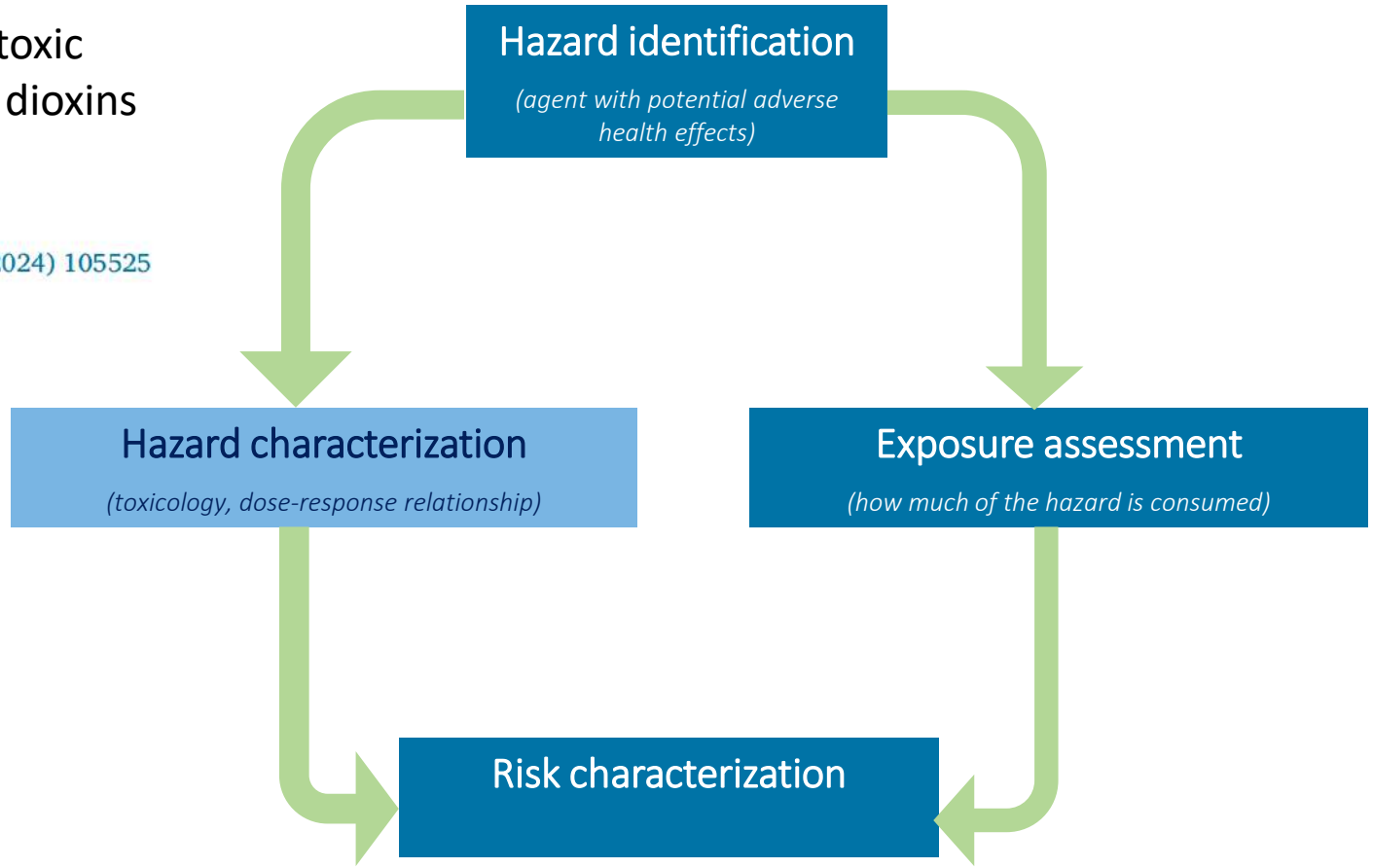
World Health Organization

Risk assessment: hazard characterization

WHO just published new toxic equivalency factors 2022 for dioxins

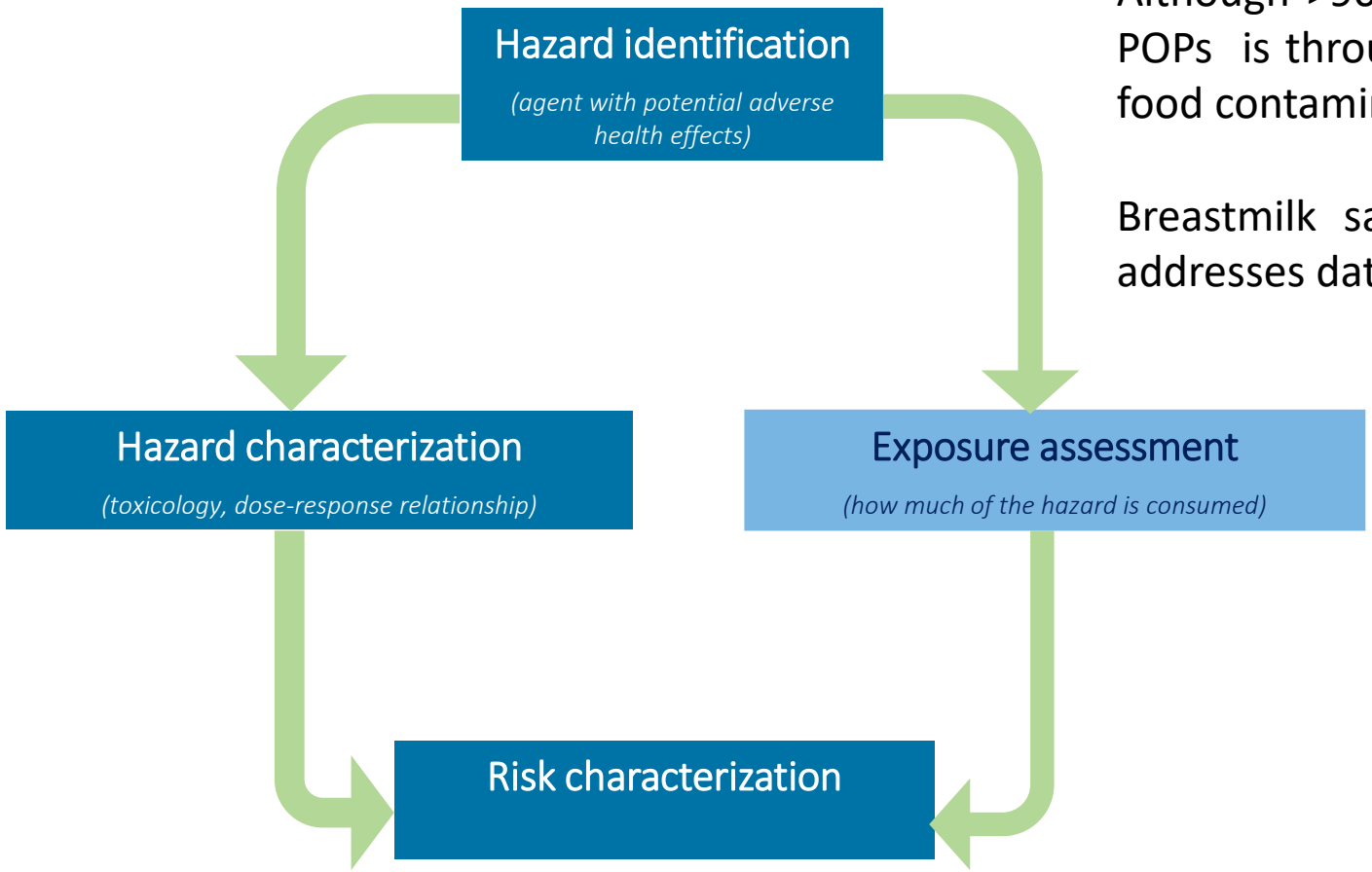
Regulatory Toxicology and Pharmacology 146 (2024) 105525





World Health Organization

Risk assessment: exposure assessment



Although >90% of exposure to POPs is through food, data on food contamination are scarce.

Breastmilk sampling currently addresses data gaps.

World Health Organization

Estimate the FBD burden, Develop indicators, and Support countries

First-ever global estimates, 2010

31 hazards included in the first WHO estimates 2010, published in 2015.

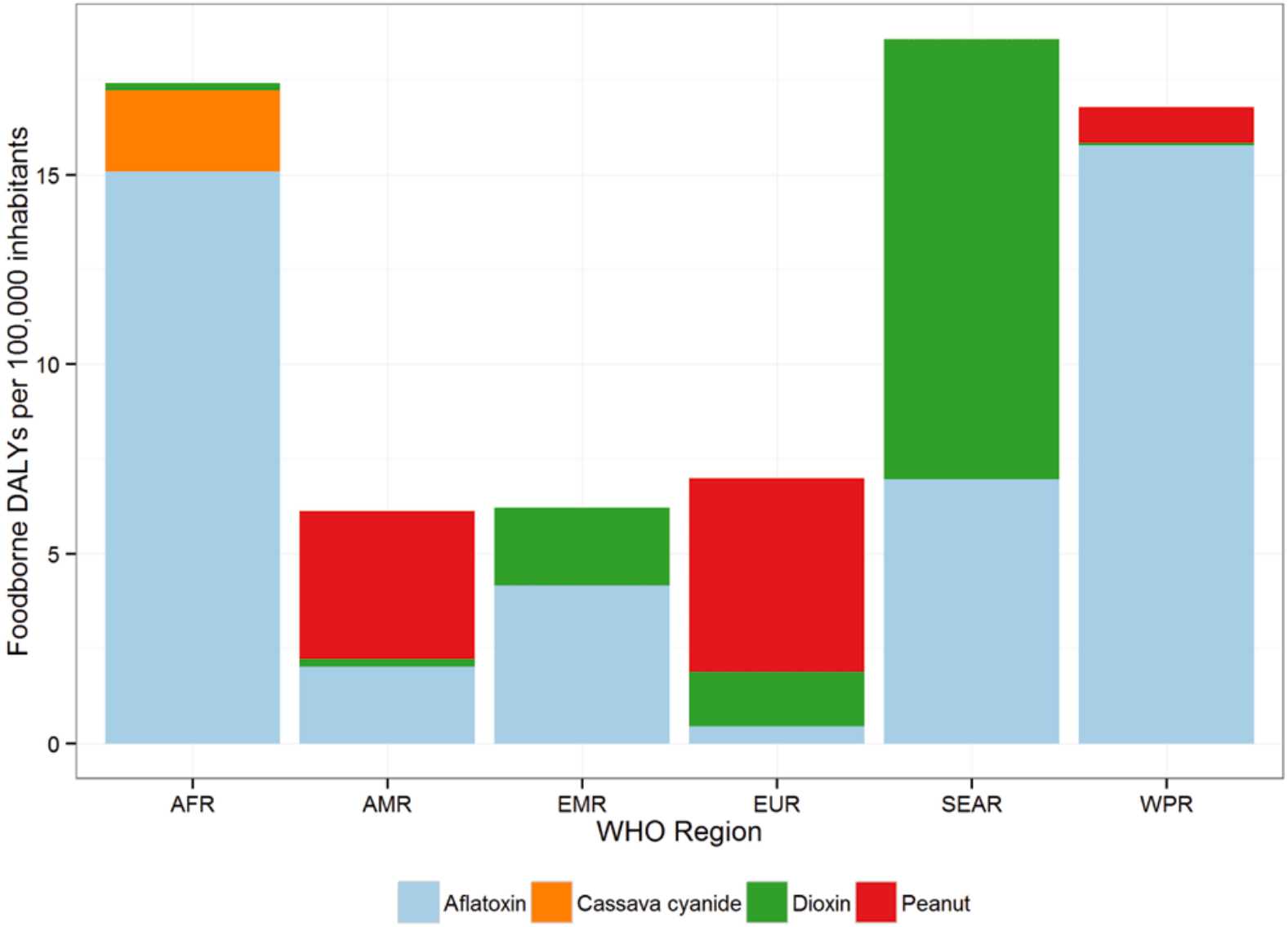
https://www.who.int/publications/i/item/9789241565165

World Health Organization

Foodborne disease estimate reference group (FERG)

World Health Organization

Figure 1. The relative contribution to the DALY incidence by each of four chemicals for each of the WHO regions



F1000Research

Gibb H, Devleesschauwer B, Bolger PM et al. World Health Organization estimates of the global and regional disease burden of four foodborne chemical toxins, 2010: a data synthesis [version 1]. F1000Research 2015, 4:1393

Burden of foodborne disease

WHO published in **2015** for the first-time estimates of the global burden of foodborne disease.

Dioxins' effects on **fertility** and on **thyroid function** were considered in this context, and these 2 endpoints alone shows that this exposure can contribute significantly to foodborne disease burden in some parts of the world.

WHO expects to publish the second estimates of the global burden of foodborne disease in **2025**.

Dioxins' effects on **cancer** will be added.

World Health Organization

Evidence-based risk management decisions

Breastmilk samples inform on the overall exposure of populations to chemical hazards.

Making targeted risk management decisions require identifications of the main contributors.

Testing dioxins and other chemical hazards in **foods** help identify priority actions for risk management.

World Health Organization

Conclusion

Thanks for UNEP outstanding contribution to public health.

Keep up the good work on GMP!

World Health Organization

Thank you

WHO FERG Secretariat

fbd-burden@who.int

World Health Organization

Capacity building activities by MTM Örebro University in African regional project

Heidelore Fiedler
Örebro University, Örebro, Sweden

ÖREBRO UNIVERSITY

Capacitiy building activities 2016-2020

- Provision of forms for sampling activities (air and water) and reporting of POPs analytes
- Laboratory training courses on-site (PFAS and dl-POPs)
- Provision of materials for (all) African POPs laboratories (includes customer-designed analytical standards for PFAS analysis)
- Support and clearance documents: (i) Import license into EU (Sweden, Netherlands, Spain) for national samples under CITES, (ii) customs declarations for shipment of test/training materials
- Backstopping on POPs analysis (PFAS and dl-POPs)
- Two rounds of interlaboratory assessments (IL3-IL4) in collaboration with E&H VU Amsterdam

Training courses - onsite

- In the on-site training courses, the 2015 guidance document, developed by E&H VU universiteit, was applied and updated according to local conditions and scientific developments;
- Tunisia, training by Dr. Ingrid Ericsson and Maria Björnsdotter in Tunis at CITET from 5 to 9 November 2018.
  Instrument fixes (install isolator column) and closing leakes; instrument was not working despite presence of service engineer. Made the standards, cleaned the manifold. Power supply not stable. Quality of solvents and nitrogen not clear.
- Uganda, training at DGAL in Kampala by Dr. Leo W.Y Yeung and Rudolf Aro from 4 to 8 March 2019; 12 participants. Theory and practical exercises on optimizing ESI-/MSMS parameters and HPLC separation methods . UNEP method adapted to the laboratory's conditions. Backdraw: none of the column brought by MTM could be installed due to wrong connectors.
- Provision of lab materials: Agreements with eight companies to deliver materials upon request to developing countries; including analytical standards, native and labelled, for ECD and MS detection; GC columns, LC columns, consumables (pipettes, syringes, liners, cartridges, alumina/silica gel/chemicals/glass wool/ solvents.


gef UNEP

Procedure for the Analysis of Persistent Organic Pollutants in Environmental and Human Matrices to Implement the Global Monitoring Plan under the Stockholm Convention

Protocol 1:
The Analysis of Perfluorooctane Sulfonic Acid (PFOS) in Water and Perfluorooctane Sulfonamide (FOSA) in Mothers' Milk, Human Serum and Air; and the Analysis of Some Perfluorooctane Sulfonamides (FOSAS) and Perfluorooctane Sulfonamido Ethanols (FOSES) in Air

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

Geneva

April 2015

Forms for sampling: Air (PAS/PUFs) (and water)

PUF AFR	Year-Season	Country of origin, ISO-3 AFR	PAS site name	GPS coordinates of site	Sampler No.	Destination lab for analysis	Analytes	Name of person who deployed the PUF	Actual exposure start date (d-mmm-yyyy)	Actual exposure end date (d-mmm-yyyy)	Name of person who collected the PUF	Effective days of exposure	Date the PUF was sent to expert lab	Comments	Sample results name
AFR-1 (2017-II)	2017-I	AFR			1	IVM VU	OCPs		1-Jan-2017	31-Mar-2017		89	4-Jul-2017	The extract will be analysed with GC/LRMS	AFR-1 2017-I
AFR-3 (2017-II)	2017-I	AFR			3	IVM VU	PCB(6)		1-Jan-2017	31-Mar-2017		89	4-Jul-2017	The extract will be analysed with GC/LRMS	AFR-3 2017-I
AFR-5 (2017-II)	2017-I	AFR			5	MTM	dl-POPs		1-Jan-2017	31-Mar-2017		89	4-Jul-2017	The extract will be analysed with GC/HRMS	AFR-5 2017-I
AFR-9 (2017-II)	2017-I	AFR			9	IVM VU	PBDE, HBCD, HxBB		1-Jan-2017	31-Mar-2017		89	4-Jul-2017	The extract will be analysed with GC/LRMS; if >LOQ for HBCD, then LC/MS	AFR-9 2017-I
AFR-11 (2017-II)	2017-I	AFR			11	MTM	PFOS		1-Jan-2017	31-Mar-2017		89	4-Jul-2017	The extract will be analysed with LC/MS	AFR-11 2017-I
AFR-1 (2017-III)	2017-II	AFR			1	IVM VU	OCPs		1-Apr-2017			-42826		The extract will be analysed with GC/LRMS	AFR-1 2017-II
AFR-3 (2017-III)	2017-II	AFR			3	IVM VU	PCB(6)		1-Apr-2017			-42826		The extract will be analysed with GC/LRMS	AFR-3 2017-II
AFR-5 (2017-III)	2017-II	AFR			5	MTM	dl-POPs		1-Apr-2017			-42826		The extract will be analysed with GC/HRMS	AFR-5 2017-II
AFR-9 (2017-III)	2017-II	AFR			9	IVM VU	PBDE, HBCD, HxBB		1-Apr-2017			-42826		The extract will be analysed with GC/LRMS; if >LOQ for HBCD, then LC/MS	AFR-9 2017-II
AFR-11 (2017-III)	2017-II	AFR			11	MTM	PFOS		1-Apr-2017			-42826		The extract will be analysed with LC/MS	AFR-11 2017-II
AFR-1 (2017-IV)	2017-III	AFR			1	IVM VU	OCPs		1-Jul-2017			-42917		The extract will be analysed with GC/LRMS	AFR-1 2017-III
AFR-3 (2017-IV)	2017-III	AFR			3	IVM VU	PCB(6)		1-Jul-2017			-42917		The extract will be analysed with GC/LRMS	AFR-3 2017-III
AFR-5 (2017-IV)	2017-III	AFR			5	MTM	dl-POPs		1-Jul-2017			-42917		The extract will be analysed with GC/HRMS	AFR-5 2017-III
AFR-9 (2017-IV)	2017-III	AFR			9	IVM VU	PBDE, HBCD, HxBB		1-Jul-2017			-42917		The extract will be analysed with GC/LRMS; if >LOQ for HBCD, then LC/MS	AFR-9 2017-III
AFR-11 (2017-IV)	2017-III	AFR			11	MTM	PFOS		1-Jul-2017			-42917		The extract will be analysed with LC/MS	AFR-11 2017-III
AFR-1 (2018-I)	2017-IV	AFR			1	IVM VU	OCPs		1-Oct-2017			-43009		The extract will be analysed with GC/LRMS	AFR-1 2017-IV
AFR-3 (2018-I)	2017-IV	AFR			3	IVM VU	PCB(6)		1-Oct-2017			-43009		The extract will be analysed with GC/LRMS	AFR-3 2017-IV
AFR-5 (2018-I)	2017-IV	AFR			5	MTM	dl-POPs		1-Oct-2017			-43009		The extract will be analysed with GC/HRMS	AFR-5 2017-IV
AFR-9 (2018-I)	2017-IV	AFR			9	IVM VU	PBDE, HBCD, HxBB		1-Oct-2017			-43009		The extract will be analysed with GC/LRMS; if >LOQ for HBCD, then LC/MS	AFR-9 2017-IV
AFR-11 (2018-I)	2017-IV	AFR			11	MTM	PFOS		1-Oct-2017			-43009		The extract will be analysed with LC/MS	AFR-11 2017-IV
AFR-1 (2018-II)	2018-I	AFR			1	IVM VU	OCPs		1-Jan-2018			-43101		The extract will be analysed with GC/LRMS	AFR-1 2018-I
AFR-3 (2018-II)	2018-I	AFR			3	IVM VU	PCB(6)		1-Jan-2018			-43101		The extract will be analysed with GC/LRMS	AFR-3 2018-I
AFR-5 (2018-II)	2018-I	AFR			5	MTM	dl-POPs		1-Jan-2018			-43101		The extract will be analysed with GC/HRMS	AFR-5 2018-I
AFR-9 (2018-II)	2018-I	AFR			9	IVM VU	PBDE, HBCD, HxBB		1-Jan-2018			-43101		The extract will be analysed with GC/LRMS; if >LOQ for HBCD, then LC/MS	AFR-9 2018-I
AFR-11 (2018-II)	2018-I	AFR			11	MTM	PFOS		1-Jan-2018			-43101		The extract will be analysed with LC/MS	AFR-11 2018-I
AFR-1 (2018-III)	2018-II	AFR			1	IVM VU	OCPs		1-Apr-2018			-43191		The extract will be analysed with GC/LRMS	AFR-1 2018-II
AFR-3 (2018-III)	2018-II	AFR			3	IVM VU	PCB(6)		1-Apr-2018			-43191		The extract will be analysed with GC/LRMS	AFR-3 2018-II
AFR-5 (2018-III)	2018-II	AFR			5	MTM	dl-POPs		1-Apr-2018			-43191		The extract will be analysed with GC/HRMS	AFR-5 2018-II
AFR-9 (2018-III)	2018-II	AFR			9	IVM VU	PBDE, HBCD, HxBB		1-Apr-2018			-43191		The extract will be analysed with GC/LRMS; if >LOQ for HBCD, then LC/MS	AFR-9 2018-II
AFR-11 (2018-III)	2018-II	AFR			11	MTM	PFOS		1-Apr-2018			-43191		The extract will be analysed with LC/MS	AFR-11 2018-II
AFR-1 (2018-IV)	2018-III	AFR			1	IVM VU	OCPs		1-Jul-2018			-43282		The extract will be analysed with GC/LRMS	AFR-1 2018-III
AFR-3 (2018-IV)	2018-III	AFR			3	IVM VU	PCB(6)		1-Jul-2018			-43282		The extract will be analysed with GC/LRMS	AFR-3 2018-III
AFR-5 (2018-IV)	2018-III	AFR			5	MTM	dl-POPs		1-Jul-2018			-43282		The extract will be analysed with GC/HRMS	AFR-5 2018-III
AFR-9 (2018-IV)	2018-III	AFR			9	IVM VU	PBDE, HBCD, HxBB		1-Jul-2018			-43282		The extract will be analysed with GC/LRMS; if >LOQ for HBCD, then LC/MS	AFR-9 2018-III
AFR-11 (2018-IV)	2018-III	AFR			11	MTM	PFOS		1-Jul-2018			-43282		The extract will be analysed with LC/MS	AFR-11 2018-III
AFR-1 (2019-I)	2018-IV	AFR			1	IVM VU	OCPs		1-Oct-2018			-43374		The extract will be analysed with GC/LRMS	AFR-1 2018-IV
AFR-3 (2019-I)	2018-IV	AFR			3	IVM VU	PCB(6)		1-Oct-2018			-43374		The extract will be analysed with GC/LRMS	AFR-3 2018-IV
AFR-5 (2019-I)	2018-IV	AFR			5	MTM	dl-POPs		1-Oct-2018			-43374		The extract will be analysed with GC/HRMS	AFR-5 2018-IV
AFR-9 (2019-I)	2018-IV	AFR			9	IVM VU	PBDE, HBCD, HxBB		1-Oct-2018			-43374		The extract will be analysed with GC/LRMS; if >LOQ for HBCD, then LC/MS	AFR-9 2018-IV
AFR-11 (2019-I)	2018-IV	AFR			11	MTM	PFOS		1-Oct-2018			-43374		The extract will be analysed with LC/MS	AFR-11 2018-IV

These forms were not/hardly used

POPs results reporting forms

	Region	Africa
Change where necessary	Matrix	PUF
	Analytical lab	E&H VU
	Sample from samplers	3
	Sampling year	2017
The dates are not real but shows how to calculate the exposure time	Start day	2017-04-01
	End day	2017-06-30
	Exposure days	90
Write sample number here	Season code	II
Write other matrix here	Year-season	2017-II
	Exposure months	3 months
	Original Sample-ID	ETH-3 (2017-II)
	Full country name	Ethiopia
	Country ISO-3	ETH
	Sample ID	ETH (2017-II)
Change where necessary	Unit	µg PUF^{-1}
	PCB #28	1.0
	PCB #52	2.0
	PCB #101	3.0
	PCB #138	4.0
	PCB #153	5.0
	PCB #180	6.0
	Sum PCB_6	21.0

	Region	Africa
Change where nece	Matrix	PUF
	Analytical lab	E&H VU
	Sample from samplers	1
	Sampling year	2017
The dates are not real but shows how to calculate	Start day	2017-04-01
	End day	2017-06-30
	Exposure days	90
Write sample num	Season code	II
Write other matrix	Year-season	2017-II
	Exposure months	3 months
	Original Sample-ID	ETH-1 (2017-II)
	Full country name	Ethiopia
	Country ISO-3	ETH
	Sample ID	ETH (2017-II)
Change where nece	Unit	ng PUF^{-1}
	PBDE-17	1.0
	PBDE-28	2.0
	PBDE-47	3.0
	PBDE-99	4.0
	PBDE-100	5.0
	PBDE-153	6.0
	PBDE-154	7.0
	PBDE-183	8.0
	Sum PBDE(8)	36.0
	α-HBCD	3.0
	β-HBCD	4.0
	γ-HBCD	5.0
	Sum HBCD	12.0
	PBB 153	3.5
	PBDE 209	4.4

Region	Africa
Matrix	Water
Lab	MTM
Date of extraction	yyy-mm-dd
Date of analysis	2017-05-12
Year	2017
Season code	1
Year-season	2017-1
Exposure time	punctual
Full country name	Kenya
Country ISO-3	KEN
Sample ID	KEN (2017-1)
Unit	ng L^{-1}
L-PFOS	1.98
br-PFOS	0.35
Sum PFOS	2.33
PFOA	0.96
PFHxS	0.52

	Sample ID	ETH (2017-II)
	Unit	pg PUF^{-1}
WHO_{2005}-TEF	**PCDD/PCDF**	
1	2378-Cl_4DD	<1.0392
1	12378-Cl_5DD	<1.4431
0.1	123478-Cl_6DD	<1.9311
0.1	123678-Cl_6DD	<1.2589
0.1	123789-Cl_6DD	<1.306
0.01	1234678-Cl_7DD	1.1
0.0003	Cl_8DD	3.3
0.1	2378-Cl_4DF	4.0
0.03	12378-Cl_5DF	2.0
0.3	23478-Cl_5DF	1.4
0.1	123478-Cl_6DF	<1.0642
0.1	123678-Cl_6DF	<0.7465
0.1	123789-Cl_6DF	<0.9084
0.1	234678-Cl_6DF	<0.7339
0.01	1234678-Cl_7DF	<0.5734
0.01	1234789-Cl_7DF	<0.679
0.0003	Cl_8DF	<1.0474
	WHO_{2005}-TEQ_{PCDD}	0.0
	WHO_{2005}-TEQ_{PCDF}	0.9
	WHO_{2005}-$TEQ_{PCDD/PCDF}$	0.9
WHO_{2005}-TEF	**dl-PCB**	
0.0001	PCB 77	27.3
0.0003	PCB 81	5.7
0.1	PCB 126	<2.8259
0.03	PCB 169	2.2
0.00003	PCB 105	35.6
0.00003	PCB 114	<2.43
0.00003	PCB 118	90.8
0.00003	PCB 123	<2.4862
0.00003	PCB 156	9.9
0.00003	PCB 157	2.6
0.00003	PCB 167	5.3
0.00003	PCB 189	1.2
	WHO_{2005}-$TEQ_{no\text{-}PCB}$	0.1
	WHO_{2005}-$TEQ_{mo\text{-}PCB}$	0.00
	WHO_{2005}-TEQ_{PCB}	0.07
	WHO_{2005}-TEQ_{total}	1.0
	Number of PUFs	1
ult per PUF in pg/	**WHO_{2005}-$TEQ_{PCDD/PCDF}$**	0.9
	WHO_{2005}-TEQ_{PCB}	0.1
	WHO_{2005}-TEQ_{total}	1.0

	Region	Africa
Change where nece	Matrix	PUF
	Analytical lab	E&H VU
	Sample from samplers	1
	Sampling year	2017
The dates are not real but shows how to calculate	Start day	2017-04-01
	End day	2017-06-30
	Exposure days	90
Write sample num	Season code	II
Write other matrix	Year-season	2017-II
	Exposure months	3 months
	Original Sample-ID	ETH-1 (2017-II)
	Full country name	Ethiopia
	Country ISO-3	ETH
	Sample ID	ETH (2017-II)
Change where nece	Unit	µg PUF^{-1}
Initial POPs	Aldrin	1.0
	Dieldrin	1.0
	Endrin	1.0
	Sum drins	3.0
	a-Chlordane	1.0
	g-Chlordane	1.0
	Oxychlordane	1.0
	cis-Nonachlor	1.0
	trans-Nonachlor	1.0
	Sum chlordanes	5.0
	o,p'-DDT	1.0
	p,p'-DDT	1.0
	o,p'-DDD	1.0
	p,p'-DDD	1.0
	o,p'-DDE	1.0
	p,p'-DDE	1.0
	Sum DDTs	6.0
	Heptachlor	1.0
	cis-Heptachlorepoxide	1.0
	trans-Heptachlorepoxide	1.0
	Sum heptachlors	3.0
	Parlar 26	1.0
	Parlar 50	1.0
	Parlar 62	1.0
	Sum toxaphenes	3.0
	HCB	1.0
	Mirex	1.0
New POPs	a-HCH	1.0
	b -HCH	1.0
	g-HCH	1.0
	Sum HCH	3.0
	sum Chlordecone	1.0
	α-endosulfan	1.0
	β-endosulfan	1.0
	Endosulfan sulfate	1.0
	Sum endosulfans	3.0
	Pentachlorobenzene	1.0
	Chlordecone	1.0
	HCBD	1.0

- Templates (in Excel) developed for OCPs, PCB(6), BFRs, dl-POPs, and PFAS for use at all matrices;
- Results arriving did not use these templates

Mirror samples, either core matrices or national samples, were not exchanged for dl-POPs or PFAS analytical results between African laboratories and MTM Örebro University.

Interlaboratory assessments IL1-IL4

Heidelore Fiedler, Ike van der Veen, Jacob de Boer
Örebro University, Örebro, Sweden
Vrije Universiteit, Amsterdam, the Netherlands

Interlaboratory Assessments

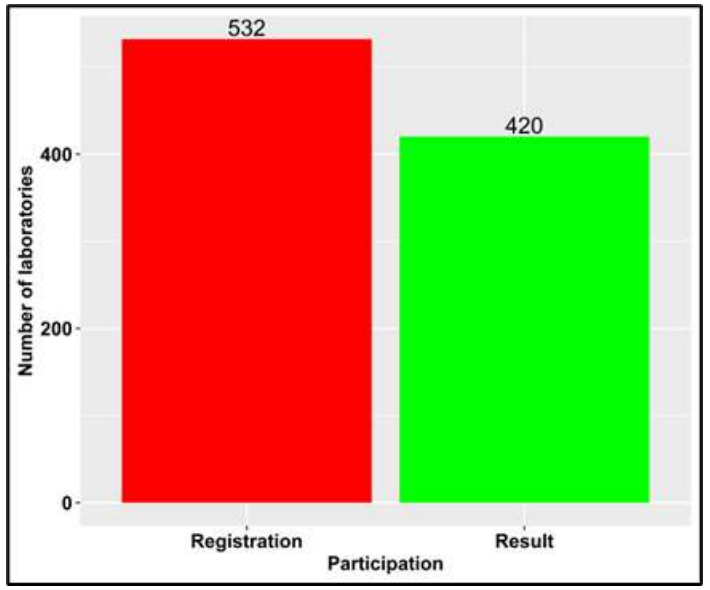
4 rounds: 2010/2011, 2012/2013, and 2016/2017, 2018/2019

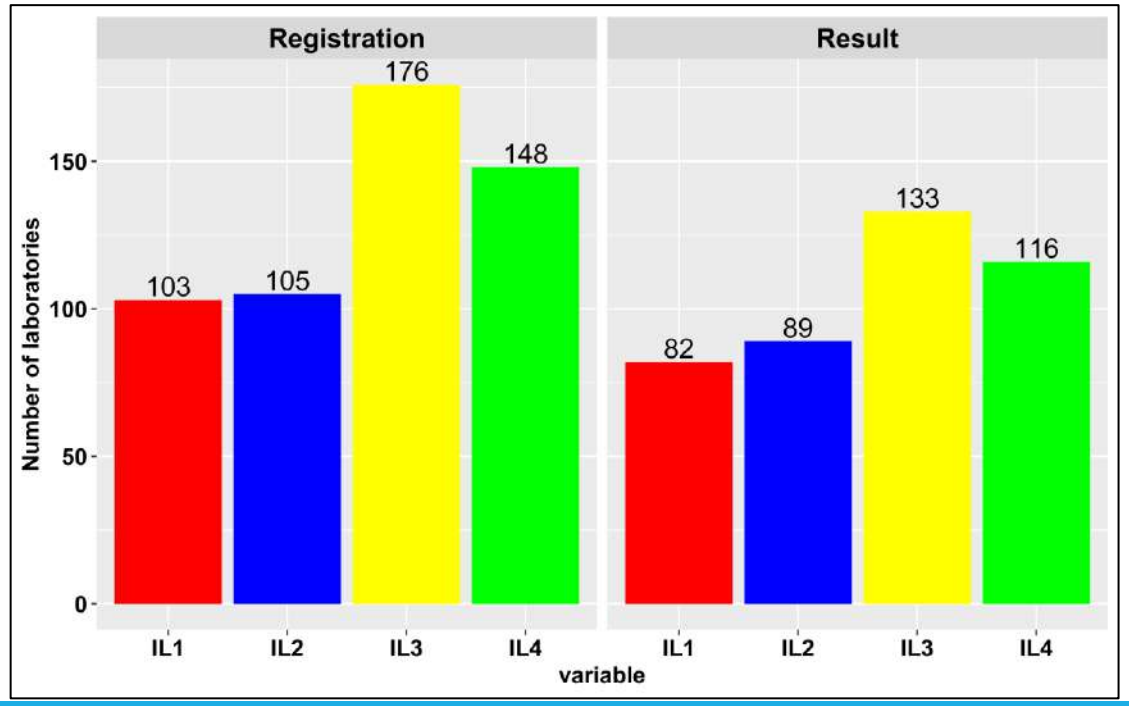
- Objective tool to test and communicate performance of a laboratory
- A test sample is sent to all laboratories interested and they report amounts found in their lab and their methodology
- Time-limited; preferentially every two years

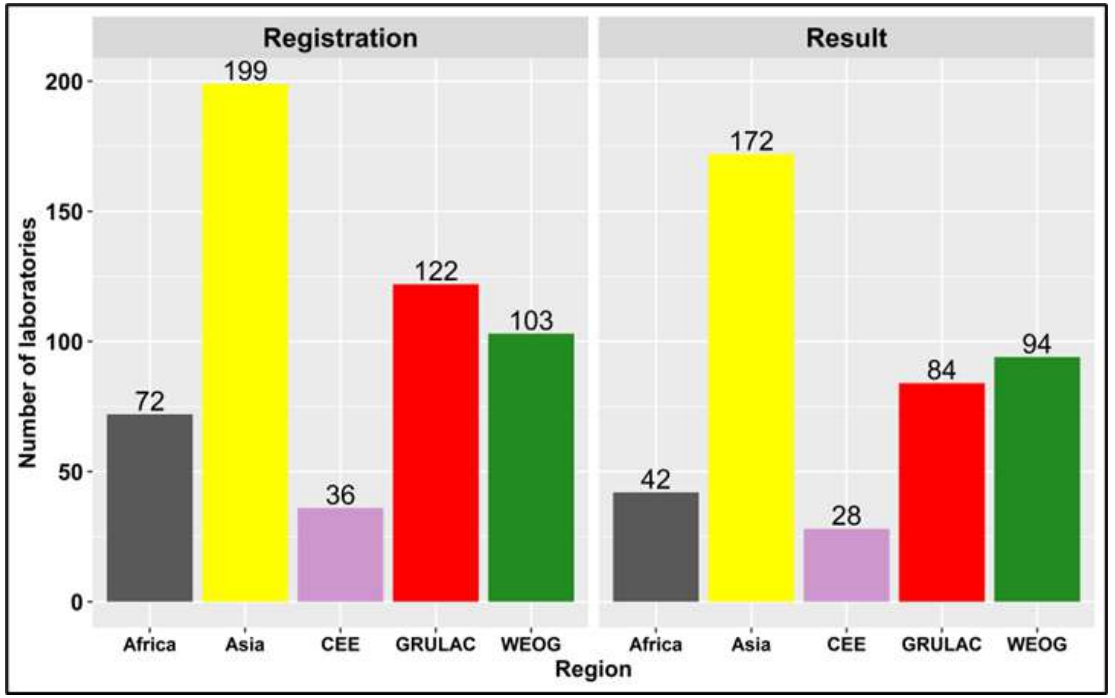
Participation

Criterion	IL1	IL2	IL3	IL4
No of laboratories registering in the round	103	105	176	148
No of laboratories obtaining at least one z-score	82	89	133	116
No of laboratories not delivering results in the round	21	16	43	32

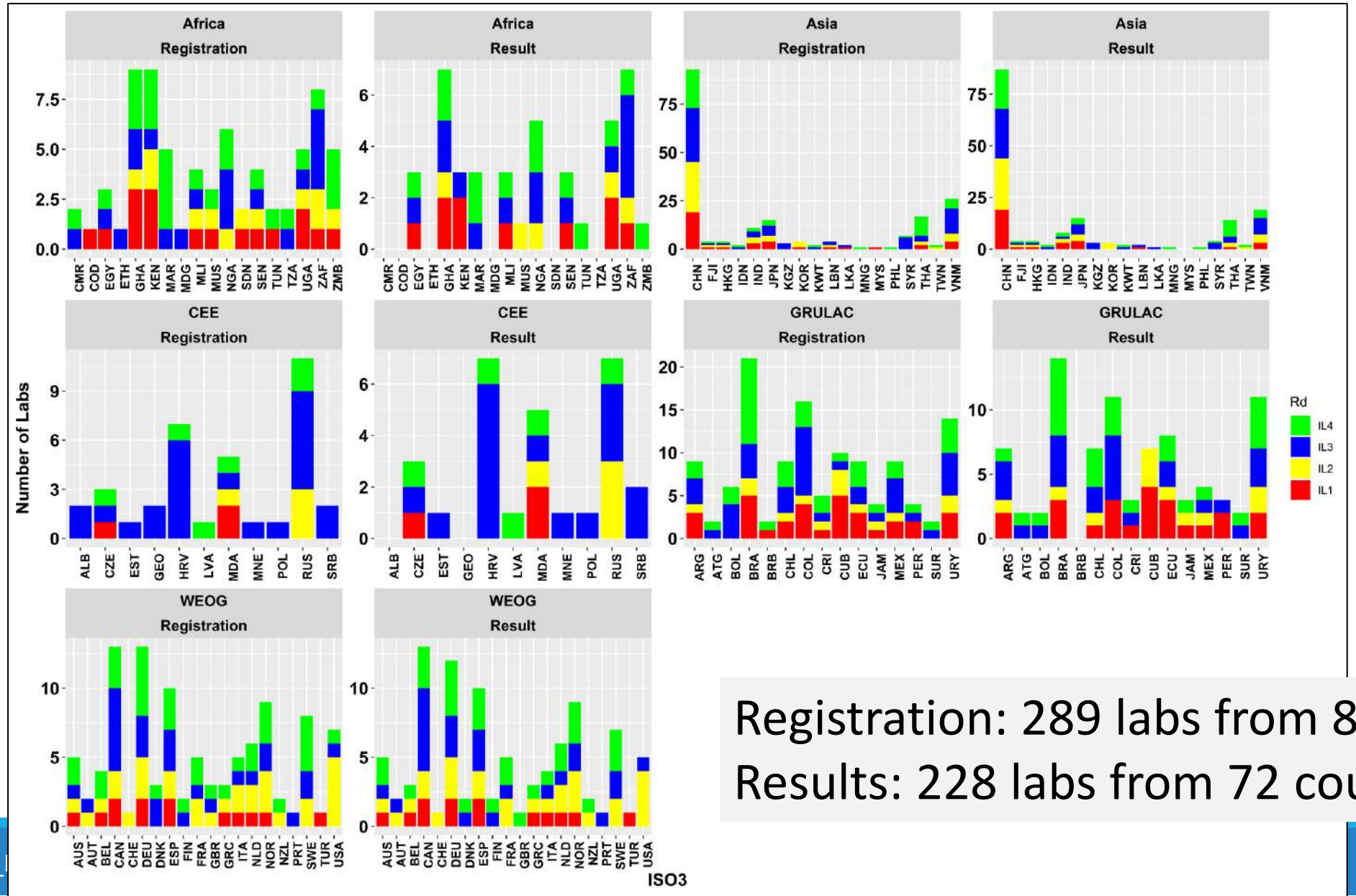
61 laboratories registered and never provided results



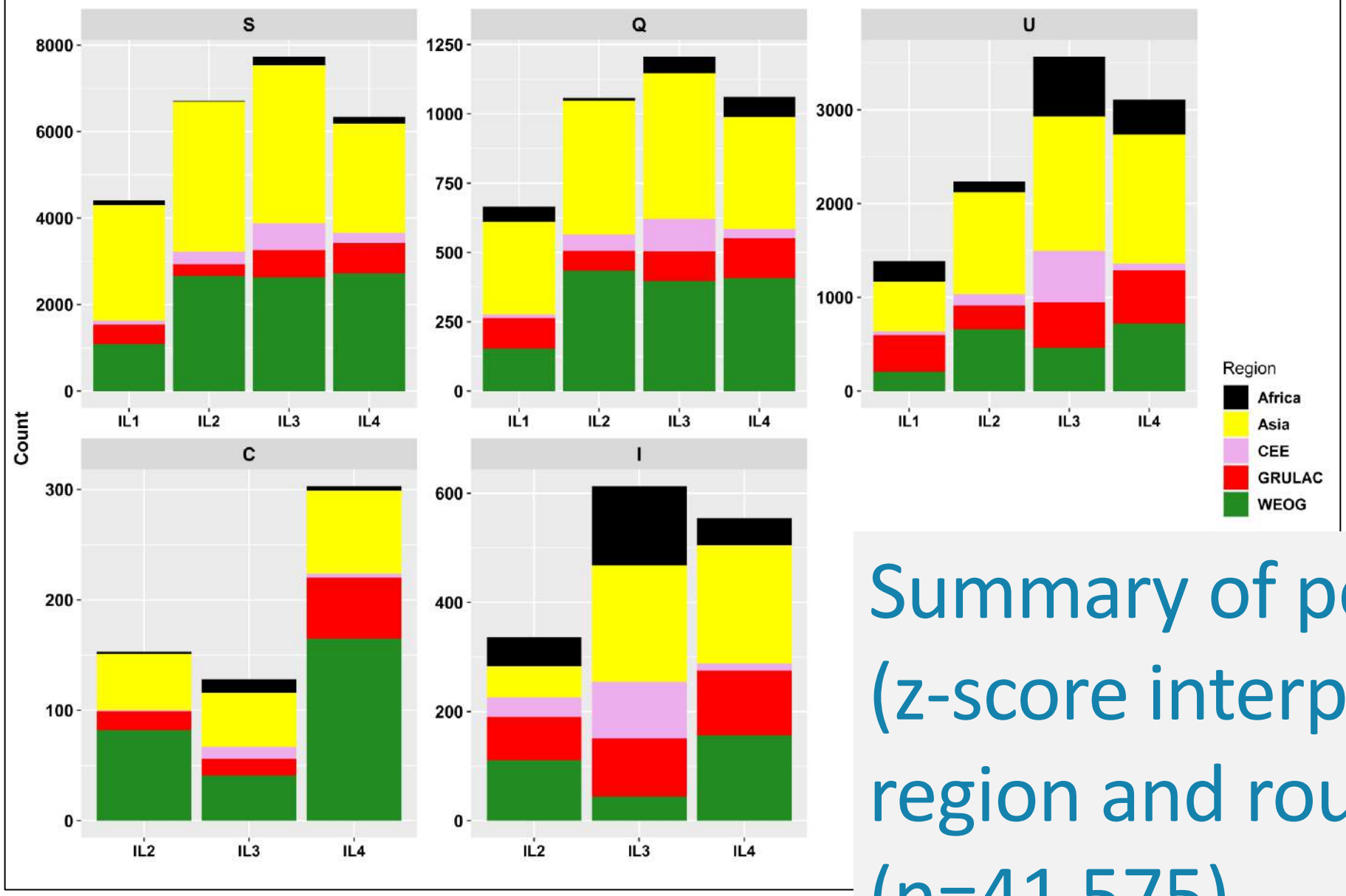




Number of labs by region and country in round



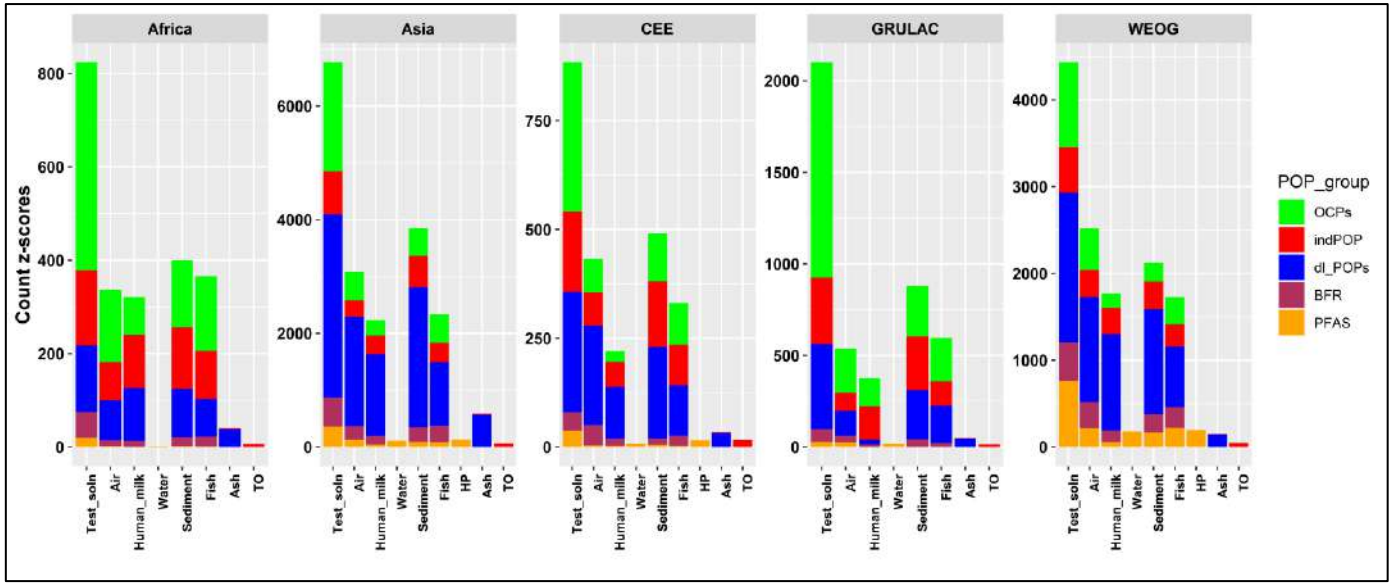
Registration: 289 labs from 82 countries
Results: 228 labs from 72 countries

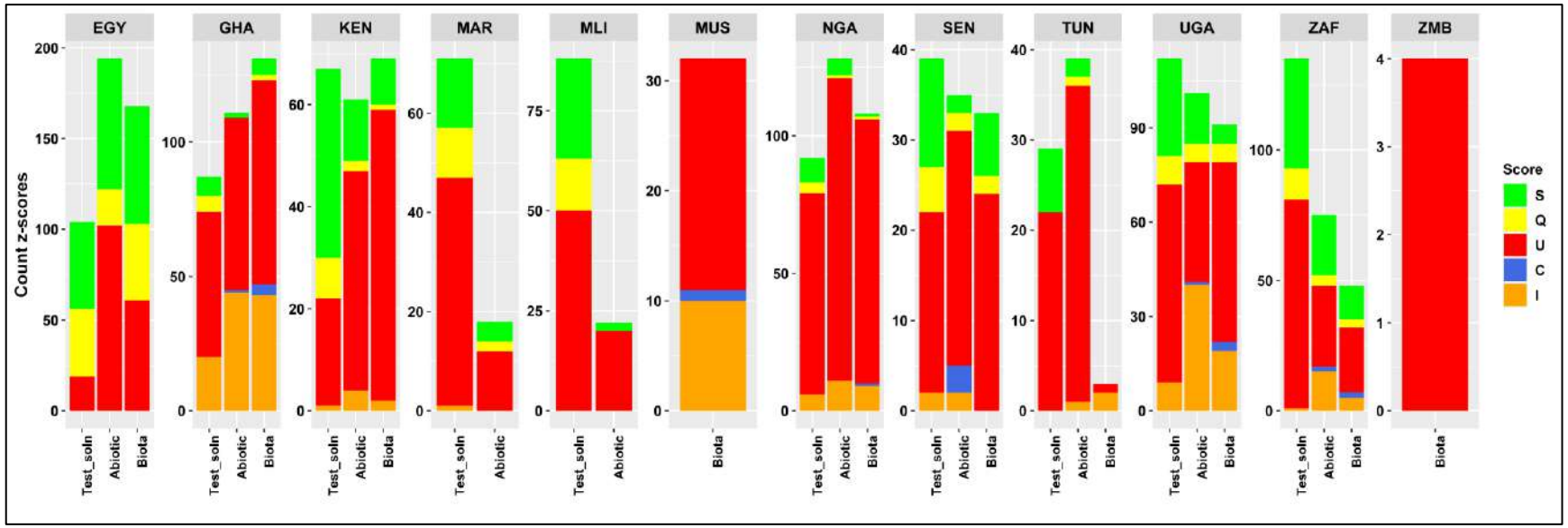


Summary of performance (z-score interpretation) for region and round (n=41 575)

Regional, national capacities and performances

- Capacity for analysis of all POPs groups exists in all UN regions (except Africa for PFAS, only for TS)
- Capacity for analysis of OCPs, indPOPs in all regions





- Capacity for dl-POPs in all regions but limited in Africa and GRULAC
- Capacity for BFRs limited in Africa and GRULAC
- Capacity and performance better for abiotic matrices than for biota

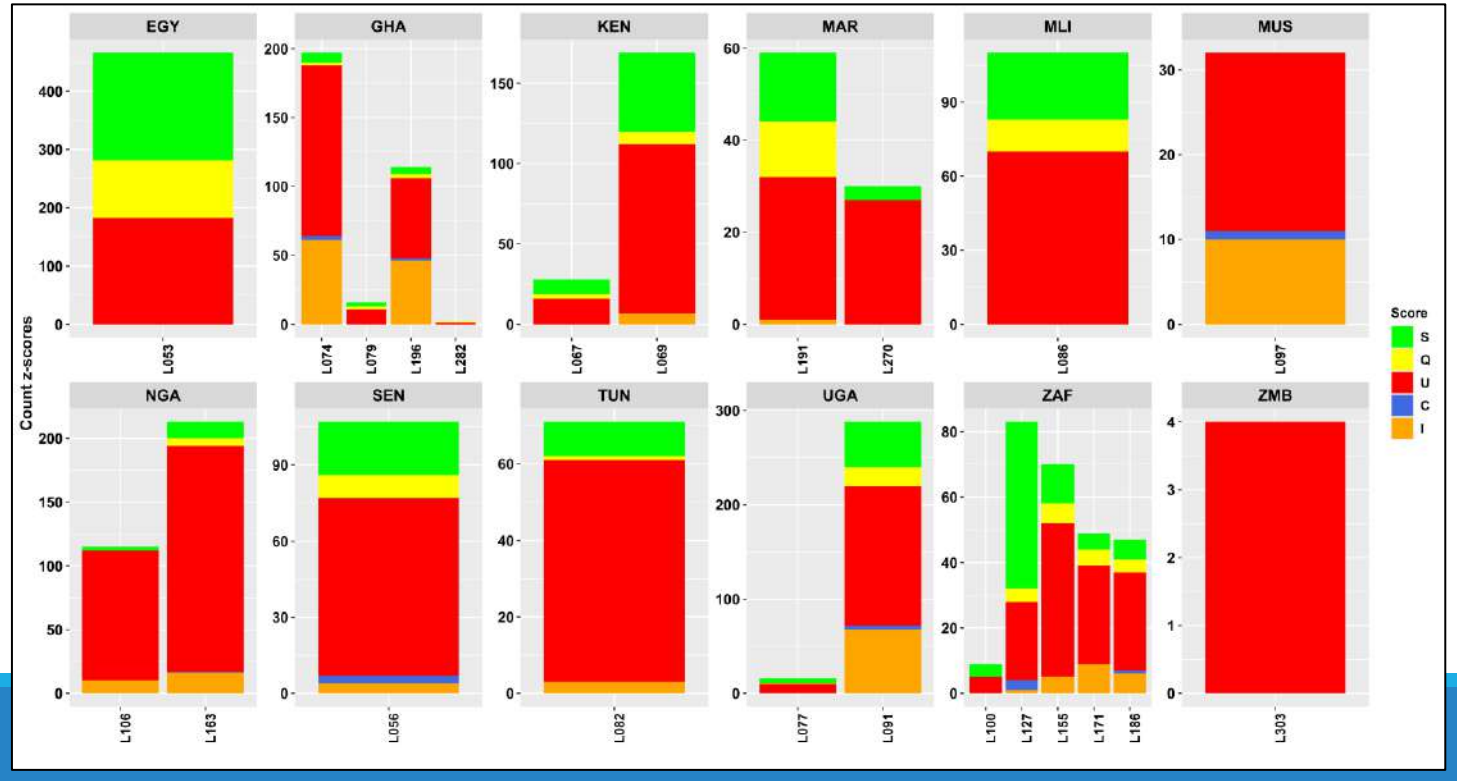
indPOP = PCB_6, HCB, PeCBz, HCBD

Performance of African laboratories

	EGY (N=466)	GHA (N=329)	KEN (N=197)	MAR (N=89)	MLI (N=110)	MUS (N=32)	NGA (N=328)	SEN (N=107)	TUN (N=71)	UGA (N=304)	ZAF (N=258)	ZMB (N=4)	Overall AFR (N=2295)	World (N=41575)
S	185	15	58	18	27	0	16	21	9)	53	78	0	**480 (21%)**	**25 192 (61%)**
Q	99	8	11	12	13	0	6	9	1	21	19	0	**199 (8.7%)**	**3 991 (10%)**
U	182	194	121	58	70	21	279	70	58	158	136	4	**1351 (59%)**	**10 305 (25%)**
C	0	5	0	0	0	1	1	3	0	4	4	0	**18 (0.8%)**	**584 (1%)**
I	0	107	7	1	0	10	26	4	3	68	21	0	**247 (118%)**	**1 503 (4%)**

z-score	Africa	Asia	CEE	GRULAC	WEOG	Total
S	480	12 314	1 249	2 053	9 096	**25 192**
Q	199	1 744	224	431	1 393	**3 991**
U	1 351	4 424	788	1 693	2 049	**10 305**
C	18	175	16	87	288	**584**
I	247	487	153	304	312	**1 503**
Total	**2 295**	**19 144**	**2 430**	**4 568**	**13 138**	**41 575**

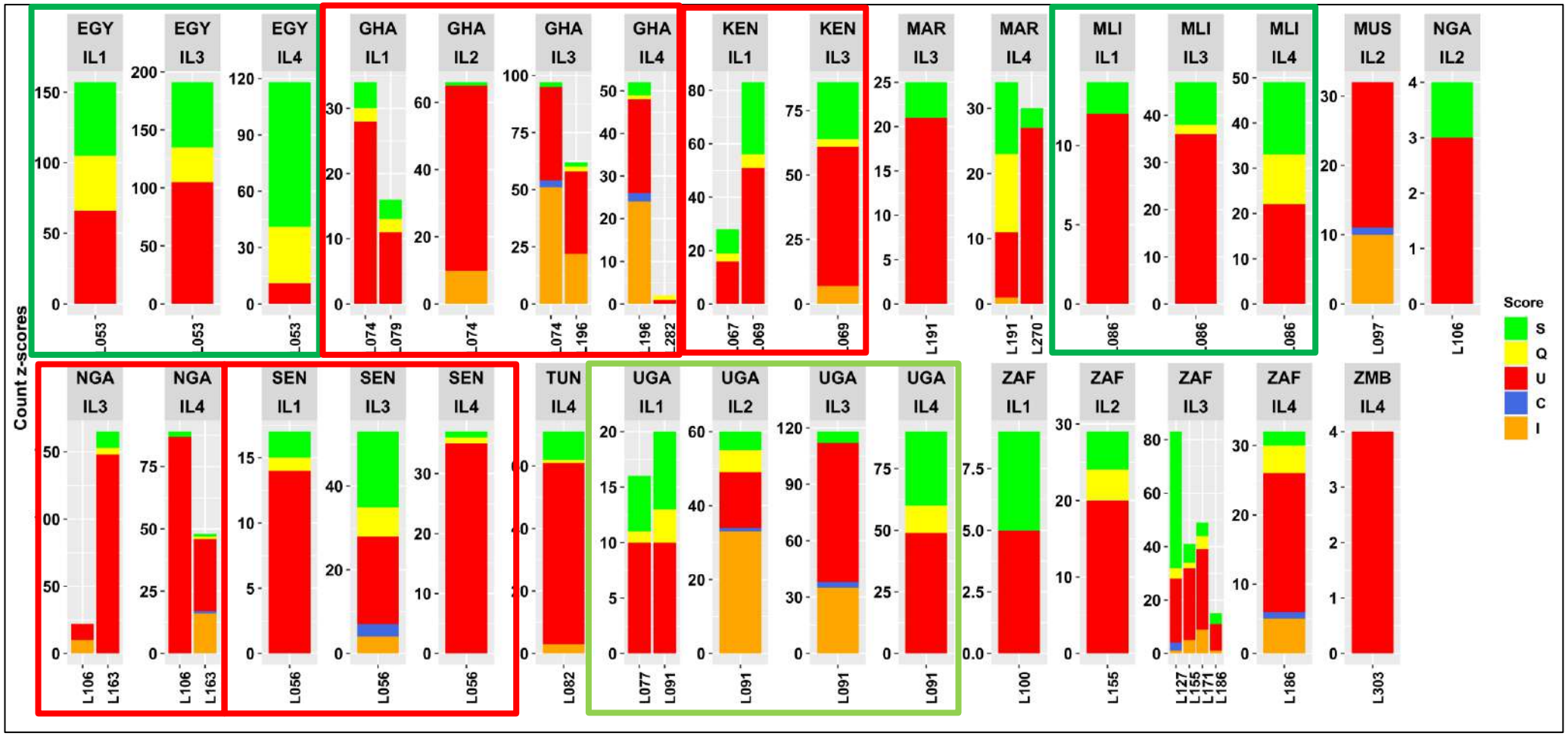
- **In general, African laboratories have small shares to total number of z-scores**
- **The percentage of satisfactory results from African laboratories is less than across all labs.**



Performance by AFR lab and round

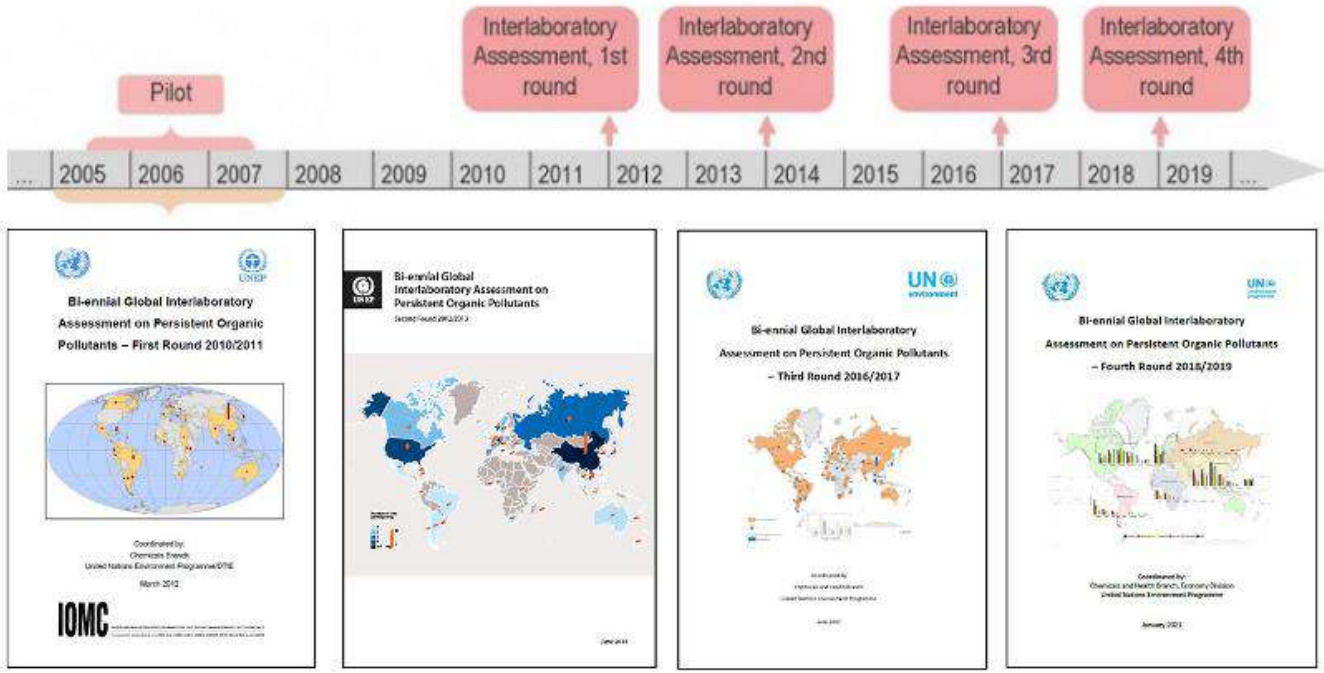
S=green, red=U; N=2295 z-scores

- Green rectangles indicate improvement
- Red rectangles indicate backward trends



Reports by UNEP

Report prepared in July 2023, not yet published

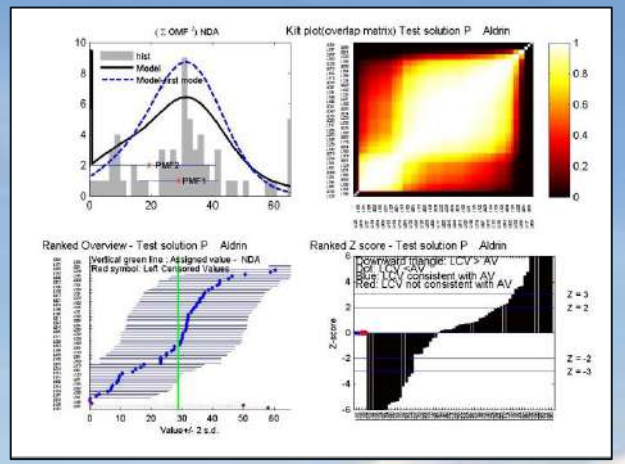


https://www.unep.org/explore-topics/chemicals-waste/what-we-do/persistent-organic-pollutants/pops-interlaboratory

- Lack of analytical capacity: Africa for dl-POPs, PBDE, and PFAS; GRULAC for PFAS and PBDE.
- Overall, performance for dl-POPs and to lesser extend PBDE and PFAS satisfactory.
- More than 60% of the z-scores for OCPs and PCB were not satisfactory.
- Human milk and fish posed the biggest challenge to the laboratories.
- Regular – and successful – participation in interlaboratory assessments remains essential.

Published papers on interlaboratory assessments

- **OCPs/BFRs**: de Boer, J., I. van der Veen, and H. Fiedler (2022). Global interlaboratory assessments on PCBs, organochlorine pesticides and brominated flame retardants in various environmental matrices 2017/2019. Chemosphere, **295**, 133991. DOI: 10.1016/j.chemosphere.2022.133991
- **dl-POPs:** Fiedler, H., I. van der Veen, and J. de Boer (2022). Interlaboratory assessments for dioxin-like POPs (2016/2017 and 2018/2019). Chemosphere, **288**, 132449. DOI: 10.1016/j.chemosphere.2021.132449
- **PFAS:** van der Veen, I., H. Fiedler, and J. de Boer (2023). Assessment of the per- and polyfluoroalkyl substances analysis under the Stockholm Convention - 2018/2019. Chemosphere, **313**, 137549. DOI: 10.1016/j.chemosphere.2022.137549
- **Assessment for UNEP/GMP-funded countries:** Fiedler, H., I. van der Veen, and J. de Boer (2022). Assessment of four rounds of interlaboratory tests within the UNEP-coordinated POPs projects. Chemosphere, **288**, 132441. DOI: 10.1016/j.chemosphere.2021.132441.
- **Assessment of 2nd and 3rd rounds for PFAS**: Fiedler, H., I. van der Veen, and J. de Boer (2020). Global interlaboratory assessments of perfluoroalkyl substances under the Stockholm Convention on persistent organic pollutants. Trac-Trends in Analytical Chemistry, **124**, 115459. DOI: ARTN 115459, 10.1016/j.trac.2019.03.023. (not open access)



UNEP Bi-ennial Global Interlaboratory Assessment on Persistent Organic Pollutants – 3rd and 4th Round non-dioxin-like POPs

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Analysis of Persistent Organic Pollutants for the Stockholm Convention´s Global Monitoring Plan

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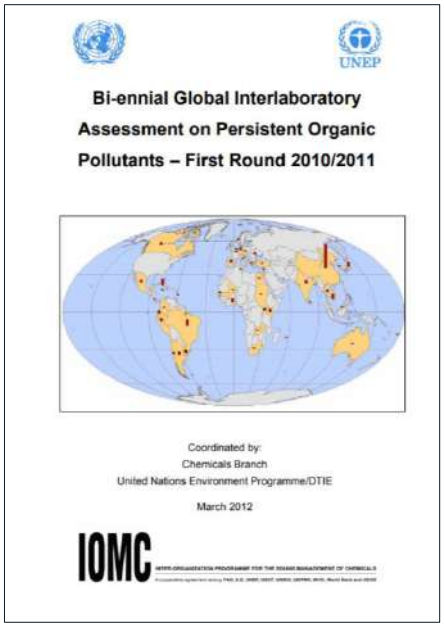
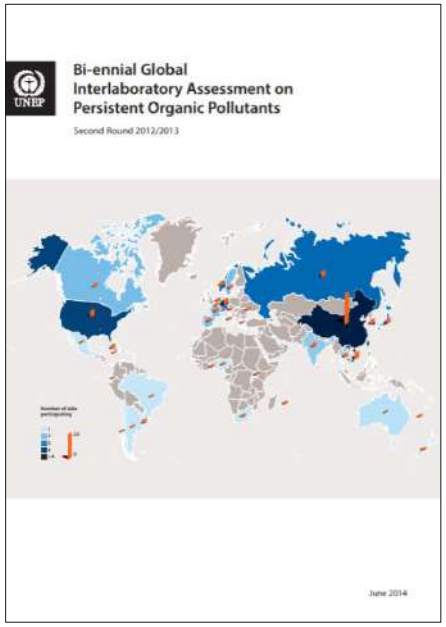
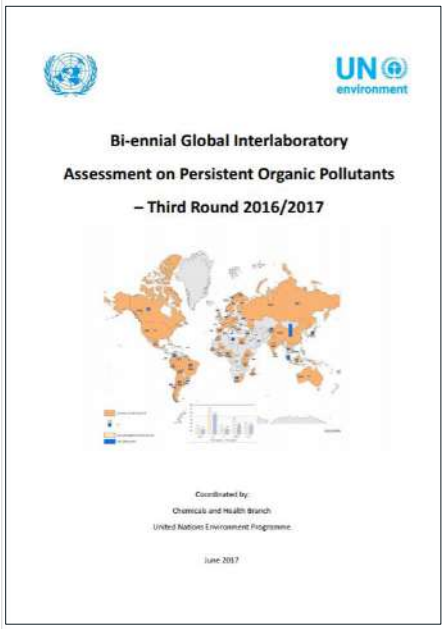
Chemosphere

Four rounds of POPs interlaboratory assessments







- Interlab studies to ensure and improve quality of labs delivering data for the Global Monitoring Program

https://www.unep.org/explore-topics/chemicals-waste/what-we-do/persistent-organic-pollutants/pops-interlaboratory

Study design

Compound classes:

- OCP
- PCB
- PCDDs, PCDFS/dl-PCB
- PBDE
- Toxaphene
- HBCD
- PFASs

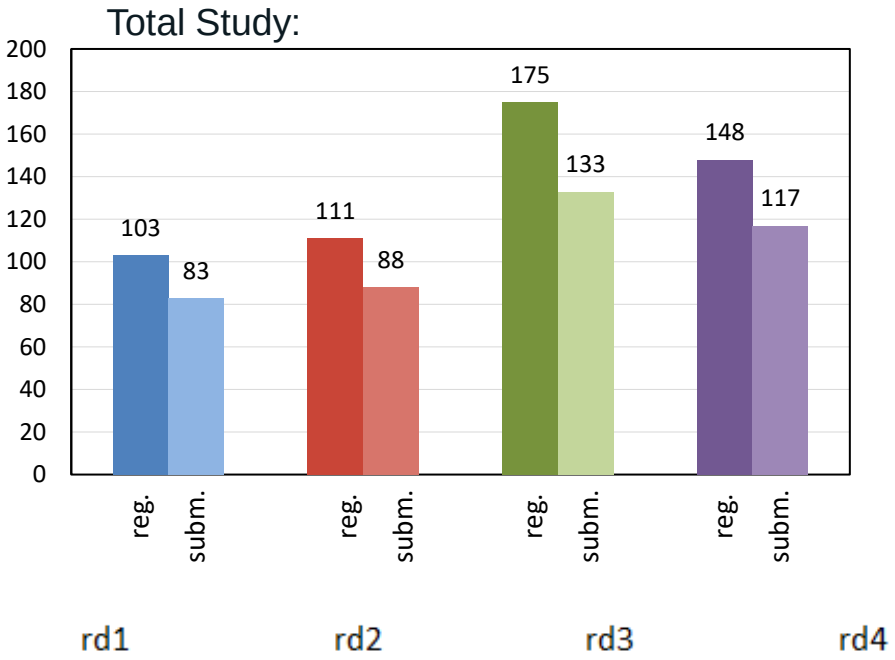
Test materials:

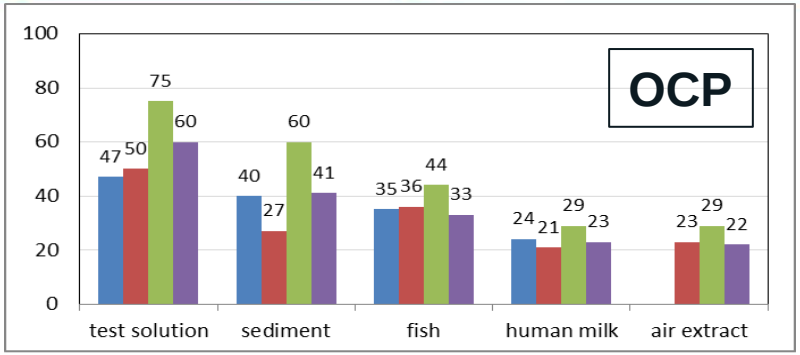
- Test solutions
- Sediment
- Fish
- Human milk
- Air (extract)
- Water (PFASs only)
- Human plasma (PFAS only)

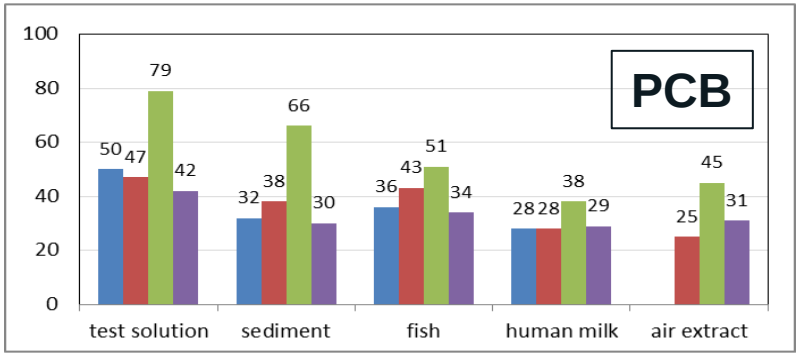


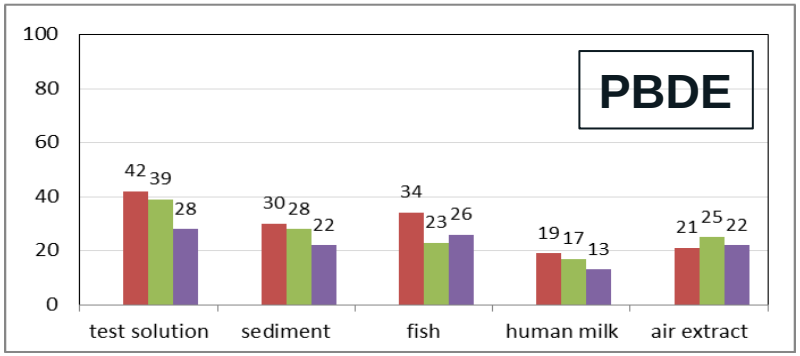


Number of participating laboratories

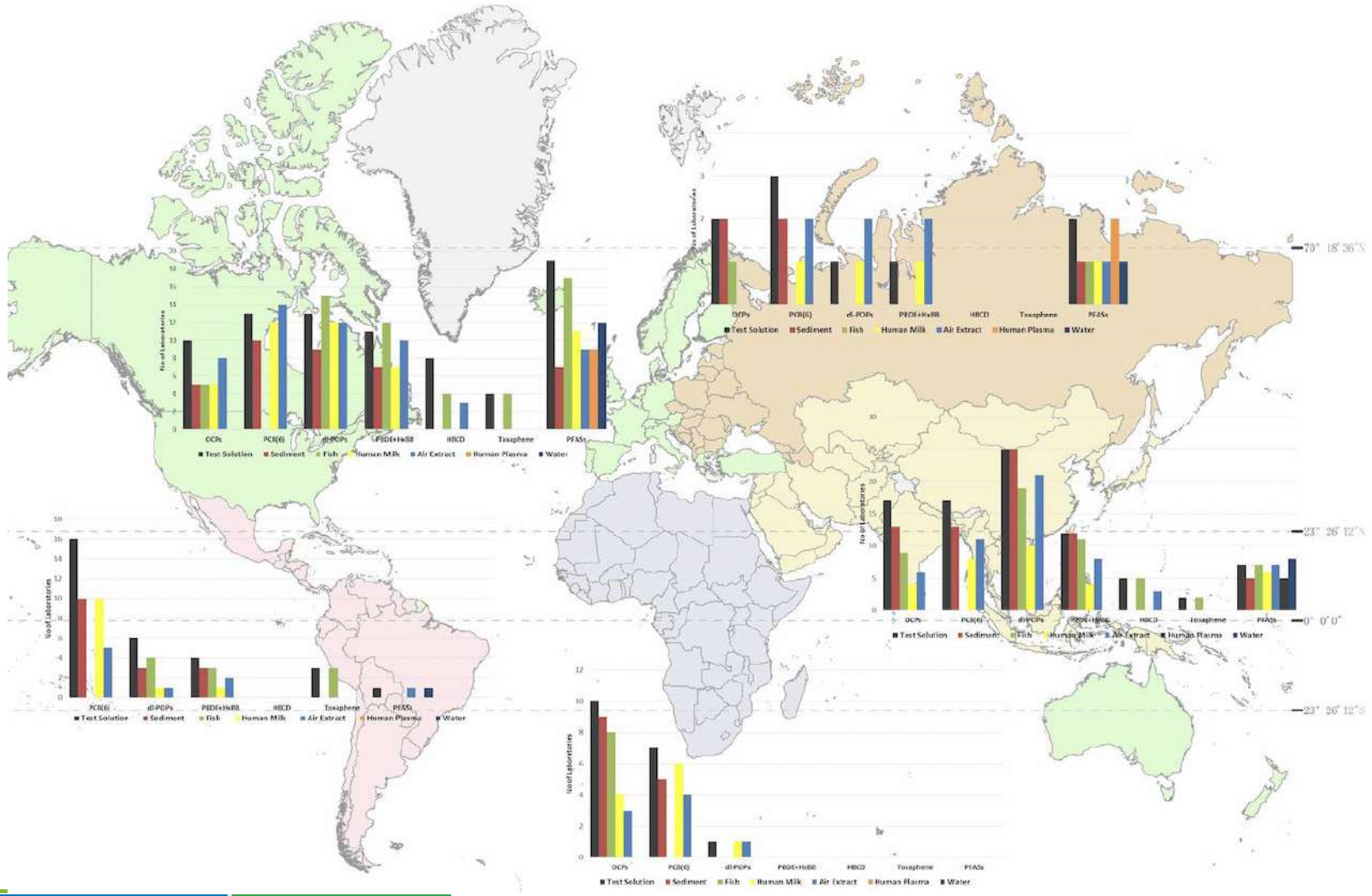






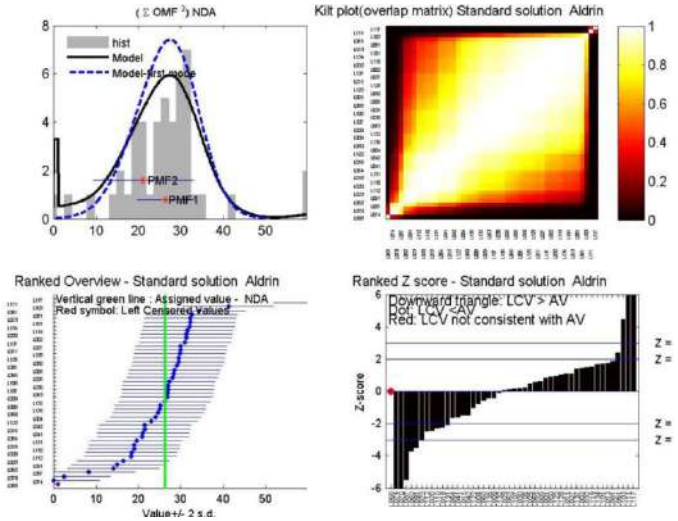


Participating Labs and Matrices



Data analyses

Cofino statistics*



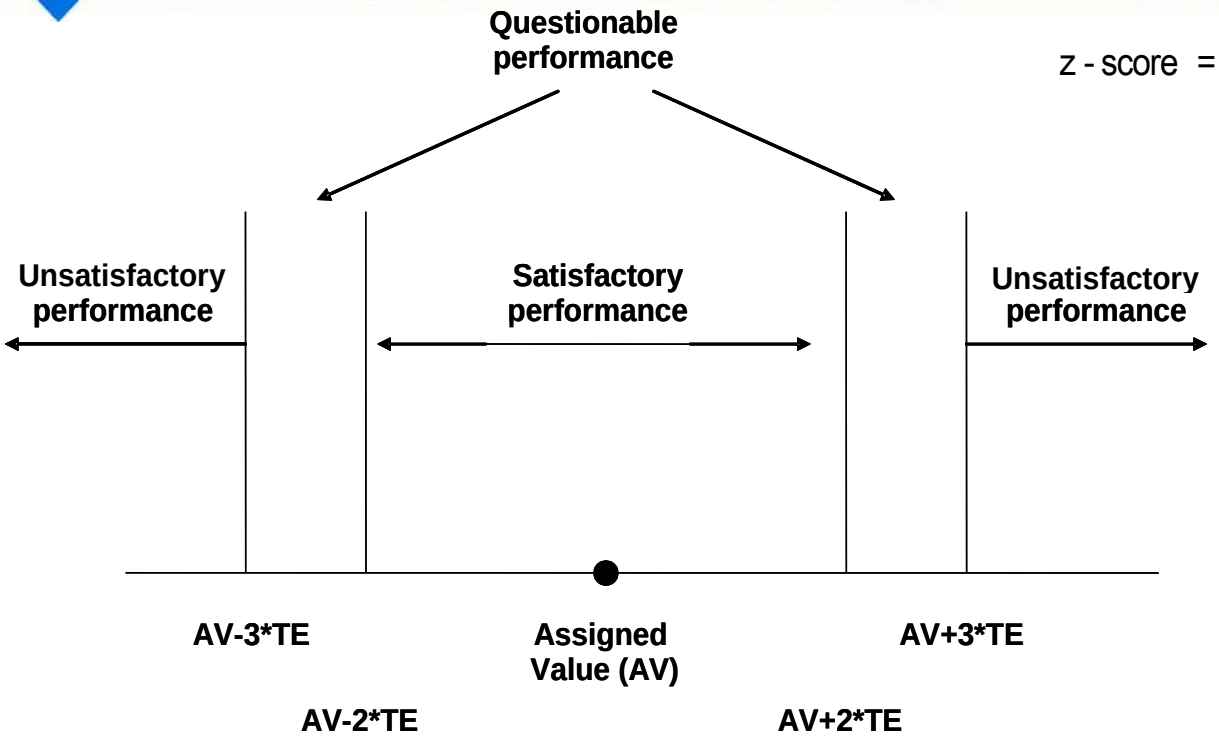
Calculating assigned values

Z-score assignment: →

- → |z| < 2 Satisfactory performance
- → 2 < |z| < 3 Questionable performance
- → |z| > 3 Unsatisfactory performance
- → |z| > 6 Extreme performance

*Cofino WP, Molenaar J, Torfs P (2017). Wiley StatsRef: Statistics reference Online, DOI: 10.1002/9781118445112.stat04068.pub2

Z-scores



TE : total error

$$z\text{-score} = \frac{\text{Mean from Laboratory} - \text{Assigned Value}}{\text{Total Error}}$$

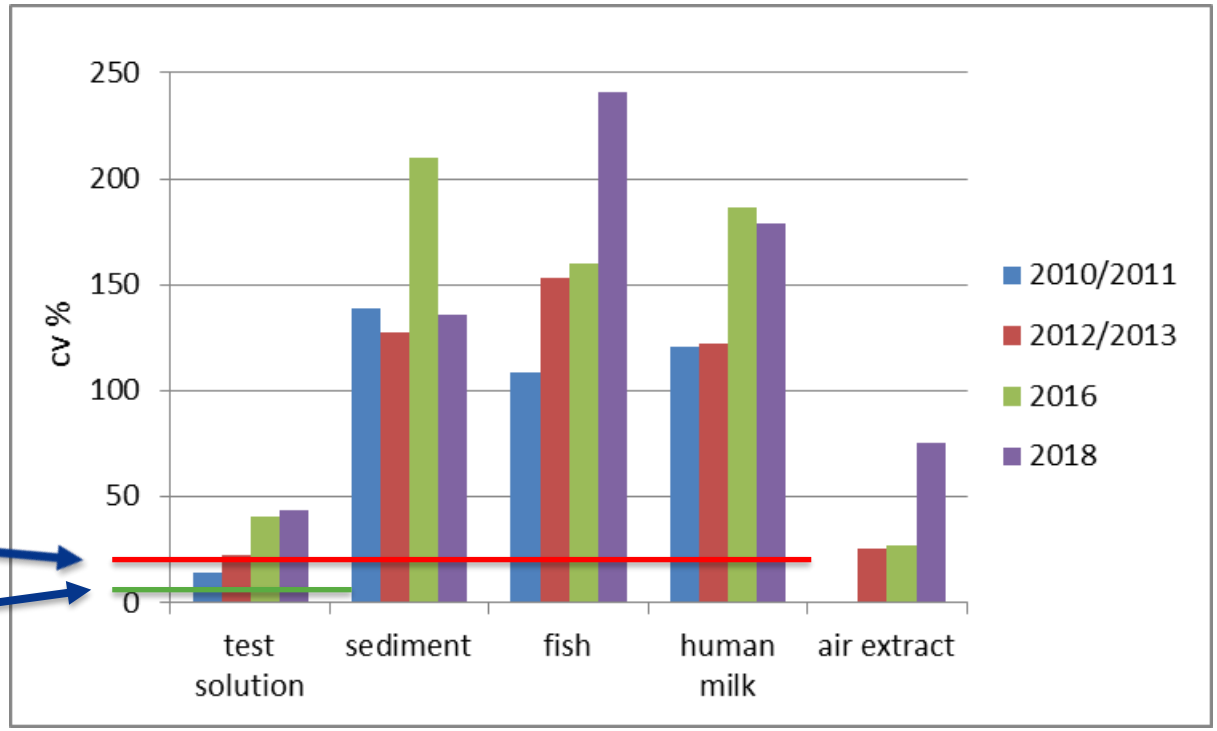
e.g. $\frac{25-50}{12.5} = -2$

- All data included
- No trimmed data
- No downweighting
- AV based on NDA mode
- All LCV values included

z score key:	**S – Satisfactory**	**Color code in Appendix IV**	S
	Q – Questionable		Q
	U – Unsatisfactory		U
LCV key:	**C – Consistent**		C
	I – Inconsistent		I
No data:	**B – Blank**		B

- NDA: Normal Distribution Assumption
- LCV: Left Censored Value
- AV: Assigned Value
- TE: Total Error

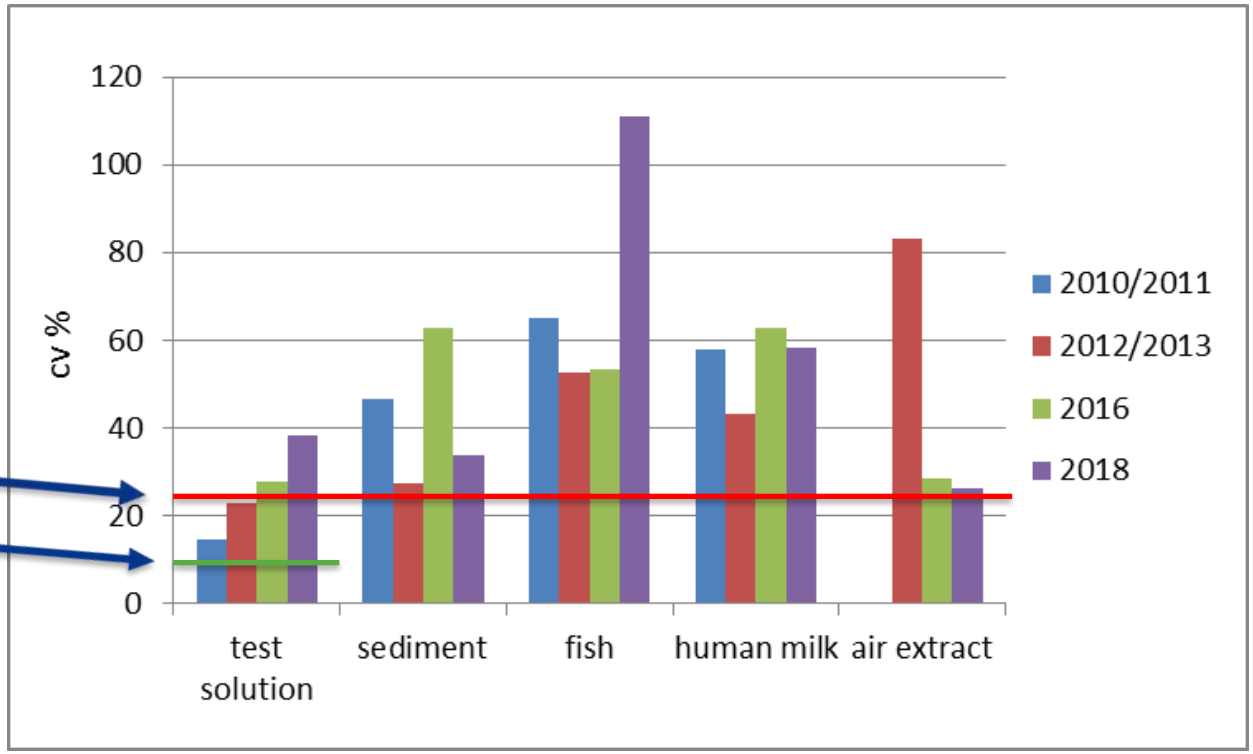
OCP results



Target envir.

Target St. Sol.

PCB results in four rounds



Individual lab PCB results sediment (GRULAC)

Region	WEOG	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC
Sediment	**L305**	**L043**	**L049**	**L060**	**L061**	**L062**	**L063**	**L065**	**L071**	**L072**	**L080**	**L083**	**L087**	**L094**	**L096**	**L102**
Indicator PCB																
PCB 28	NA	NA	NA	-2.97	NA	13.97	NA	2.06	NA	-0.29	NA	NA	NA	NA	NA	0.27
PCB 52	NA	NA	NA	-2.82	NA	-5.86	NA	2.75	NA	-0.49	1.36	NA	NA	NA	NA	0.76
PCB 101	NA	NA	NA	0.84	NA	-2.33	NA	1.10	NA	-0.40	1.10	NA	NA	NA	NA	2.76
PCB 138	NA	NA	NA	2.78	NA	NA	NA	0.92	NA	-0.55	2.39	NA	NA	NA	NA	7.58
PCB 153	NA	NA	NA	1.01	NA	-6.02	NA	0.86	NA	-0.93	1.89	NA	NA	NA	NA	2.04
PCB 180	NA	NA	NA	-0.56	NA	NA	NA	-1.06	NA	-0.41	2.09	NA	NA	NA	NA	3.73
Sum Indicator PCB Lower Bound (ND=0)	***NA***	***NA***	***NA***	***0.18***	***NA***	***-3.98***	***NA***	***0.84***	***NA***	***-0.66***	***0.70***	***NA***	***NA***	***NA***	***NA***	***3.14***
Sum Indicator PCB Upper Bound (ND=LOD)	***NA***	***NA***	***NA***	***0.14***	***NA***	***-3.80***	***NA***	***0.80***	***NA***	***-0.69***	***1.66***	***NA***	***NA***	***NA***	***NA***	***3.09***

Region	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC
Sediment	**L103**	**L161**	**L164**	**L176**	**L179**	**L182**	**L188**	**L189**	**L194**	**L215**	**L229**	**L238**	**L255**	**L260**	**L262**	**L263**
Indicator PCB																
PCB 28	NA	NA	NA	NA	NA	NA	NA	-2.14	NA	NA	NA	NA	-2.93	NA	NA	NA
PCB 52	NA	NA	15.60	NA	NA	NA	NA	3.25	NA	NA	NA	NA	-4.34	NA	NA	NA
PCB 101	NA	NA	NA	NA	NA	NA	NA	-5.72	NA	NA	NA	NA	-2.87	NA	NA	NA
PCB 138	NA	NA	NA	NA	NA	NA	NA	-0.80	NA	NA	NA	NA	-0.26	NA	NA	NA
PCB 153	NA	NA	6.61	NA	NA	NA	NA	-3.84	NA	NA	NA	NA	-3.12	NA	NA	NA
PCB 180	NA	NA	NA	NA	NA	NA	NA	-4.75	NA	NA	NA	NA	-2.27	NA	NA	NA
Sum Indicator PCB Lower Bound (ND=0)	***NA***	***NA***	***-1.69***	***NA***	***NA***	***NA***	***NA***	***-2.85***	***NA***	***NA***	***NA***	***NA***	***-2.56***	***NA***	***NA***	***NA***
Sum Indicator PCB Upper Bound (ND=LOD)	***NA***	***NA***	***6.25***	***NA***	***NA***	***NA***	***NA***	***-2.87***	***NA***	***NA***	***NA***	***NA***	***-2.58***	***NA***	***NA***	***NA***

Region	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	Africa	Africa	Africa	Africa	Africa	Africa	Africa	Africa	Africa	Africa
Sediment	**L264**	**L265**	**L267**	**L283**	**L292**	**L294**	**L052**	**L053**	**L056**	**L058**	**L067**	**L069**	**L074**	**L082**	**L086**	**L091**
Indicator PCB																
PCB 28	-1.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.33	NA	NA
PCB 52	-0.91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	28.42	NA	NA
PCB 101	-0.68	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-6.17	NA	NA
PCB 138	-1.49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-6.64	NA	NA
PCB 153	1.55	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	-6.57	NA	NA
PCB 180	2.64	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	15.13	NA	NA
Sum Indicator PCB Lower Bound (ND=0)	***0.13***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***1.66***	***NA***	***NA***
Sum Indicator PCB Upper Bound (ND=LOD)	***0.09***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***1.62***	***NA***	***NA***

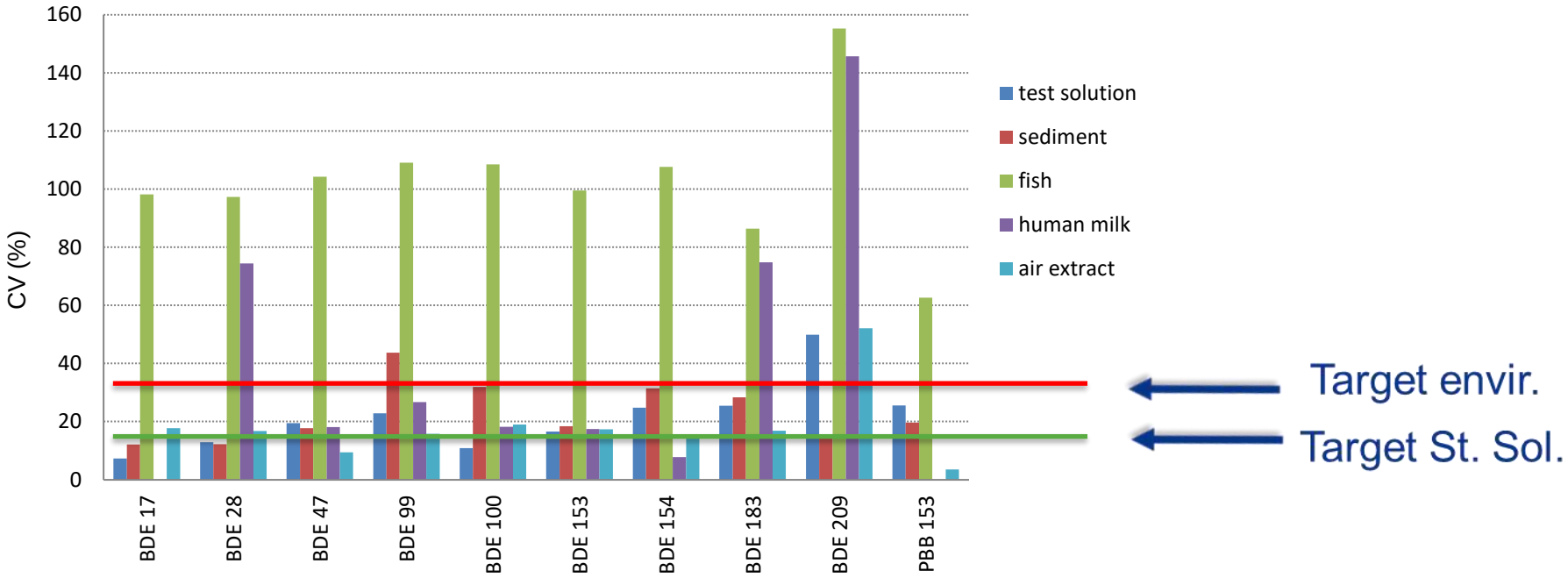
Individual Labs PCB results air extact (GRULAC)

Region	WEOG	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC
Air extract (TOL)	**L305**	**L043**	**L049**	**L060**	**L061**	**L062**	**L063**	**L065**	**L071**	**L072**	**L080**	**L083**	**L087**	**L094**	**L096**	**L102**
Indicator PCB																
PCB 28	NA	NA	NA	NA	NA	NA	NA	3.63	NA	-0.81	NA	NA	NA	NA	NA	1.08
PCB 52	NA	NA	NA	NA	NA	31.17	NA	1.06	NA	-0.33	NA	NA	NA	NA	NA	2.22
PCB 101	NA	NA	NA	NA	NA	51.39	NA	1.35	NA	-0.34	NA	NA	NA	NA	NA	4.52
PCB 138	NA	NA	NA	NA	NA	13.52	NA	1.58	NA	-0.54	NA	NA	NA	NA	NA	5.25
PCB 153	NA	NA	NA	NA	NA	20.66	NA	1.88	NA	-0.97	NA	NA	NA	NA	NA	5.79
PCB 180	NA	NA	NA	NA	NA	11.83	NA	1.15	NA	-0.05	NA	NA	NA	NA	NA	2.56
Sum Indicator PCB Lower Bound (ND=0)	***NA***	***NA***	***NA***	***NA***	***NA***	***21.61***	***NA***	***1.59***	***NA***	***-0.75***	***NA***	***NA***	***NA***	***NA***	***NA***	***3.45***
Sum Indicator PCB Upper Bound (ND=LOD)	***NA***	***NA***	***NA***	***NA***	***NA***	***21.59***	***NA***	***1.53***	***NA***	***-0.79***	***NA***	***NA***	***NA***	***NA***	***NA***	***3.38***

Region	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC
Air extract (TOL)	**L103**	**L161**	**L164**	**L176**	**L179**	**L182**	**L188**	**L189**	**L194**	**L215**	**L229**	**L238**	**L255**	**L260**	**L262**	**L263**
Indicator PCB																
PCB 28	NA	NA	1050.57	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 52	NA	NA	172.80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 101	NA	NA	1427.78	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 138	NA	NA	221.35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 153	NA	NA	912.55	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB 180	NA	NA	139.62	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sum Indicator PCB Lower Bound (ND=0)	***NA***	***NA***	***737.06***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***
Sum Indicator PCB Upper Bound (ND=LOD)	***NA***	***NA***	***732.66***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***

Region	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	GRULAC	Africa	Africa	Africa	Africa	Africa	Africa	Africa	Africa	Africa	Africa
Air extract (TOL)	**L264**	**L265**	**L267**	**L283**	**L292**	**L294**	**L052**	**L053**	**L056**	**L058**	**L067**	**L069**	**L074**	**L082**	**L086**	**L091**
Indicator PCB																
PCB 28	NA	NA	NA	NA	NA	NA	NA	0.96	NA	NA	NA	NA	NA	450.12	NA	-1.64
PCB 52	NA	NA	NA	NA	NA	NA	NA	0.40	NA	NA	NA	NA	NA	56.59	NA	-2.10
PCB 101	NA	NA	NA	NA	NA	NA	NA	-0.52	NA	NA	NA	NA	NA	33.05	NA	-0.12
PCB 138	NA	NA	NA	NA	NA	NA	NA	1.69	NA	NA	NA	NA	NA	221.69	NA	0.10
PCB 153	NA	NA	NA	NA	NA	NA	NA	0.74	NA	NA	NA	NA	NA	42.47	NA	1.76
PCB 180	NA	NA	NA	NA	NA	NA	NA	0.03	NA	NA	NA	NA	NA	445.66	NA	-5.54
Sum Indicator PCB Lower Bound (ND=0)	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***0.31***	***NA***	***NA***	***NA***	***NA***	***NA***	***179.21***	***NA***	***-1.04***
Sum Indicator PCB Upper Bound (ND=LOD)	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***NA***	***0.26***	***NA***	***NA***	***NA***	***NA***	***NA***	***178.10***	***NA***	***-1.08***

PBDE results



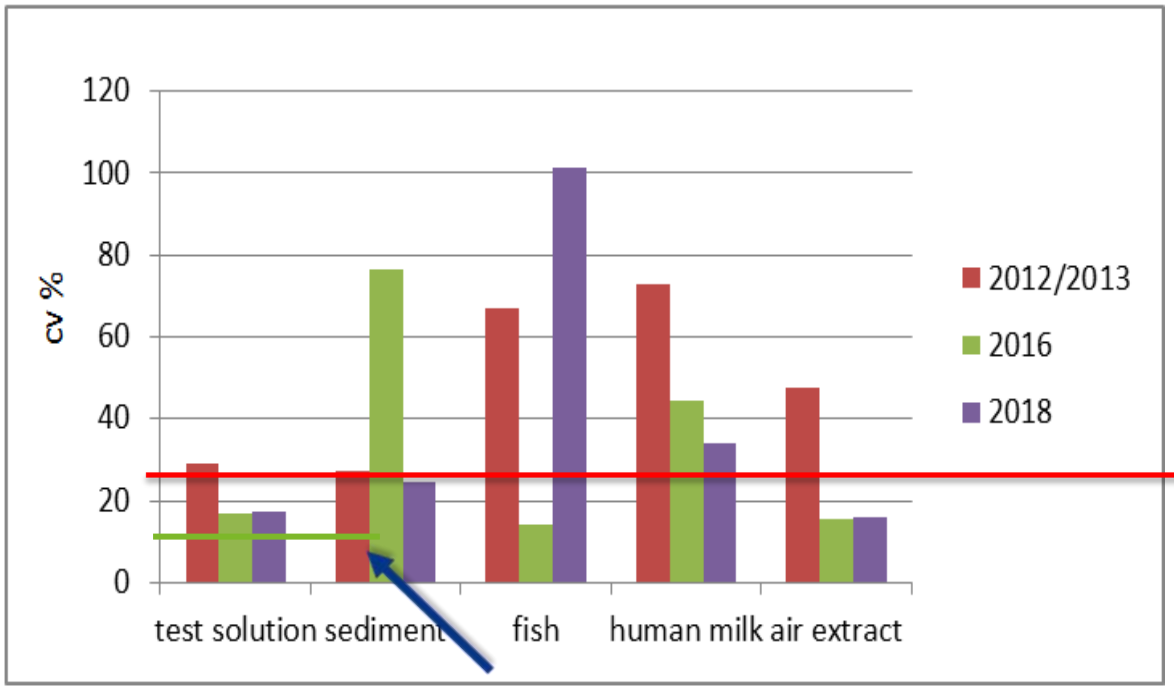
Trends

Trends in Analytical Chemistry, Vol. 25, No. 4, 2006

Pitfalls in the analysis of brominated flame retardants in environmental, human and food samples – including results of three international interlaboratory studies

Jacob de Boer, David E. Wells

PBDE results in last three ILSs

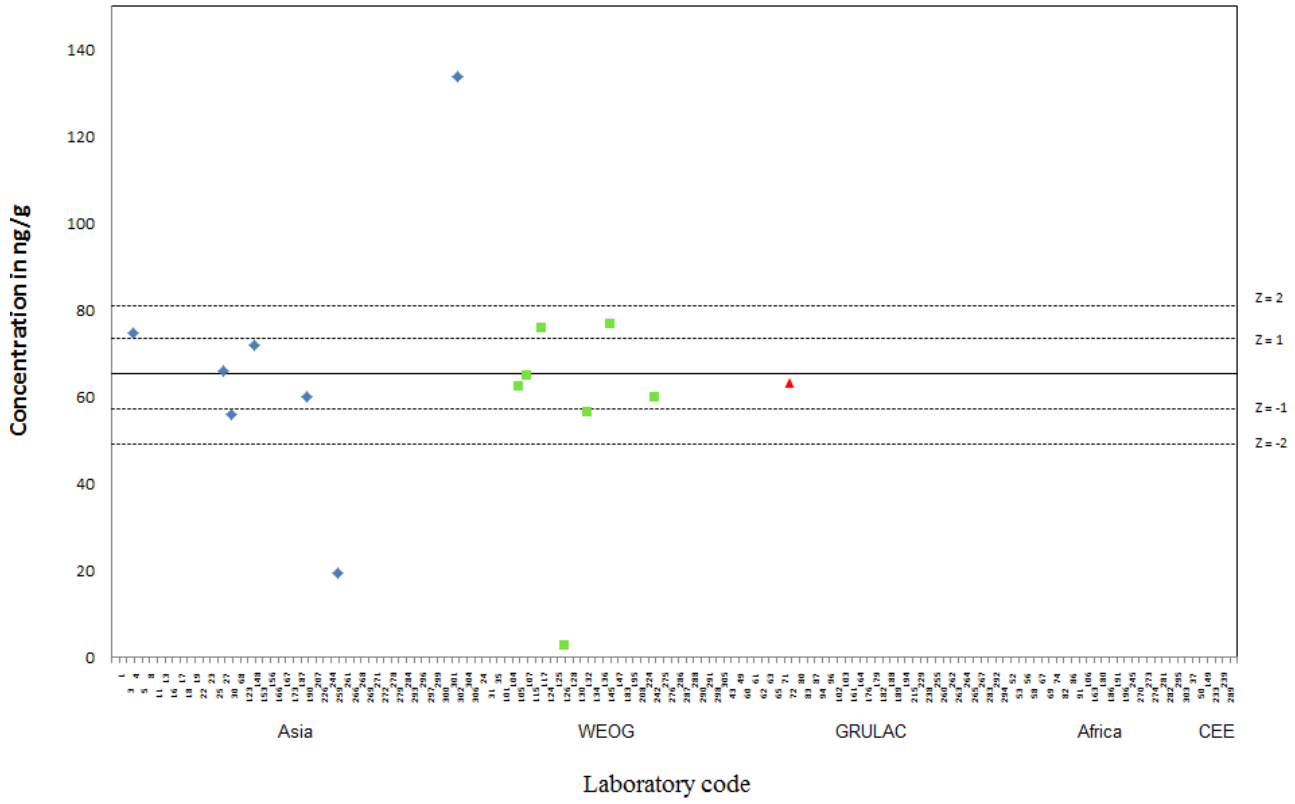


Target Test Solution

Target environ. samples

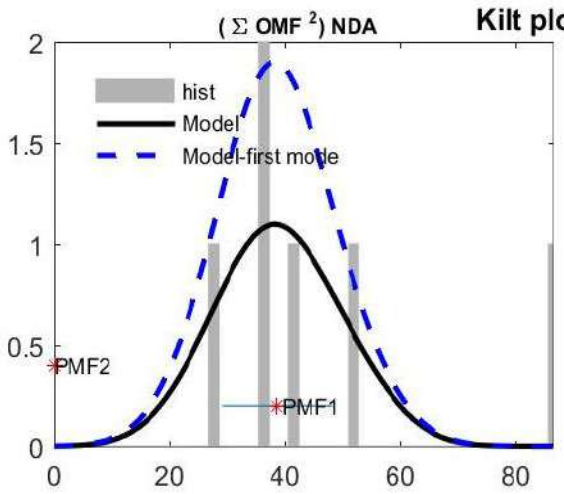
Results without BDE 209

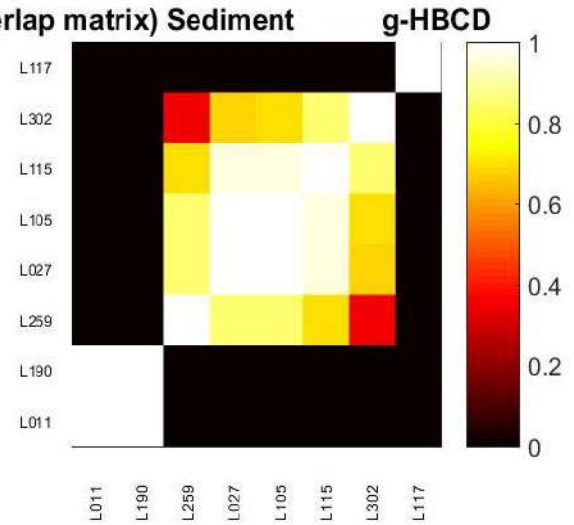
BDE209 in sediment

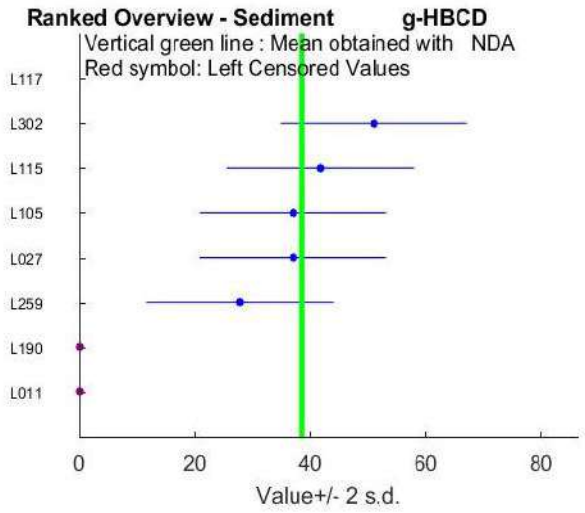


Asia
WEOG
GRULAC
Africa
CEE

HBCD: few results, good performance



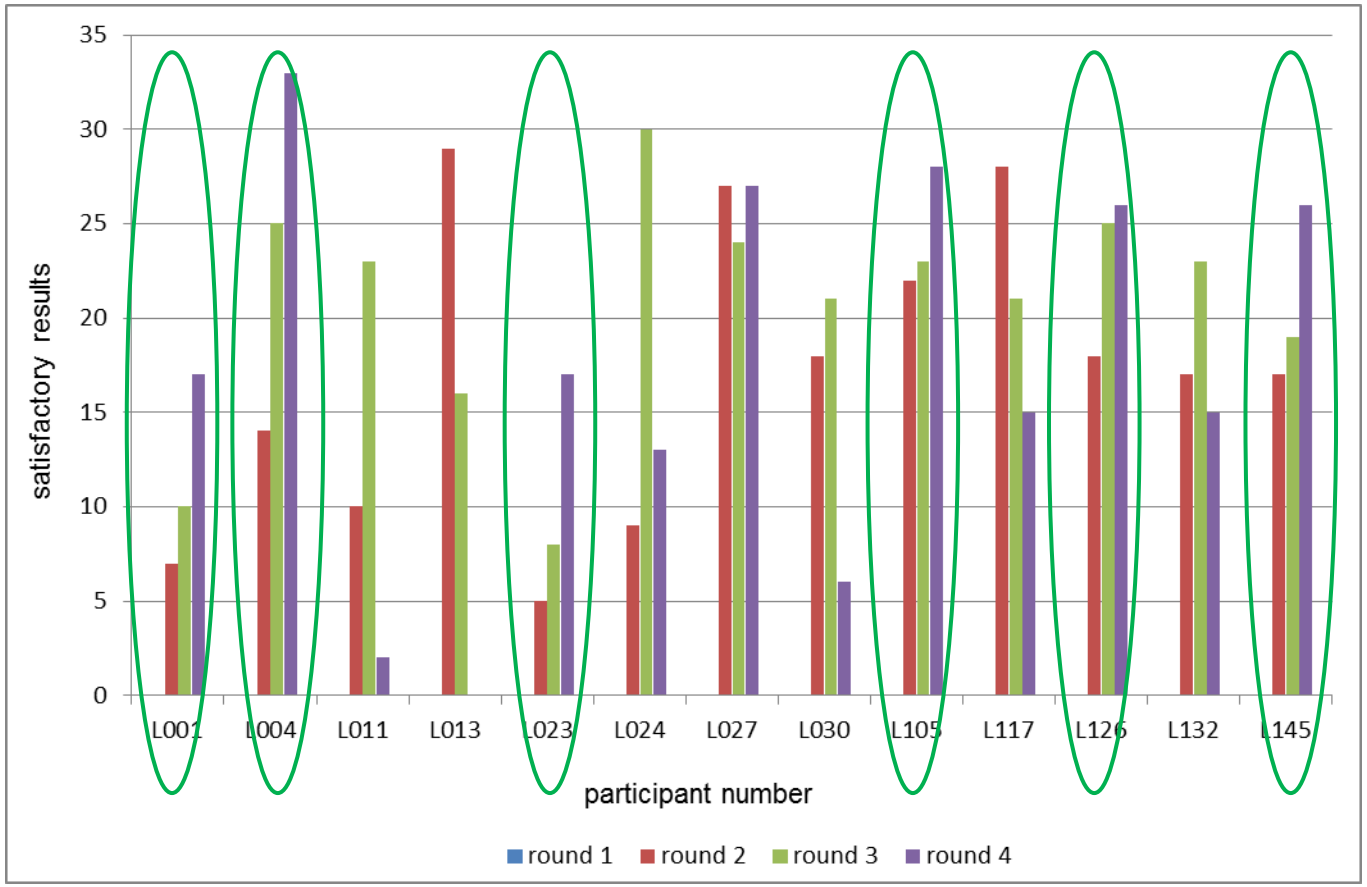




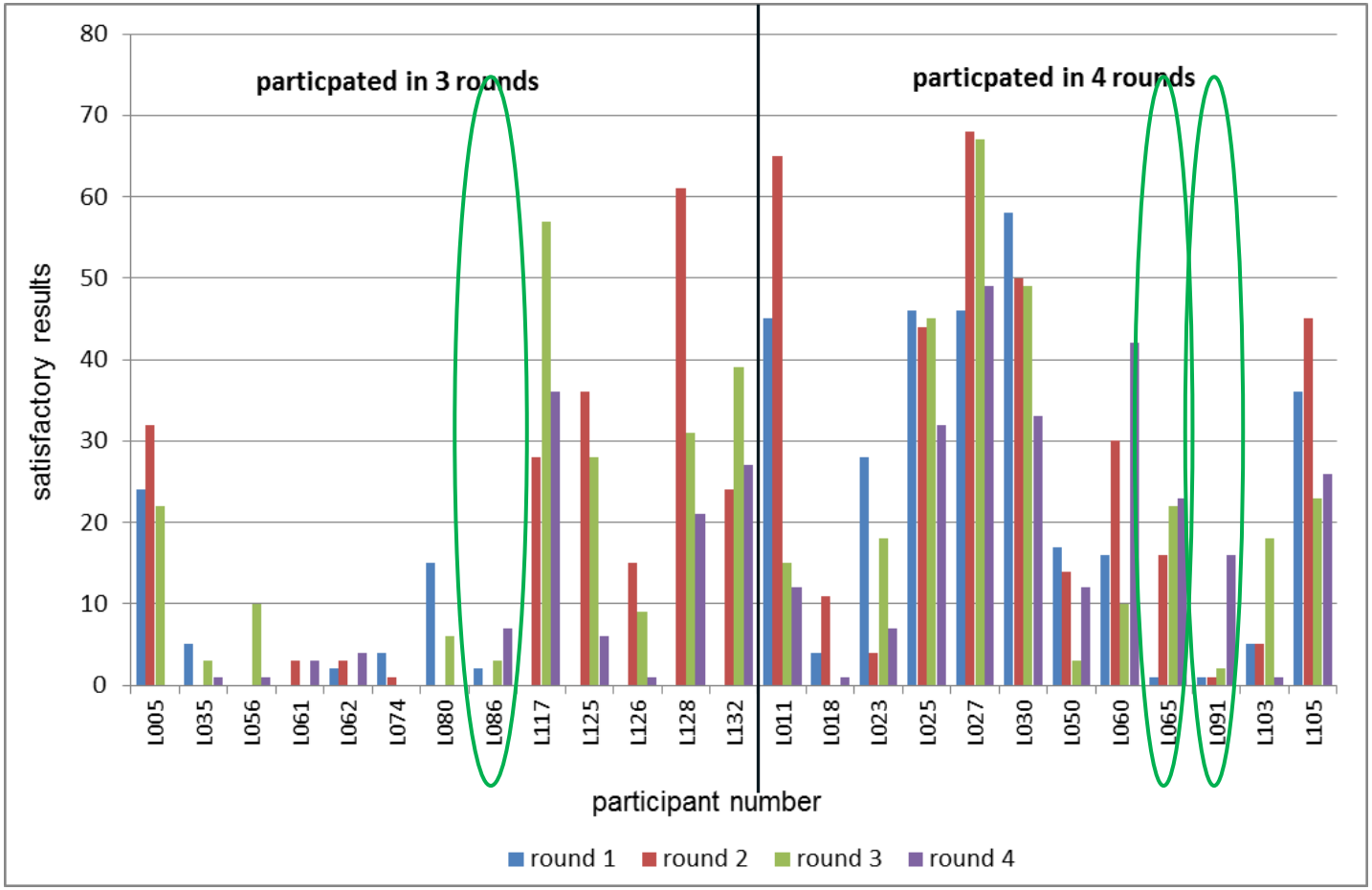
Category 2: No AV: 4,5 or 6 data

< 70% data with |Z|<3 and/or <5 data with |Z|<2

Interlab trends PBDE individual labs



Interlab trends OCPs individual labs



Conclusions

- PCB and particularly OCP remain on a low performance level
- **Without a regular program analyses**, and without having a QA/QC system in place, **results will not improve**
- Sensitivity in a number of laboratories was in insufficient to determine ndl-POPs in naturally contaminated fish
- PBDE results better than OCP and PCB results (CVs < 25%)
- Clean-up needs to be improved for reliable OCP values when using ECD
- **GC/MS with labeled standards is essential to make real progress**
- LC/MS and labeled standards are needed for HBCD and PFAS analysis

MUNI | RECETOX

Training activities carried by RECETOX in Africa during the GEF GMP2 project

Head of the National Centre for Toxic Compounds and of
the Stockholm Convention Regional Centre in the Czech Republic (SCRC)
RECETOX, Faculty of Science, Masaryk University, Brno, Czech Republic

Kateřina Šebková, Ph.D
katerina.sebkova@recetox.muni.cz

Final Meeting of the UNEP/GEF project "Support in the Implementation of the Global Monitoring Plan for Persistent Organic Pollutants (POPs) in the countries of the African Region ", Casablanca, Morocco, 28-30 November 2023

Mandate

- capacity building activities - training of laboratory experts in two countries in Africa
- as agreed in the Projet Steering Committee - training was to be done in 2017 to allow for participating in the “POPs Interlab” next round

Activities

- training agenda was prepared in a close collaboration with GMP coordinators in each country and on the basis of questionnaire filled by each country
- focus on both theory and practice, building on modules used in the RECETOX summer school, but adapted directly to the country/lab needs
- questionnaire for participants
- questionnaire for trainers

Training 1

- On sampling - we covered all core topics - air both passive and active sampling including sampler maintenance, storage and troubleshooting.
- A test sample by active sampler.
- In addition, standard operating procedures for sampling of air by passive samplers and active sampler were provided as well as training videos for sampling air and water were screened and provided to training participants on USB disks for later reference and use.
- Moreover, we sampled water in Nairobi and surroundings.

Training 1

- Laboratory analyses also consisted of the maintenance of the instrument, set up of a analytical method, calibration and validation of the method and experimental run-ups of test samples. In addition, a session was also dedicated to the evaluation of results and QA/QC procedures implementation. The greatest emphasis was placed on the introduction and validation of the method to analyze brominated POPs.
- Objective of the training was: advance the work to cover also PBDEs, work with GCMS-troubleshooting and operational maintenance, calibration and validation of methods

Challenges identified during the training

- Power outages every day that resulted in delay of extraction steps and validation of chromatographic method, as the analytical equipment had to be restarted several times. This situation is also not helping the stability of the chromatographic system and to the reproducibility of results.
- Consumables and spare parts for training and beyond were shipped prior the training via DHL, but it was very difficult to clear some boxes from the customs
- Purchase of laboratory/chemical materials - supported by UNEP project, list was filled and provided to MTM for further action past the training. The most pressing issue is availability of analytical standards.

Summary training 1

- **Kenya** 22-26 May 2017

- focus on active sampling, water sampling, air and water samples clean up by using Soxhlet extraction as well as SPE (solid phase extraction for water samples).
- significant portion of work devoted brominated flame retardant analysis and work with GC-MS its calibration, run of standard solutions and validation of a method for PBDE analysis. In addition, part of work was devoted to improvement in QA/QC management
- used also demonstration video materials (PAS air, water sampling), brought SOP for sample handling (PUF, also active sampler)
- total 5 days in English
- RECETOX delivered some spare parts for gas chromatography analyses, sample clean-up and spare chromatographic column.
- The result is 9 trained experts.

Training 2

- advance the work to cover pesticides and indicator PCBs, troubleshooting and operational maintenance of gas chromatograph, calibration and validation of methods and evaluation of results. Communication of methods to process biotic samples and verify the sampling techniques
- On sampling - hands on sampling of air and water as well as a thorough training in the laboratory including sample clean up, extraction, volume reduction and laboratory analyses.
- In addition, standard operating procedures for sampling of air by passive samplers and active sampler were provided as well as training videos (in French) for sampling air and water were screened and provided to training participants on USB disks for later reference and use.

Training 2

- thorough training in the laboratory including sample clean up, extraction, volume reduction and laboratory analyses
- Soxhlet extraction as well as SPE (solid phase extraction for water samples) and needs for sample transfers (quantitative) into the sampling vials
- a session was also dedicated to the evaluation of results and QA/QC procedures implementation.

Summary training 2

- **Morocco,** 20-24 November 2017

- focus on PCB and OCP analyses, equipment after a long “stand-by”.
- four institutions trained Laboratoire National des Etudes et de la Surveillance de l'environnement (LNESP), Rabat (hosting institution), Institut national de recherche haleutique (INRH), Casablanca, Institut national de hygiene (INH), Rabat, and Office National de l’Electricité et Eau Potable, branche de l’eau, ONEE-BO.
- used also demonstration video materials in French (PAS air, water sampling), brought SOP for sample handling
- Total 5 days, delivered in French.
- The result is 8 trained experts.

Summer schools for experts, policy makers and technicians

- June, 5 days, annually, since 2005 at RECETOX premises in Brno
- lectures and hands on in the laboratories
- scholarship to CEE region
- 2 modules
- 50 participants 15 countries

MUNI | RECETOX

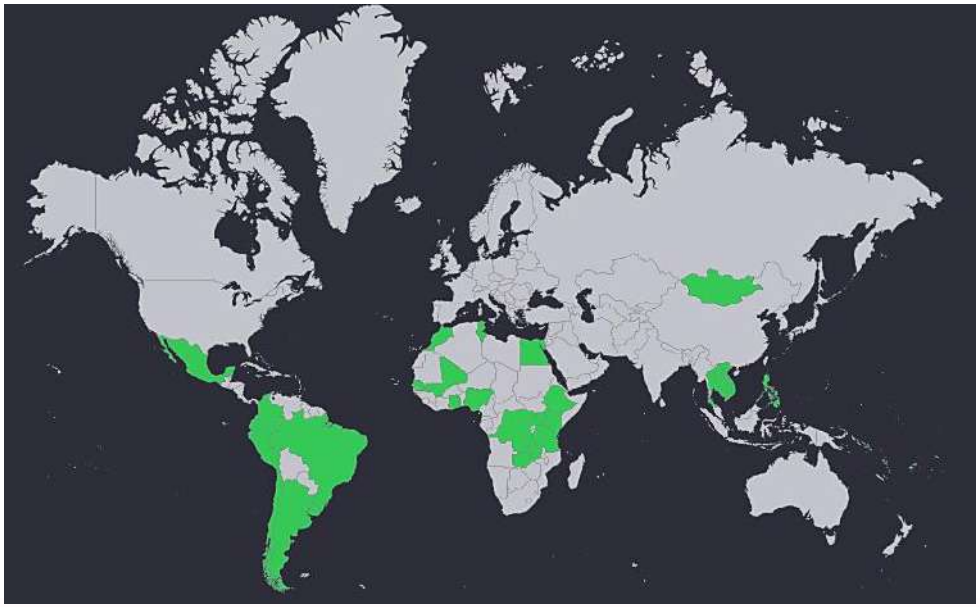
Summary of the RECETOX summer schools

- 5 day training, theoretical and practical exercise, sampling hands-on, and field trip to a sampling site in Košetice (background EMEP station)
- fee covering participation + accommodation
- Total more than 1000 participants over 19 years
- 35-60 participants in person
- since 2007 work with UNEP to support GMP implementation
- UNEP supported 85 participants over 9 years (2007-2015), all regions.
- Ministry of Environment Czech Republic supported 34 participants over 9 years predominantly CEE region (since 2010)
- in 2020, 2021 and 2022 online (Teams), free of charge
- topic changes every year

Final Meeting of the UNEP/GEF projects

"Final Meeting of the UNEP/GEF project "Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in African Region"

Dr. Esteban Abad, Dr. Manuela Ábalos
Laboratory of Dioxins, IDAEA-CSIC



Casablanca, Morocco 27-30 November 2023

Final Meeting of the UNEP/GEF projects

Final Meeting of the UNEP/GEF project “Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in Africa Region”

GRULAC Region

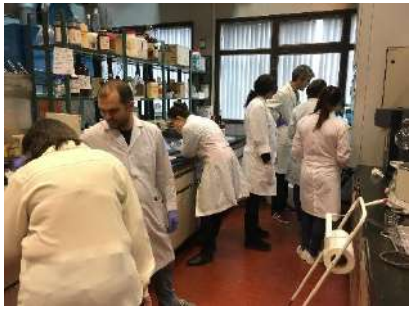
The journey from 2016:

Training Capacity Building
Procurements
POPs Survey in core matrices
National Samples

GMP2 GRULAC Virtual Meeting on Analytical Results of POPs in Air and Water

Training and Capacity Building – 10 countries, around 100 people instructed

Antigua and Barbuda



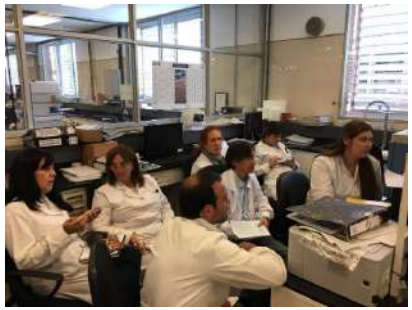
Argentina

Barbados

Brazil

Colombia

Jamaica



Uruguay

Ecuador, Chile and Peru

On-line training

GMP2 GRULAC Virtual Meeting on Analytical Results of POPs in Air and Water

Sampling: 2 years, 8 campaigns, 400 PUFs, 12 PAS, more than 5,000 data of POPs in AIR in GRULAC

Antigua and Barbuda

Argentina

Barbados

Brazil

Chile

Colombia

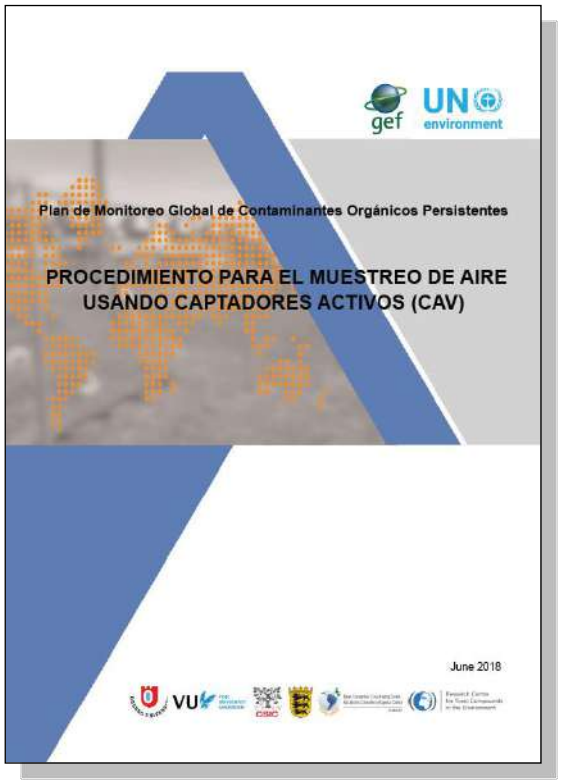
Ecuador

Jamaica

Mexico

Uruguay

Collecting Ambient Air Samples by High Volume Sampling Device



https://wedocs.unep.org/bitstream/handle/20.500.11822/27634/ActSamplSOP.pdf?sequence=1&isAllowed=y

Collecting Ambient Air Samples by High Volume Sampling Device

Video

https://youtu.be/S0OtiboWuzE

COLLECTING AMBIENT AIR SAMPLES BY HIGH VOLUM SAMPLING DEVICE

Three Different Regions

Brazil

COLLECTING AMBIENT AIR SAMPLES BY HIGH VOLUM SAMPLING DEVICE

Three Different Regions

Mongolia – September 2019

Some testing before sampling episodes

COLLECTING AMBIENT AIR SAMPLES BY HIGH VOLUM SAMPLING DEVICE

Three Different Regions

Mauritius – January 2020

ANALYSIS OF POPs IN PUFs – PCDD/Fs, PCBs, PBDEs,…

Four videos available with subtitles in Spanish, French and English

Youtube

On behalf of all the CSIC team:

Thanks for your attention

Basel Convention Coordinating Centre
Stockholm Convention Regional Centre
URUGUAY

Basel Convention Coordinating Centre Stockholm Convention Regional Centre Uruguay

DATA HANDLING and MANAGEMENT

Final Meeting of the UNEP/GEF project "Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in African Region"

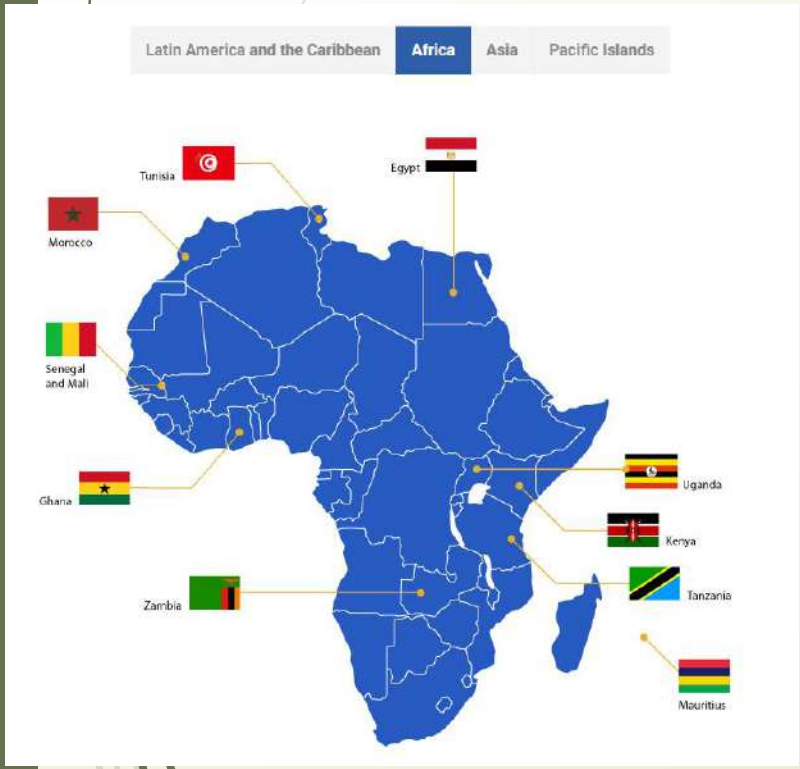
November 28th – 30th, 2023

Virginia Santana
BCCC-SCRC Technical Assistant

Ministerio de Ambiente

LATU

SUMMURY



- Who are we? What do we do?
- POPs expertise and GMP in GRULAC
- "T**OOLBOX**" (with guides/manuals, infographics, awareness materials... recorded courses/explanatory videos of SOP...).
- **Capacity building on Data Handling and Management**
- **Study cases**

Basel Convention Coordinating Centre for Training and Technology Transfer for Latin America and the Caribbean Region (1998) - Stockholm Convention Regional Centre for Latin America and the Caribbean Region (2009), hosted in Uruguay.

Mission and vision

- Promote information exchange and capacity development.
- Promote capacity building.
- Development of communication materials and technical reports related to the Stockholm Convention and MEAs.

NETWORK - SOLUTIONS ADAPTED

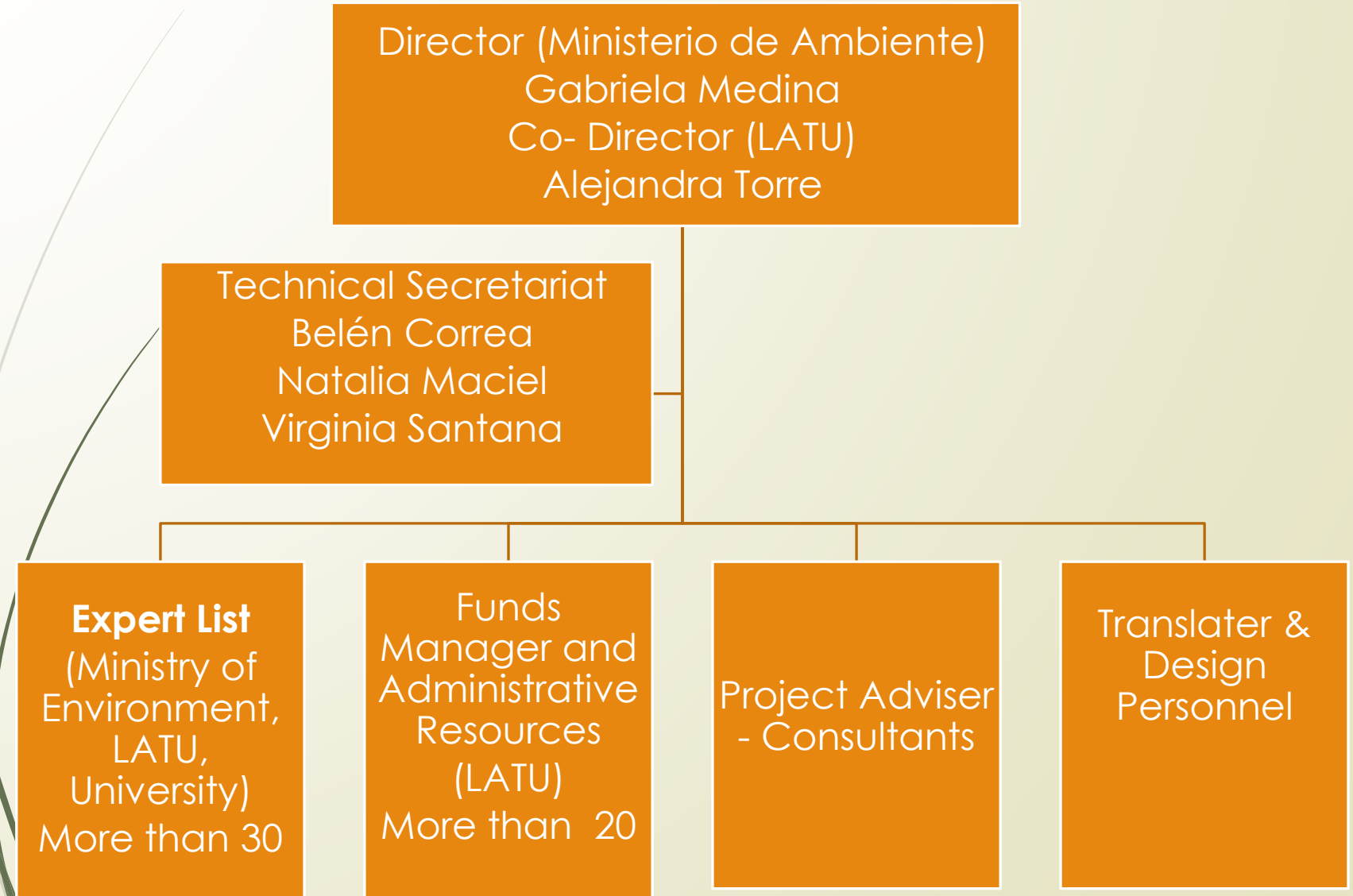
All activities contribute to the search for solutions adapted to the participating countries, strengthening national/regional capacities, using tools provided by the Chemicals Conventions cluster and other forums, facilitating the dissemination of knowledge and the implementation of success stories and lessons learned (the center tries to be like a kind of compass to help find the tools)

The Center, given its "impartial or pro-common good" character, will continue to facilitate the formation of **networks**, the multi-sector approach and technical communication between the different actors

Facilities

The Centre is entitled to enter into agreements through the LATU and has access to its administrative services, which enables the Centre to make any kind of acquisitions and contracts. It also has a special office for managing of funds, allowing the required transparency,

Organizational chart



SUMMARY PROJECT-ACTIVITIES

POPs expertise

Regional Workshop for the Evaluation of Existing and Necessary Capacities for the Analysis of POPs

GMP I project

GMP II project

Data Managment

2005

2006

2009

2012

2015

2020

2021

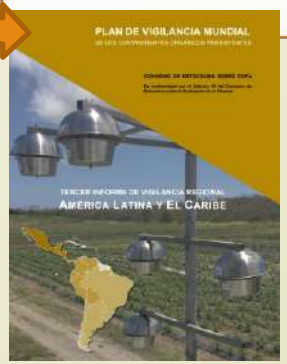
2023

LATU
Pilot laboratory

Member ROG - GCC

Support to the 3th ROG regional report

POPs trainig on plastic



The Minamata Convention on Mercury and its implementation in the Latin American and Caribbean Region

Mercury is recognized as a chemical of global concern due to its long-range transport in the atmosphere, its persistence in the environment, its ability to bioaccumulate in ecosystems and its negative effect on human health and the environment.

Mercury can produce a range of adverse human health effects, including permanent damage to the nervous system, particularly the developing nervous system. Because of these effects, and also because mercury can be transferred from a mother to her child during pregnancy, infants, children and pregnant women are considered the most vulnerable populations.

MERCURY PROJECTS

- Development of Minamata Initial Assessment in Cuba
- Minimization and environmentally sound management of mercury containing waste in Latin America and Caribbean countries
- Mercury storage and disposal LAC two countries project
- Rational management of mercury-containing products
- Ratification and early implementation of the Minamata Convention on Mercury in Uruguay.
- Environmentally Sound Life Cycle Management of Mercury-Containing Products and their Wastes
- Development of mercury risk management approaches in Latin America
- Development of Minamata Initial Assessment in LAC

GMP2 in GRULAC

11 countries

All the objectives proposed by the project have been achieved.

Addition activities:

- **analyses of POPs that were not foreseen were carried out, for example, short-chain chlorinated paraffins (SCCPs) in breast milk**
- **training in POP analysis in plastics** and other on-line training.
- PFAS in plastic samples

Great challenge, communicating data... awareness raising to decision makers and the community to promote changes in agricultural practices, consumption patterns...

LESSONS LEARNED

COMMUNICATION

Dissemination of results through the implementation of simple actions focused on the prevention of harm to human health official communications from UNEP and WHO on sensitive issues, such as breast milk sampling and POPs in food.

Non-COP "the" day - SC anniversary can be used

Requiring labeling of products containing POPs

Maintain active laboratory database

INSTITUTIONAL

Maintaining and improving POPs analysis capacity in the countries to keep up with new SC requirements requires funds, time and perseverance..

To achieve long-term sustainability, the participation of more than one institution in sampling and analysis may be considered to contribute to data generation.

Establish a set of tools, a KIT to develop long-term POPs monitoring plans, with scenarios, inaction costs, locate sources, analyze trends, definition of follow-up lines. monitoring lines..

FOR THE PREVENTION OF SUBSTITUTIONS/REPLACEMENTS WITH OTHER CHEMICALS AS HARMFUL OR POTENTIALLY WORSE THAN THE CURRENTLY LISTED POPS, IT IS ESSENTIAL AND CROSS-CUTTING TO POTENTIALLY WORSE THAN THE CURRENTLY LISTED POPS, THE COMMITMENT OF ALL PARTIES, ESPECIALLY INDUSTRY AND THE COMMITMENT OF ALL PARTIES, ESPECIALLY INDUSTRY AND THE SCIENTIFIC COMMUNITY, IS ESSENTIAL AND CROSS-CUTTING.

LEGALS

Regulations are required for the control of POPs in products.
control of POPs in products. Establishment of labeling.

To generate institutionalism, it is suggested that each country establish a "mandatory" requirement for certain institutions to conduct periodic POPs analyses, expand and update existing information on production, use and inventory of POPs releases at the national level, linking monitoring data, NIP updates and national reports required by the Stockholm Convention.

Implementation of programs and methodologies for the management of POPs contaminated sites and additional preventive measures.

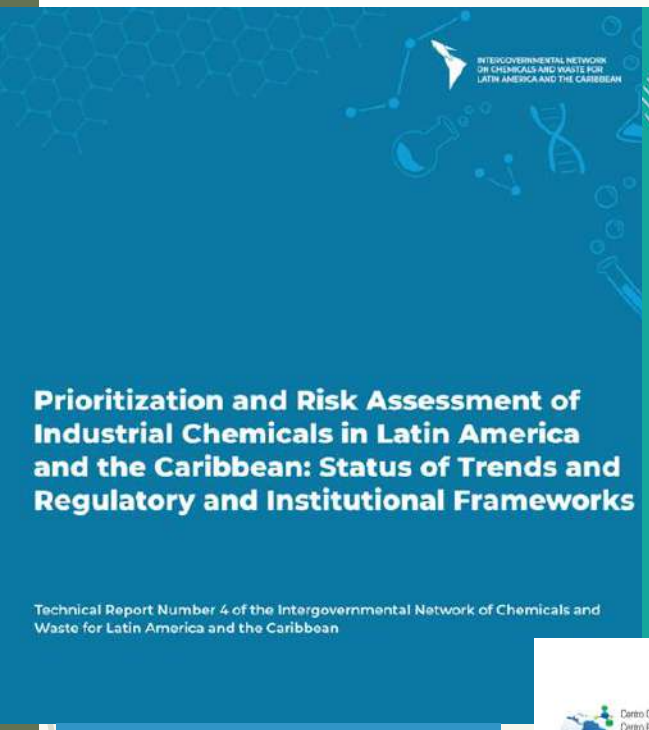
TECHNICAL

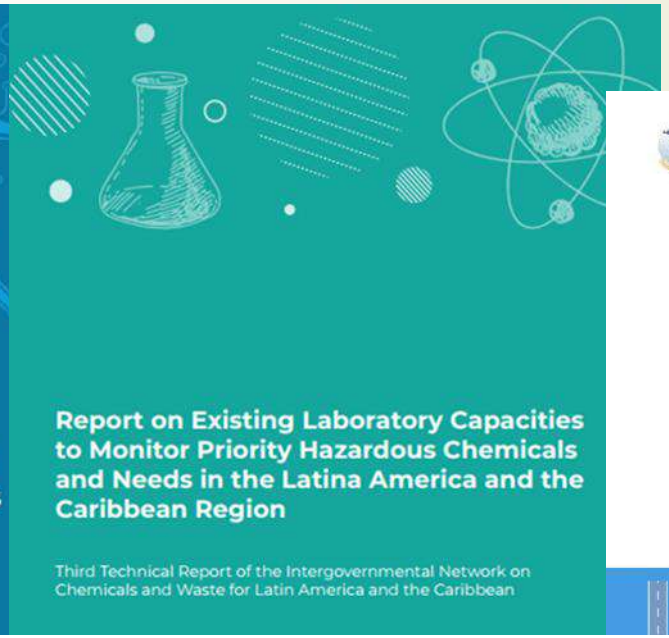
Standardize/agree on measurement techniques to measure POPs in products.

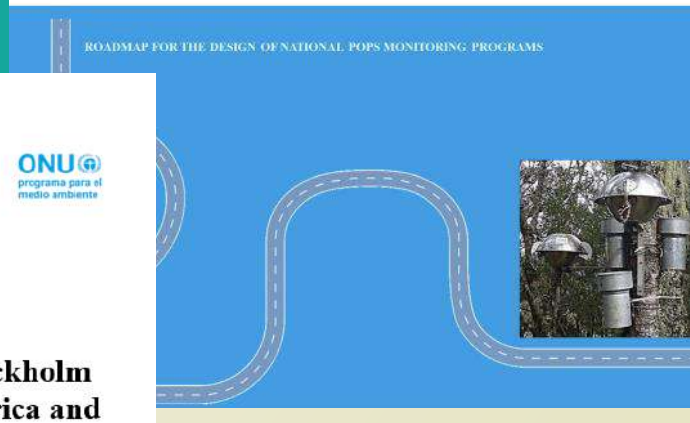
Encourage continuity in the analysis of samples and promote the integration of data to draw conclusions, compare results and trends.

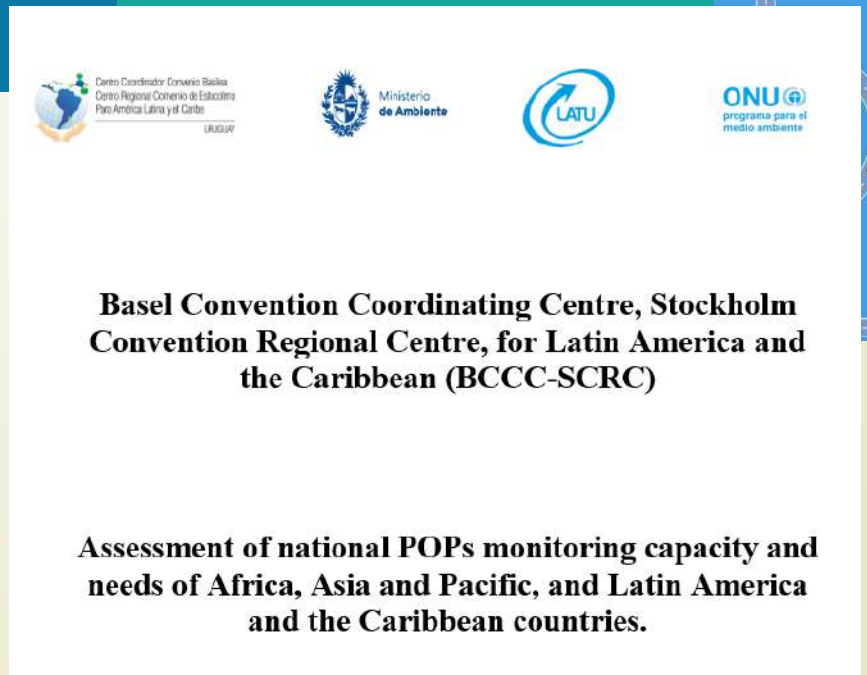
Roadmap for monitoring POPs at the regional level, understood as a set of tools for establishing long-term plans, with scenarios, inaction costs, locating sources, analyzing trends, defining follow-up lines (the Stockholm Convention should suggest the requirements and minimum periodicity for sampling in the different matrices and of the different POPs), etc.

TOOLBOX - guidance documents and assessment





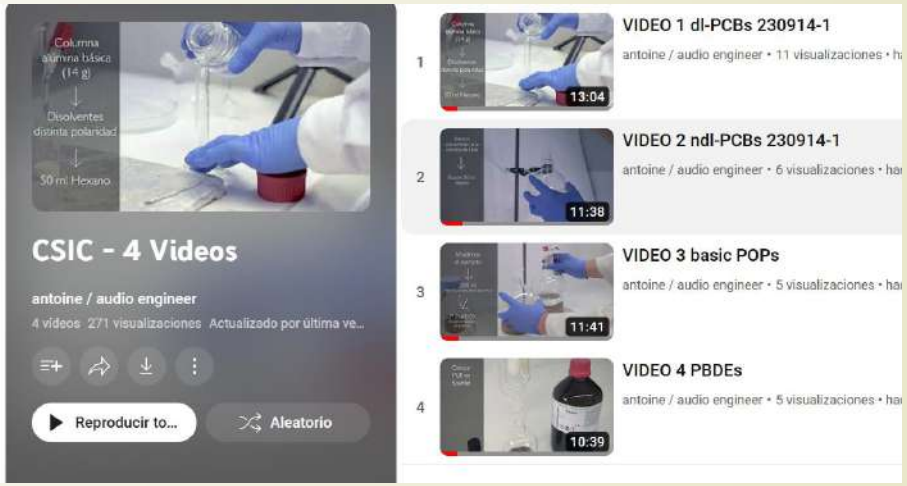




TOOLBOX - TRAINING

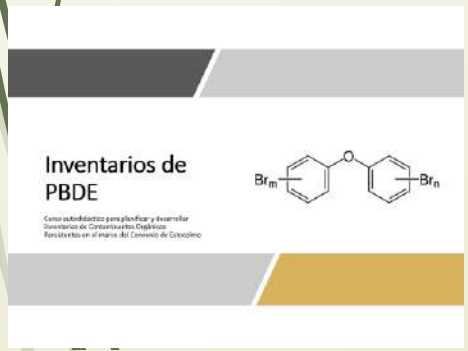
3 LANGUAGES

- **SOPs**
- **Human milk video**
- **POPs analisys videos**
- **Self-paced course on data interpretation**
- self-study courses in PBDE and HBCD based on available guidance documents

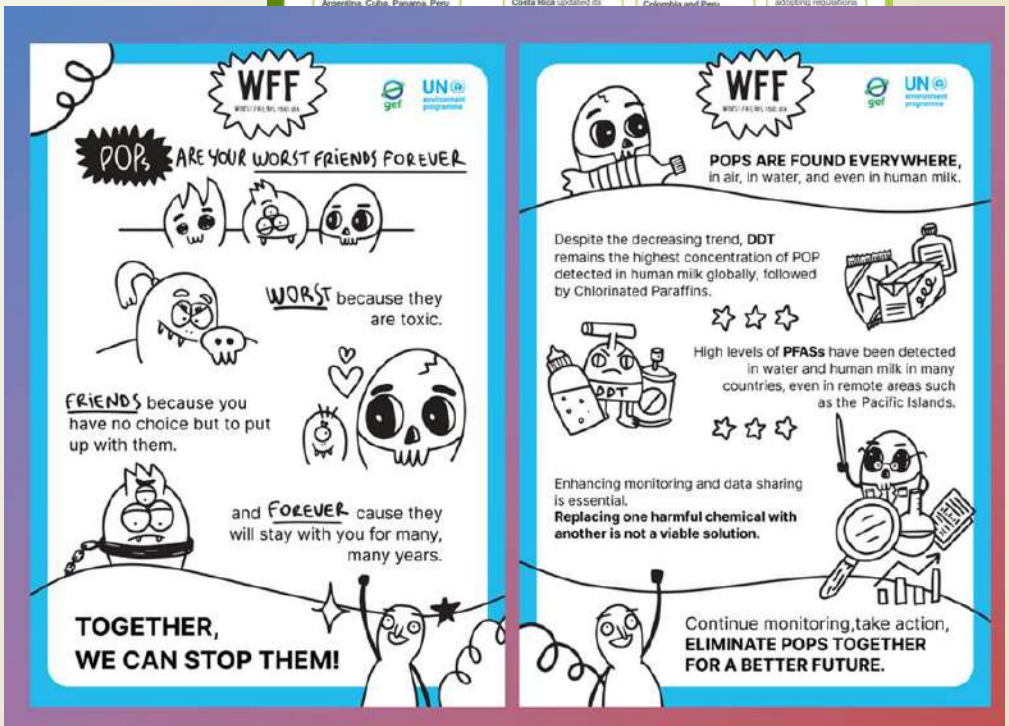


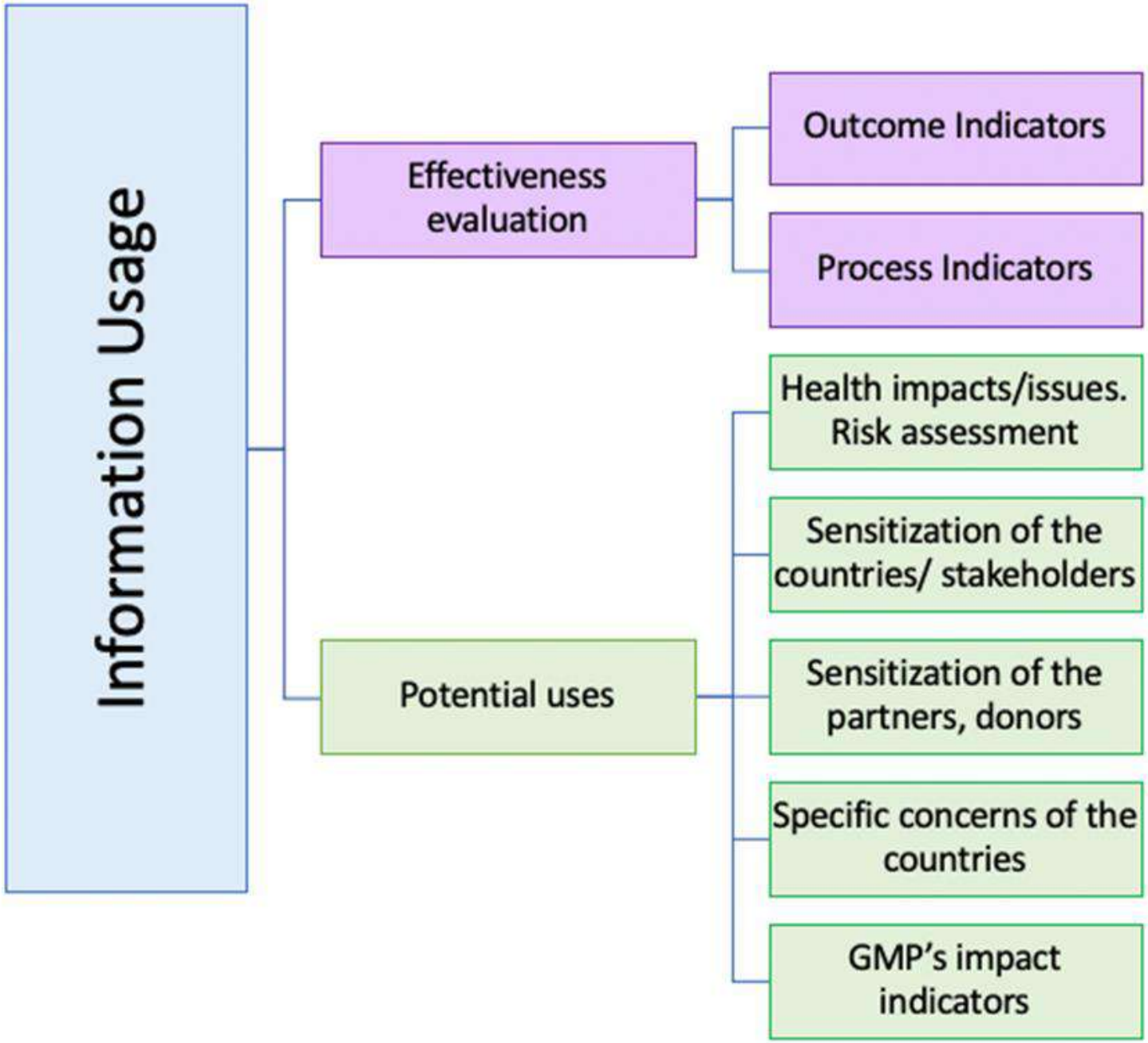
Efforts have been made to create documents and courses **that transcend time**, we are working to encourage their use.

Efforts made in training and tools created to facilitate the reporting, for example integrated electronic toolbox of articles 7 and 15 . Theoretical-practical course "**National Inventory and Environmentally Sound Management of the new Persistent Organic Compounds and Mercury** - January 2022.

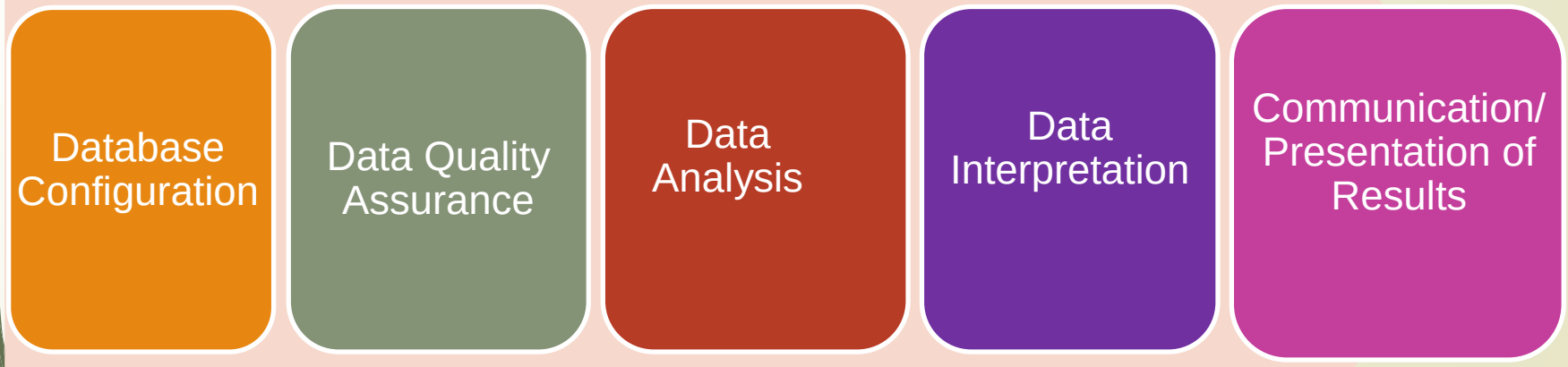


TOOLBOX COMUNICATIONS




Information Usage
Effectiveness evaluation
Outcome Indicators
Process Indicators
Potential uses
Health impacts/issues. Risk assessment
Sensitization of the countries/ stakeholders
Sensitization of the partners, donors
Specific concerns of the countries
GMP's impact indicators

Data Handling process



Data Handling and management

- Guide for managing regional COP data, has data from the region and examples (E and S)
- Virtual Trainings (E and S)

Pacific Island:

- Individual tutorial
- Guidance to the national implementation team

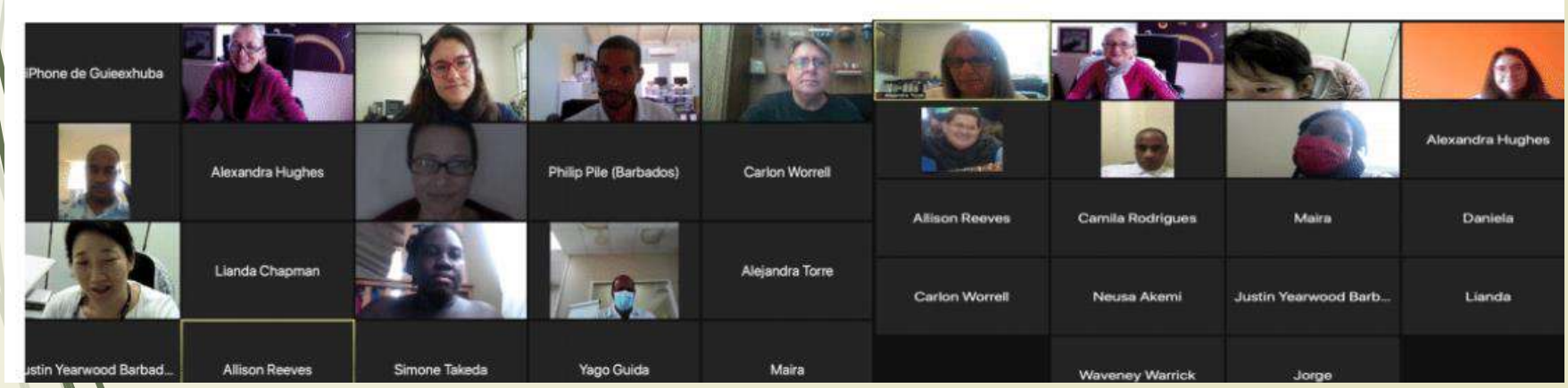
Training courses POPs Data Handling

The virtual practical- theoretical course was held through zoom platform in English and Spanish (total time 15 hours).

The practices were using the POPs data on GMP DWH (Data Warehouse)

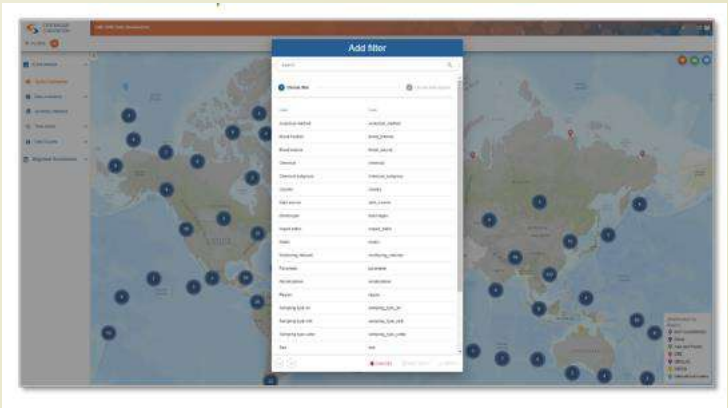
For English speakers (Brazil and Caribbean): 6 instances. (August 31, September 2, 7, 9, 14 and 16, 2021), 23 participants attended the course.

For Spanish speakers: 6 instances (August 3,5, 6, 11 and 12, August 2021), 56 participants attended the course.



Training courses POPs Data Handling (results)

- All participants were satisfied.
- They worked with their own Country data, understanding it and comparing it at regional and global level.
- Using a simple and accessible database (excel).



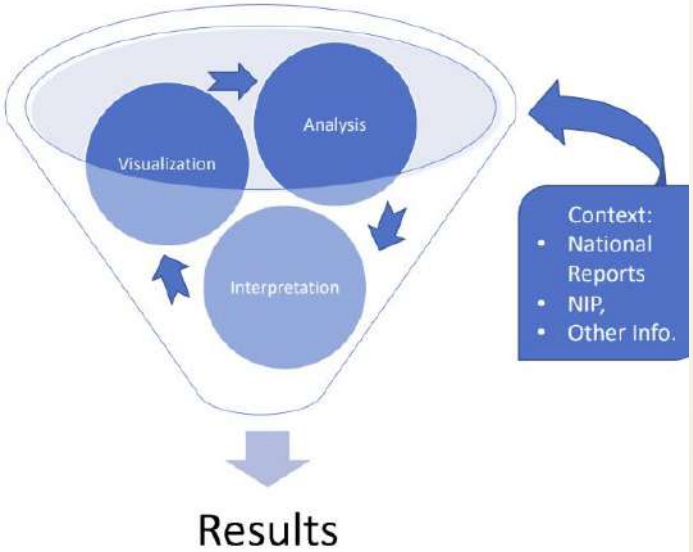
Self-paced course on **data interpretation**

A training course on the interpretation of POPs monitoring data was designed to support national decision-making, including the updating and presentation of NIPs.

The course content is in 3 languages (Spanish, English and French). The course will be available online.

The interpretation of the data includes the following:

- **Meaning of data interpretation**
- **Methods of interpretation of data**
- **Data Interpretation Process**
- **Dynamics of data interpretation process**
- **Recommended steps for data interpretation**
- **The use of POPs information**



Meaning of data interpretation

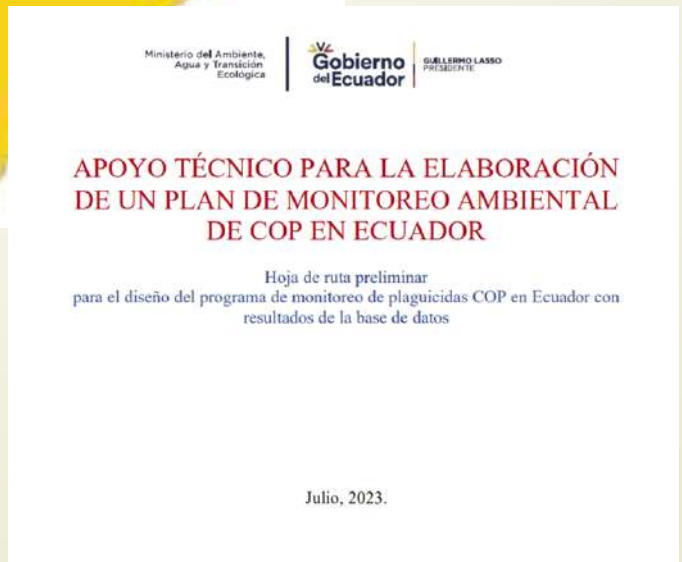
- Data interpretation gives meaning to the information analyzed and determines its significance and implications.
- Data interpretation is intended to help people make sense of the numerical data that have been collected, analyzed, and presented.
- In interpreting data, an analyst must attempt to discern differences between correlation, causation, and coincidence, as well as many other biases, but also must consider all the factors involved that may have led to a result, the context.

CASE STUDY: Technical support was provided for the diagnosis and development of a proposed monitoring program in Ecuador and Mexico.

COUNTRY'S PROFILE

- Evaluation of all POPs data.
- Evaluate where POPs come from to provide a solution (local or global).
- Population health data.
- Allows establishing priorities for action.

ECUADOR - Draft roadmap



- It focuses on problems found in the country's profile.
- Directed monitoring to measure the effectiveness of actions.
- Environmental management more focused on problems.

ECUADOR – Draft roadmap

The methodology used to develop the roadmap is the one proposed in the document: "Roadmap for the Design of National POPs Monitoring Programs" (Martinez y Manuweera, 2023) wich is based on the EPA Guidance QA/G-4 of 2006 (Guidance on Systematic Planning Using the Data Quality Objectives Process).

A monitoring program is made up of three phases linked to a quality assurance and control system:

1) Program planning includes the design of it.
2) Implementation.
3) Evaluation.

Fuente: Martinez y Manuweera, 2023.

REMEMBER

- Some materials are available on the center's website and from UNEP.
- Others are in the process of being uploaded to the center's website (editing, translation...)
- **If you are interested in any of these, write to us.**
- **It will be an honor to help you.**

Thank you, Merci, gracias!!

http://www.ccbasilea-crestocolmo.org.uy

Basel Convention Coordinating Centre
Stockholm Convention Regional Centre

URUGUAY

LATU

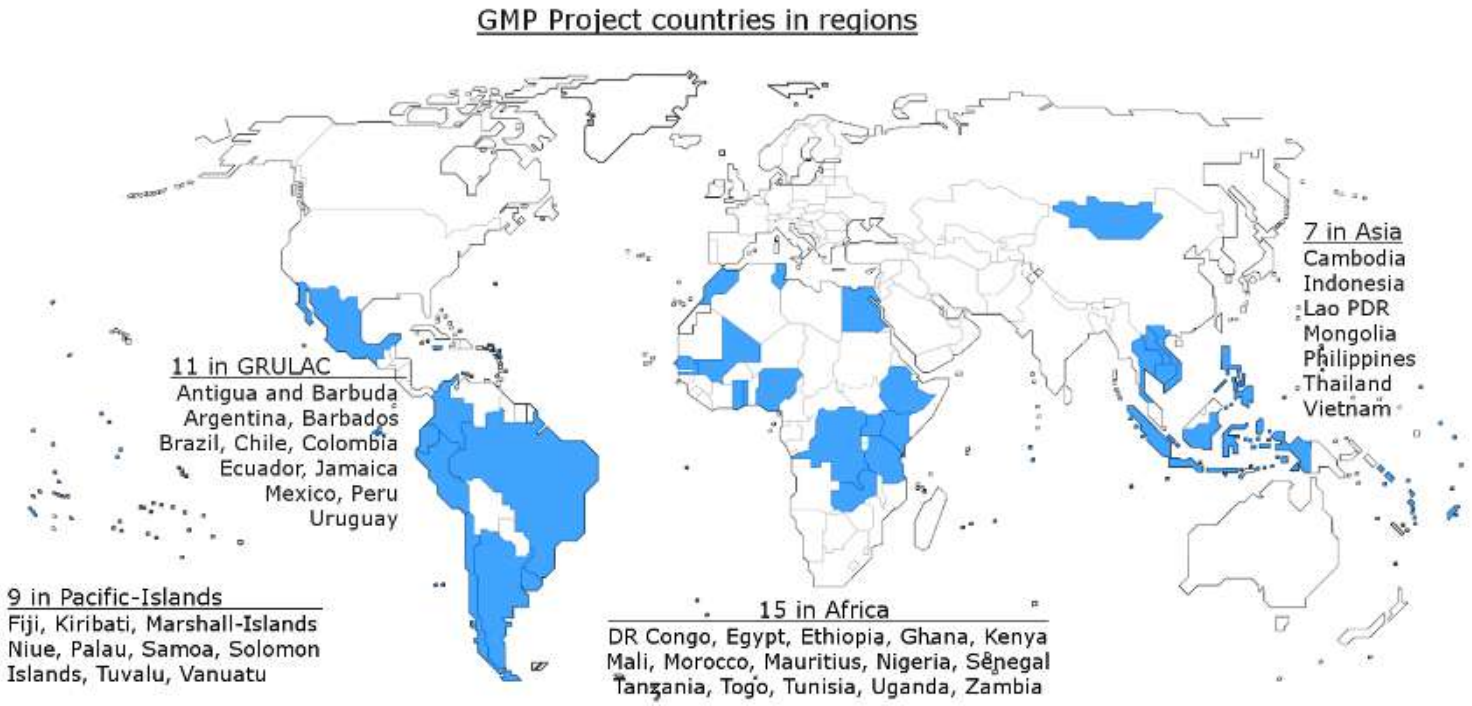
Ministerio de Ambiente

Data dashboard, laboratory databank and UNEP WESR

Final Meeting of the UNEP/GEF GMP of POPs projects in: African Region
Casablanca, Morocco, 28 – 30 November 2023

Victor Estellano
Chemicals and Health Branch, UNEP

Overview



- UNEP/GEF GMP1 project (2008-2012) based on the success of two GEF pilot test projects
- UNEP/GEF GMP2 project (2016-present) following decision SC-6/23 and the success of the UNEP/GEF GMP1 project to support **data generation** and **capacity building.**

31 POPs analyzed in over **900** samples of air, water, human milk and matrices of national interest in 42 countries.

Over **20** years of human milk data covering 82 countries globally.

Over **50,000** data points generated.

Training in **26** national laboratories.

289 laboratories registered in the interlaboratory assessments with **228** reported data.

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Overview of data generated under the GMP2-Projects

POPs groups	Analytes		Total N° of Samples			
	PUF & Nat.S.	HBM	PUF-PAS	Nat. Samples	HBM	Water
dl-POPs	29	29	195	~276	44	
OCPs(all)+PCB(6)	31	31	295		44	
PBDE+PBB+HBCD screening	13	29	295		43	
toxaphene/chlordecone	4	4	295		44	
PFAS	11	4	308		44	144
PCNs	-	21	-	-	40	
CPs (SCCPs + MCCPs)	-	2	-	-	42	
Data for single analytes produced			**23,203**	**~ 20,000**	**5,163**	**432**
			Approx. 50,000			

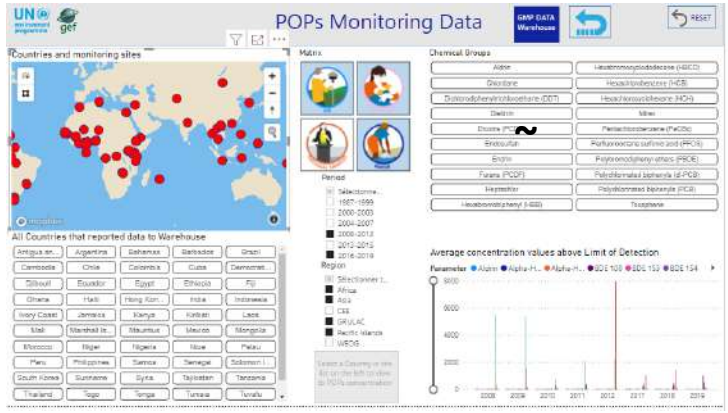

A lot of data, knowledge and information generated
But so what?

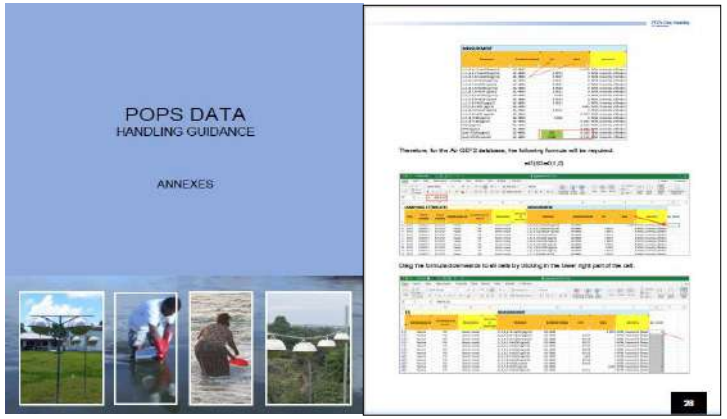
The evidence base needs strengthening

Data and knowledge generation

Data interpretation

Integration, management and usage





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HELP

UNEP/GEF POPs Global Monitoring Plan Projects 2008-2012, 2016-2022

POPs Monitoring

For more information on the projects and data, please contact **science.chemicals@un.org**

How to navigate the Dashboard?
YouTube

ABOUT THE DASHBOARD

Persistent Organic Pollutants (POPs) are hazardous chemicals that **threaten human health and the planet's ecosystems**.

To support the Stockholm Convention POPs Global Monitoring Plan, UNEP/GEF POPs GMP projects conducted data generation and capacity building in 42 countries to record the presence of POPs in humans and in the environment.

The dashboard aims to make **data and information** easily accessible and understandable for broader stakeholders to support informed decision making.

Sampling Activities

Capacity Building

Monitoring Results

Inter-Lab Assessments

POPs Information

Data Download

EXTERNAL INFORMATION

GMP DATA Warehouse

POPs LABORATORY DATABANK

Global Monitoring Plan

Update POPs laboratory databank.

In total, 256 laboratories analyzing POPs are registered in the UNEP databank of Laboratories.
The databank include laboratories analyzing:

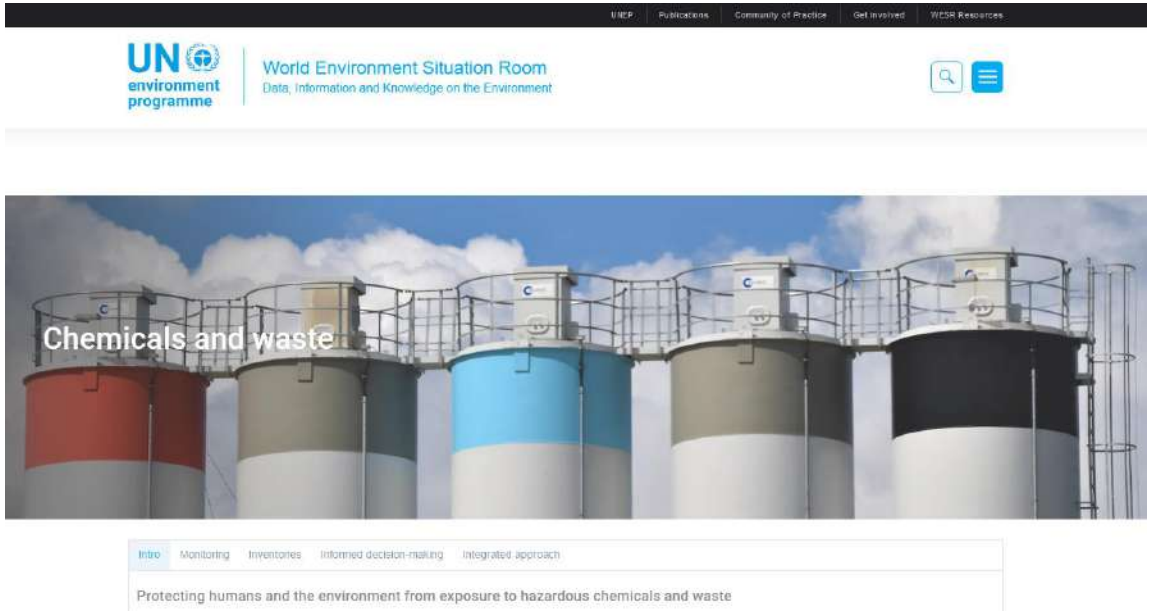
- ✓ 101 labs analyzing LEAD
- ✓ 210 labs analyzing MERCURY
- ✓ 256 labs analyzing POPS

Final Meeting of the UNEP/GEF GMP of POPs projects in the African Region

World Environment Situation Room
Data, Information and Knowledge on the Environment

Protecting humans and the environment from exposure to hazardous chemicals and waste

The work of UNEP Chemicals and Health Branch has generated a wealth of information, data and knowledge related to chemicals and wastes. To assist countries and stakeholders with meeting various environmental targets and objectives of Multilateral Environmental Agreements, activities were conducted with digital tools developed and data generated.



https://staging7.unep.org/wesr/web/article/chemicals-and-waste


Thank you, Merci

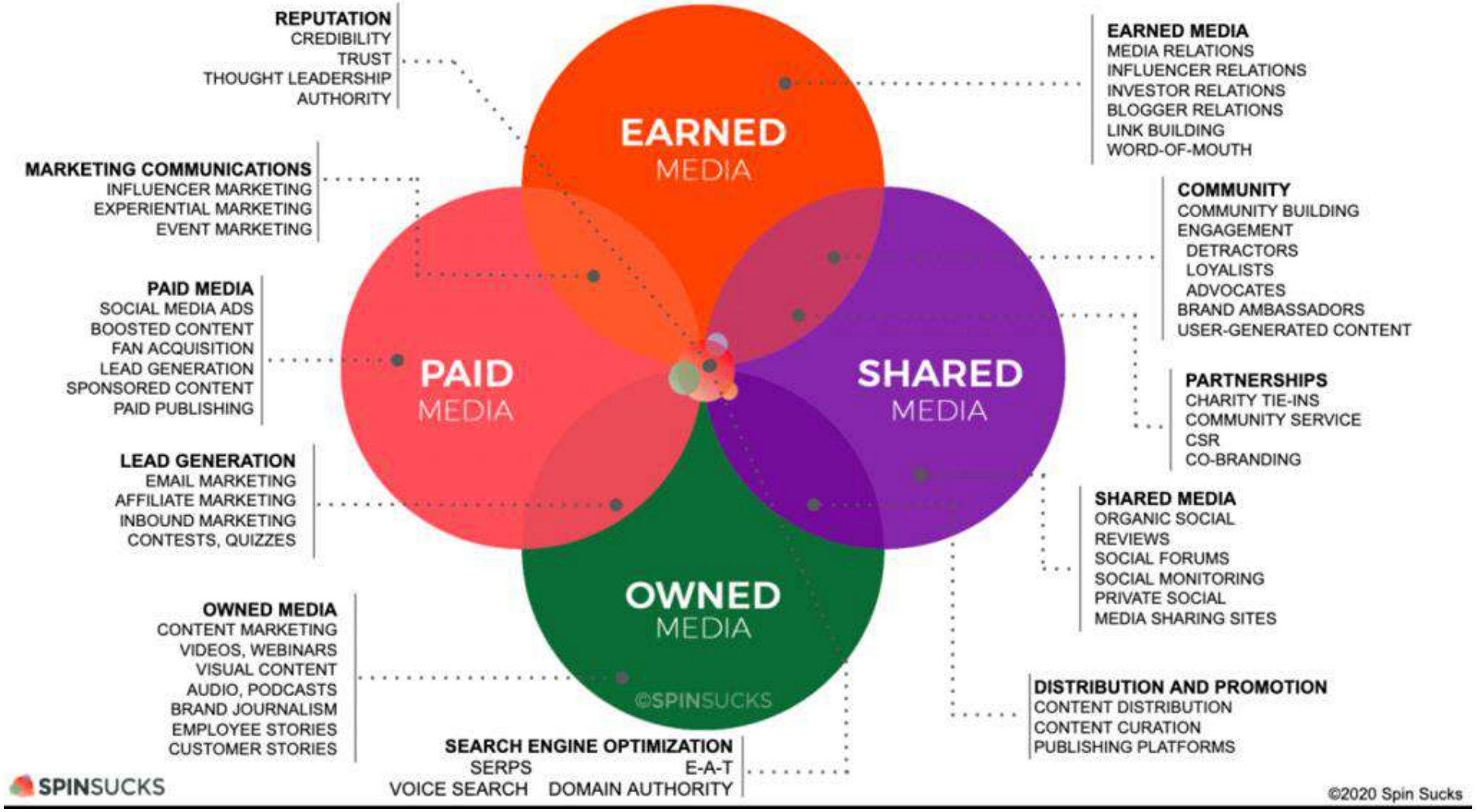
UNEP/GEF POPs GMP2 Communication

Final Meeting of the UNEP/GEF project “Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in Africa Region"

Haosong Jiao, Associate Programme Management Officer
Chemicals and Health Branch, Industry and Economy Division

QUESTION

How does this relate to our work? Why should we care?

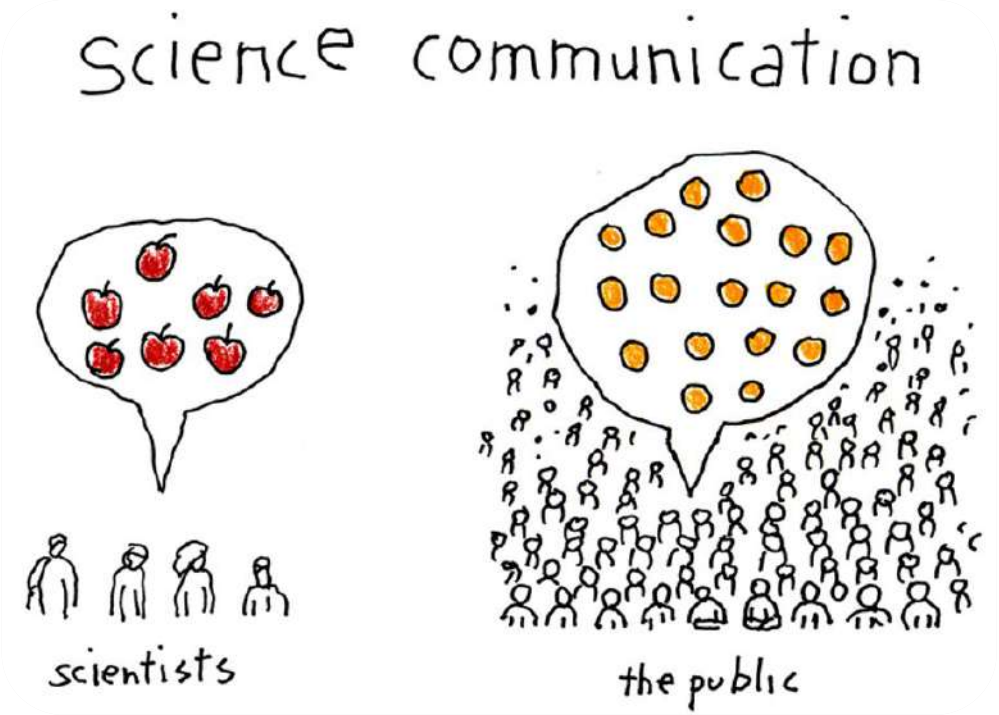


PESO is not only about weight!


Without facts, you're just another person with an opinion. Prepare people with the truths to anticipate risks and take actions.

Translate the data, information and knowledge

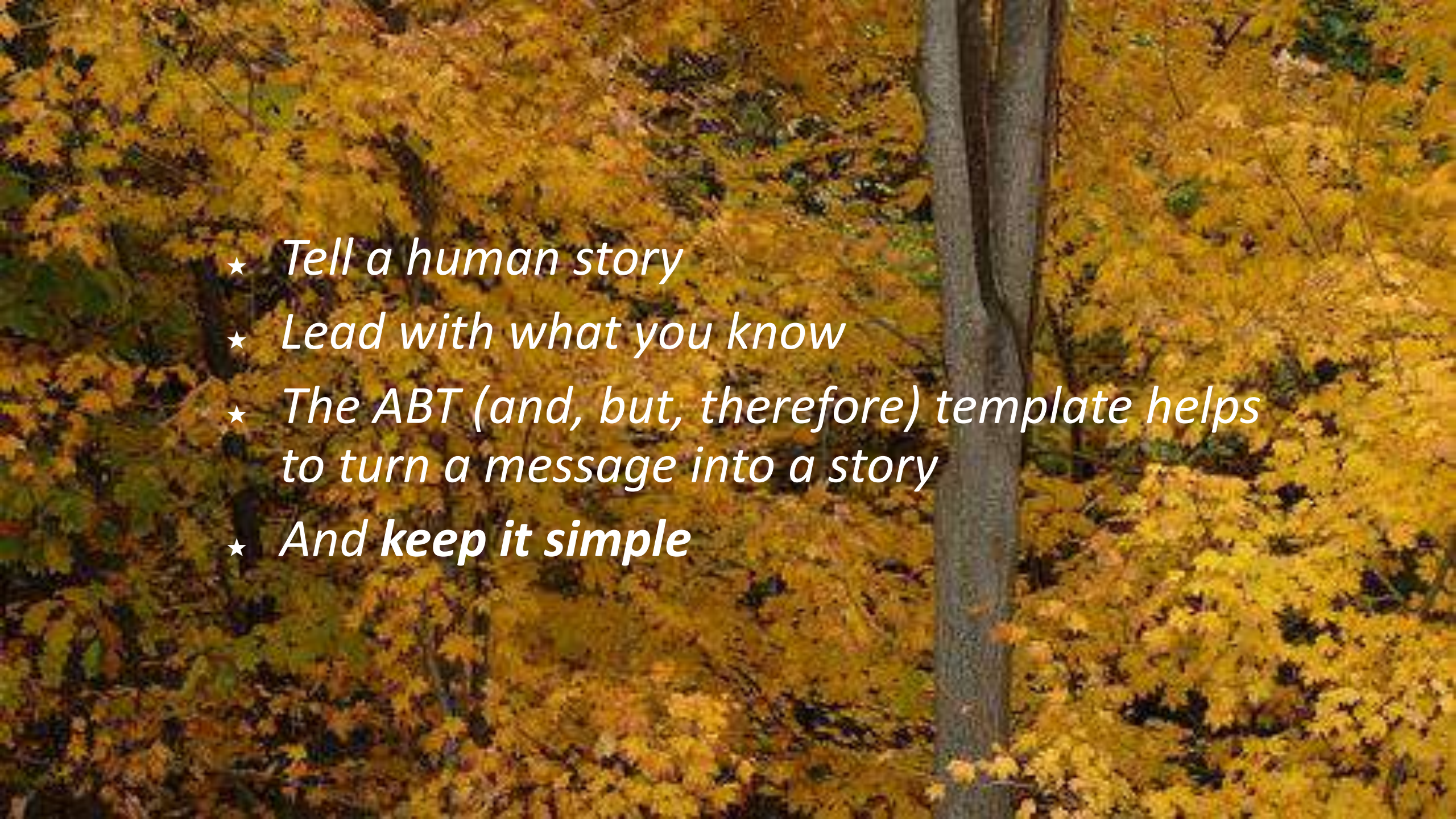
Into DOING



We're not all scientists, and we need to translate the data and knowledge into **digestible and close-to-home content**, so it gains relevance, and makes one care

National successes can be enhanced by good communications, which generate a better understanding of the sense of urgency as well as roles and responsibilities

With everybody on board we can fast-track action and have more effective impact


★ *Tell a human story*
★ *Lead with what you know*
★ *The ABT (and, but, therefore) template helps to turn a message into a story*
★ *And **keep it simple***

WFF

WORST FRIENDS FOREVER

WFF

WORST FRIENDS FOREVER

UN environment programme
gef

WORST FRIENDS FOREVER

THEY NEVER LEAVE YOU

#WFF

WORST FRIENDS FOREVER

UNBEARABLE, ANNOYING, INSUFFERABLE, TOXIC... BUT THEY NEVER LEAVE US.

UNEP

Objective and Audience Segmentation

Different audiences have unique information needs, interests, and communication preferences.

OBJECTIVE

We propose a **targeted Communications Plan** that focuses on demonstrating the POPs GMP 2 project's **key findings** and raising **awareness among stakeholders and the general public**.

Press Release, Technical Reports:
Stakeholders and Professional Audience

Sharing technical reports and package of communication materials with stakeholders, professionals and media groups to facilitate broader dissemination of information.

Worst Friends Forever Campaign:
General Public

Social Media campaign to raise public awareness, understanding, and recall of Forever Chemicals.

Communication for the General Public – WFF Campaign

General Public, Media Outlets, Environmental Advocacy Groups, Youth

Objective

- Explain effectively **a complex concept** to achieve **public awareness**, understanding, and recall of Forever Chemicals and chemical pollution.

- Encourage **engagement and responsibility** among the general public to demand informed decisions and effective actions to reduce POPs use and improve waste management to **protect ourselves and the environment**.

- Raise public support for POPs **monitoring and stricter regulations** and national policies.

Content

9 videos

9 Social Media assets

1 interactive webpage

4 factsheets

3 infographics

1 Colorbook

1 Trello board

Scheduled Date

- **Videos and Social Media:** 17 May 2024 together with BRS.
- **Interactive website, factsheets, and infographics:** Back-to-back with UNEP #BeatChemicalPollution campaign.-*Advice with communication division*-

Distribution Channels

- **Release**: UNEP SoMe, WFF and UNEP websites, BRS SoMe channels.
- **Promotion**: UNEP SoMe, campaign newsletter, participating members' channels.

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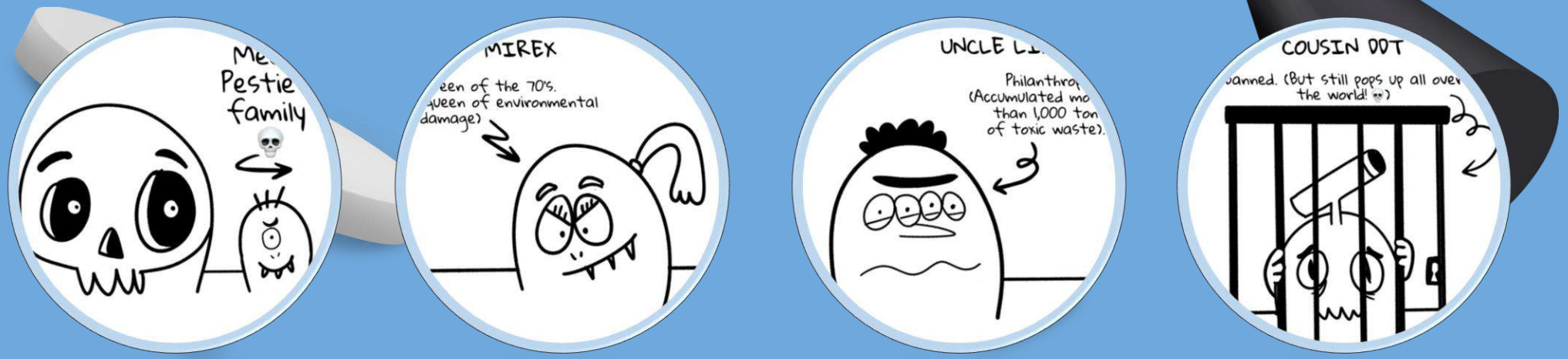
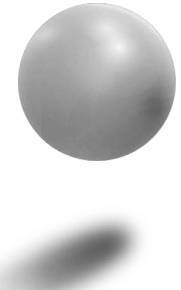
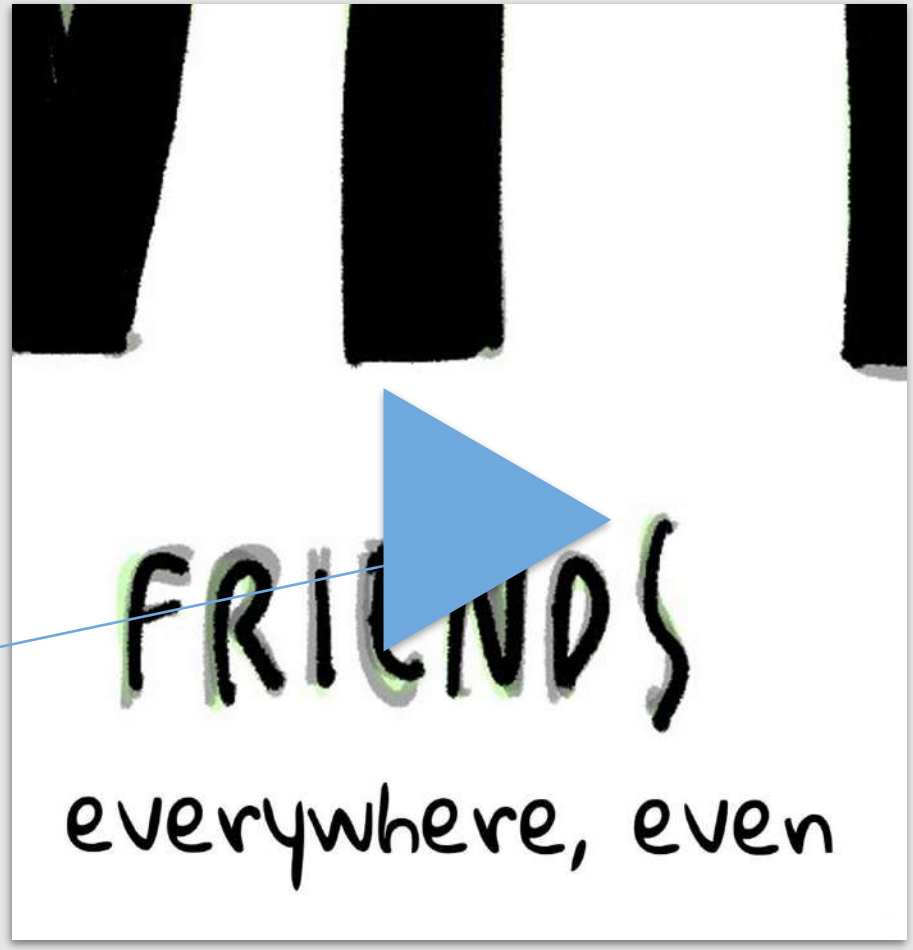
The assets

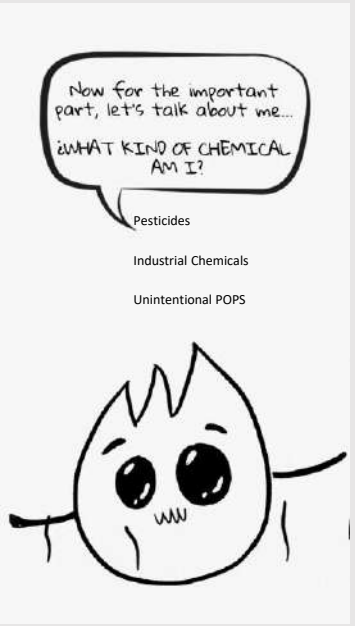


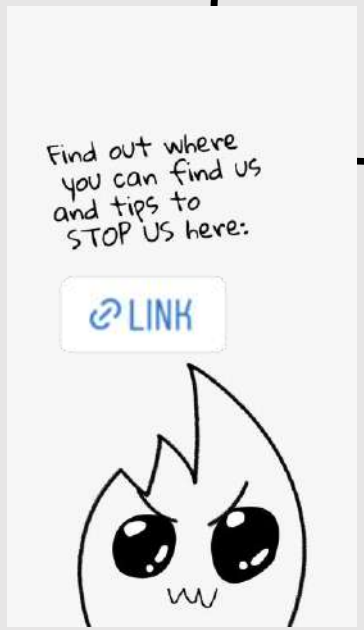
Interactive Webpage



Featured story







Infographics [EN]

+ 添加卡片

Factsheets [EN]

+ 添加卡片

Social Media Posts [EN]

CAROUSEL - Pesticide POPs
3

VIDEO - POPs Pesticides: Pestie's Childhood at the Farm

CAROUSEL - Meet the POPs Pesticides
1

VIDEO - Unintentional POPs: Sparky's Journey

CAROUSEL - Sparky's Journey
3

VIDEO - Industrial POPs: Sticky's Adventures

+ 添加卡片

Videos [EN]

The Worst Friends Forever – Episode 1
1

The POPs Growing Family - Episode 2
1

POPs Pesticides: Pestie's Childhood at the Farm - Episode 3
1

Unintentional POPs: Sparky's Journey - Episode 4
1

+ 添加卡片

Videos [SP]

Worst Friends Forever – Episodio 1
1

La Creciente Familia de COP - Episodio 2
1

Pesticidas COP: La Infancia de Pestie en la Granja - Episodio 3
1

COP No Intencionales: El Viaje de Chispita - Episodio 4
1

+ 添加卡片

Videos [FR]

Worst Friends Forever – Épisode 1
1

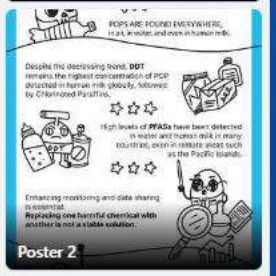
La Famille Grandissante des POP - Épisode 2
1

POP Pesticides : L'enfance de Pestie à la Ferme - Épisode 3
1

POP Non Intentionnels : Le Voyage de Sparky - Épisode 4
1

+ 添加卡片

Posters [EN]



+ 添加卡片

Colorbook [EN]

WFF Colorbook
2

+ 添加卡片

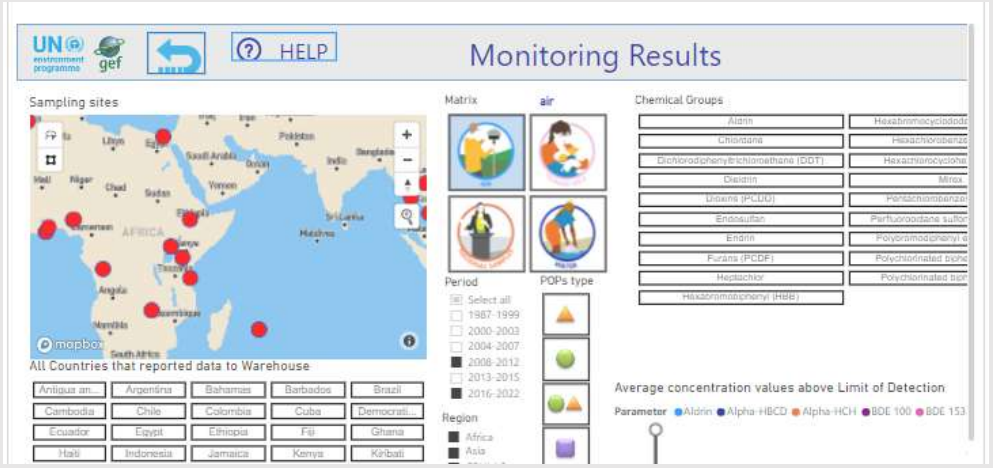
Influencers

Influencers for voluntary reaction videos

UNEP ambassadors?

The “Ecosystem” Thinking

- UNEP regular pages for knowledge sharing (guidance, project documents, reports and meetings etc.)
- World Environment Situation Room dedicated page on chemicals and waste (dashboards for data sharing)
- **Campaign page under the UNEP umbrella for hosting and distribution of communication materials**



Benefits of the Approach

Double Target

Through effective communication, we improve our impact on our stakeholders and the general public.

Media Presence

Through SoMe, POPs will have a bigger impact. To achieve significant change, the general public is crucial.

Raise Support

Showing the GMP impact and our communication efforts we will enhance our stakeholder engagement and support.

Tailored Information

We will be able to cultivate a well-informed public and ensure our stakeholders are aware of our progress.

Engagement

Encourage responsibility among the general public to demand informed decisions and effective actions.

Common Goal

We have a common goal: the elimination of POPs.
This is a shared problem.

Thank you

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Haosong Jiao
Knowledge and Risk Unit, Chemicals and Health Branch, Economy Division

www.unep.org

The work of ROGs in Regional Monitoring Activities in the Africa Region

Vincent Madadi, Martin Ngassoum, Anas Otmani, Taelo Letsela, Halimatou Kone Esp Traore & Bondi Nyuma Gevao

Africa ROG and GCG Members

Presentation Outline

1) Article 16 of the Stockholm Convention
2) Africa GMP coordination arrangement
3) Role of the ROG members
4) Monitoring programmes
5) Overview of GMP monitoring data in Africa
6) POPs monitoring challenges in the region
7) Conclusion and recommendations

The work of ROGs in Africa POPs monitoring Activities

- **The objective of the Stockholm Convention on POPs is to protect human health and the environment from persistent organic pollutants by reducing or eliminating releases to the environment**.
- Article 16 of the Stockholm Convention requires the Conference of the Parties **to evaluate periodically whether the Convention is effective in achieving this objective**. This evaluation is to be based on:
  1) **Comparable and consistent monitoring data** on the presence of POPs in the environment and in humans pursuant to paragraph 2 of Article 16;
  2) Information provided through the national reports submitted pursuant to Article 15;
  3) Non-compliance information under Article 17.

Global Monitoring Plan on Persistent Organic Pollutants

- The Global Monitoring Plan is implemented by the regional organization groups (ROGs) established in the five United Nations regions (decision SC-3/19).
- The main objective of the regional organization groups is to **define and implement the strategy for regional information gathering**, including **facilitating capacity enhancement**, and to **produce the regional monitoring reports.**
- **A global coordination group**, comprising of three members from each regional organization group, is in place to:
  - harmonize and coordinate implementation activities among the UN regions,
  - produce the global monitoring report, and
  - maintain up-to-date the guidance on the Global Monitoring Plan.
- The terms of reference of the regional organization groups and the global coordination group are included in the annex to decision SC-8/19.

Regional Organization and coordination of activities

Sierra Leone	Cameroon	Kenya	Mali	Morocco	Lesotho
Sierra Leone	Sudan	Burundi	Niger	Algeria	Zambia Zimbabwe
Democratic	Djibouti	Uganda	Senegal	Egypt	Mozambique
Republic of	Somalia	Madagascar	Guinea	Libyan Republic	Namibia
Congo	South Sudan	Rwanda	Guinea-Bissau	Tunisia	Botswana
Central African	Ethiopia	Seychelles	The Gambia	Morocco	Swaziland
Republic	Cameroon	Eritrea	Cape Verde	Mauritania	South Africa
Gabon	Chad	Kenya	Liberia		Lesotho
Angola	Nigeria	Comoros	Côte d'Ivoire		Malawi
Sao Tome and	Ghana		Burkina Faso		Tanzania
Principe	Benin		Mali		Mauritius
Equatorial	Togo				
Guinea					
Republic of					
Congo					

The main tasks of the ROG members

1) Identifying where **existing suitable monitoring data are and are not available**;
2) **Promoting and updating as necessary the regional strategy** for implementation of the global monitoring plan;
3) **Promoting and helping to maintain regional, sub-regional and interregional monitoring networks** and extending them as necessary to improve geographic coverage;
4) **Coordinating with Parties involved in sampling and analytical arrangements**;
5) **Ensuring compliance with protocols** QA&QC, noting the examples described in the **guidance on the global monitoring plan for** POPs for **sample collection** and **analytical methodologies**, for **data archiving** and **accessibility** and for **trend analysis methodologies** to **ensure quality and allow comparability of data;**

The main tasks of the ROG members cont…

6) **Ensuring and improving internal consistency of the methods and comparability of the data** within a particular programme over time;
7) **Maintaining the interaction with other regional organization groups** and the Secretariat, as appropriate;
8) **Identifying further capacity enhancement needs** in its region;
9) **Assisting, for the purpose of filling gaps, in the preparation of project proposals**, including through strategic partnerships;
10) **Preparing a summary of experiences** in implementing the duties assigned in subparagraphs (8) and (9) above for transmission to the coordination group via the Secretariat;

The main tasks of the ROG members cont…

11) **Preparing regional reports**;
12) **Encouraging transparency of communication and information dissemination** within and between regions, noting the need for stakeholder involvement;
13) **Nominating for each evaluation cycle three of its members** to serve in the **global coordination group**.

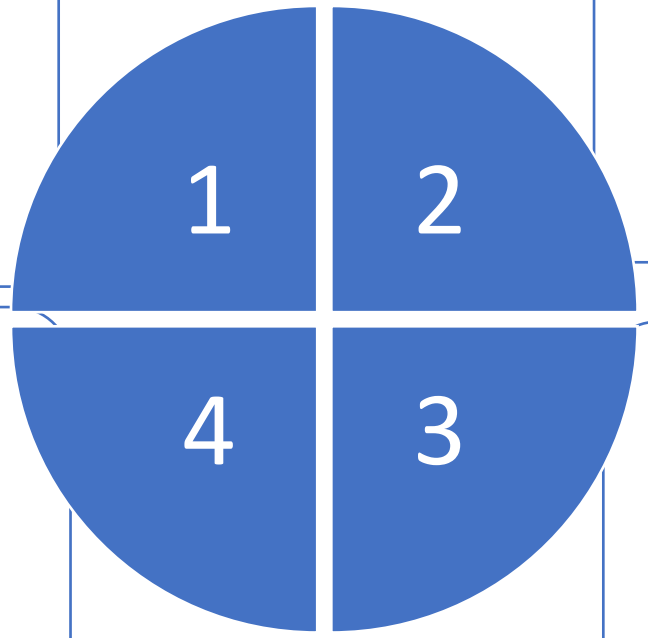
Overall flow of work from regional activities to EE of the Stockholm Convention

ROG activities:

- Define and implement the regional strategy for data gathering & capacity enhancement, filling data gaps, dissemination.

ROG activities :

- Drafting regional POPs monitoring report.
- Regional Circulation of report.
- Submission regional report secretariat



SC Effectiveness: Evaluation Committee

- SC-EEC considers the Global Monitoring report.

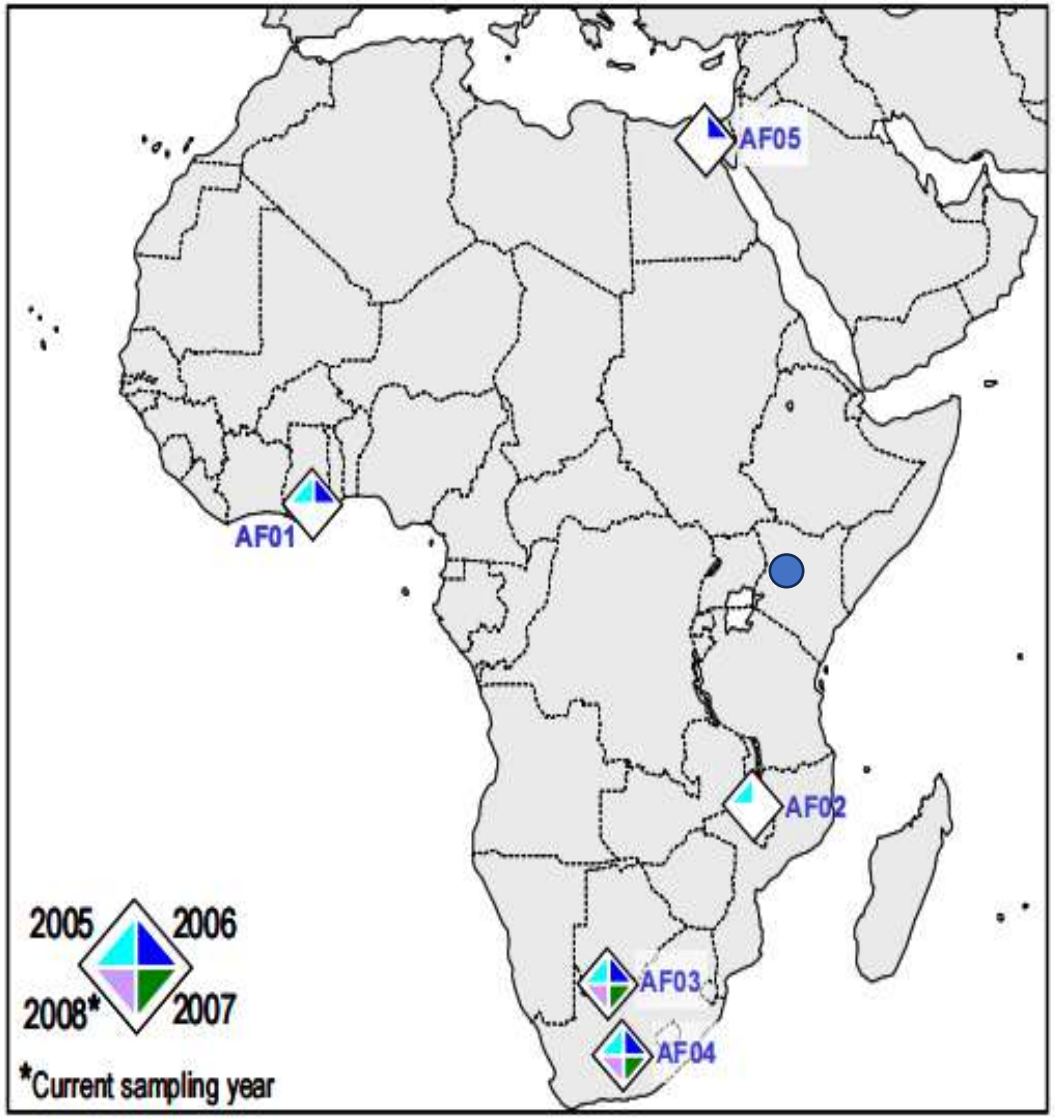
GCG:

- Use the 5 regional reports to develop the Global Monitoring Report.
- Global reports gives the global picture of all POPs levels in the core media and other selected media.

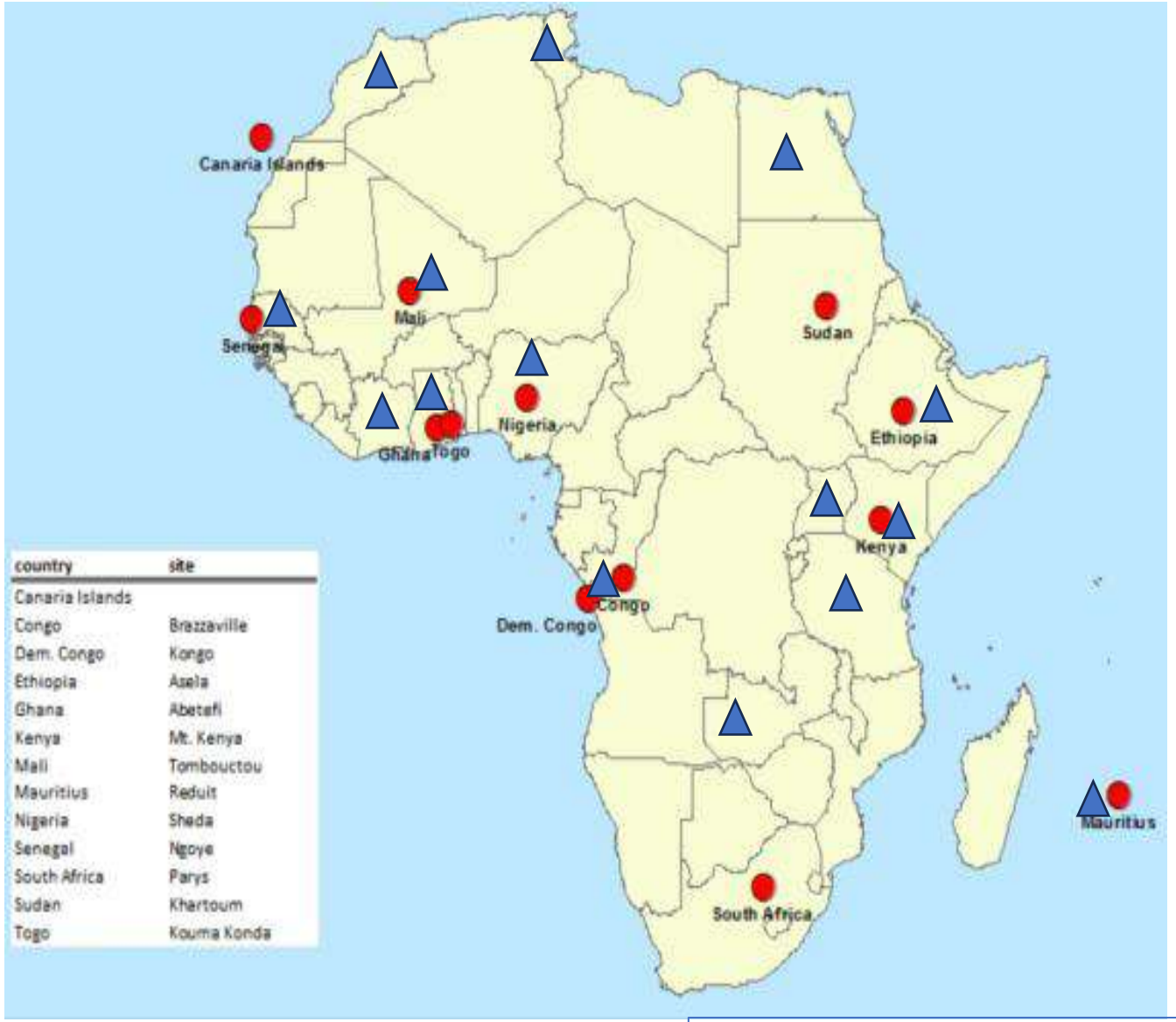
POPs Monitoring programmes in Africa Region

		GMP1 2009	GMP2 2010-2015	GMP3 2016-2021	GMP4 2022-2027	Sites/countries
	Air Monitoring Programmes					
1	MONET Africa					
2	GAPS					
3	UNEP/GEF GMP 1&2 projects					
	Mothers milk Monitoring Programmes					
1	UNEP/WHO					
2	UNEP/GEF GMP 1&2 projects					
	Water Monitoring Programmes					
1	MONET Africa					
2	UNEP/GEF GMP Projects					
	Other media Programmes					
1	MONET Africa					
2	UNEP GEF GMP 1&2 projects					

Background POPs Air Monitoring in Africa



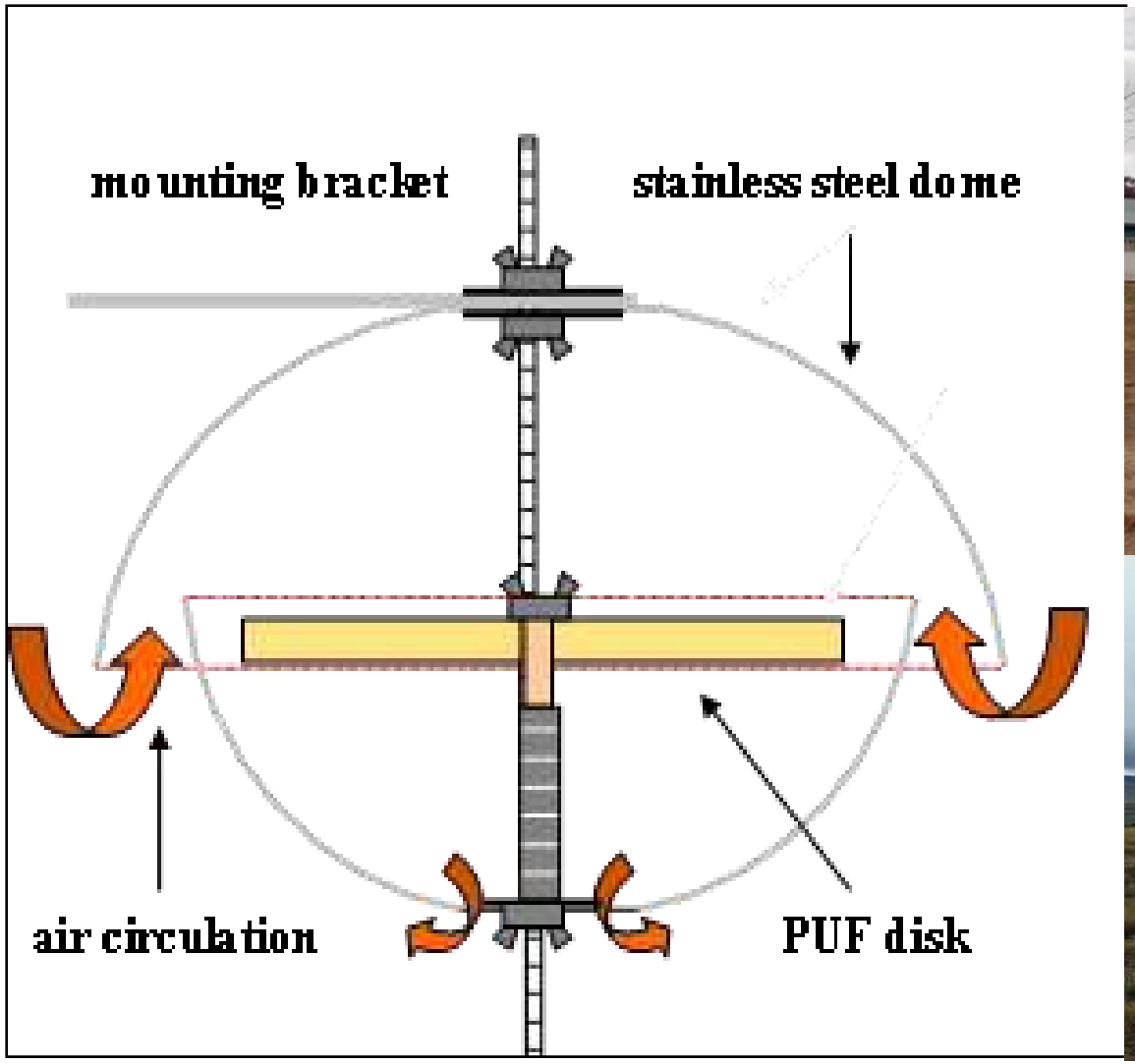
GAPS sites in the Region have reduced since 2008



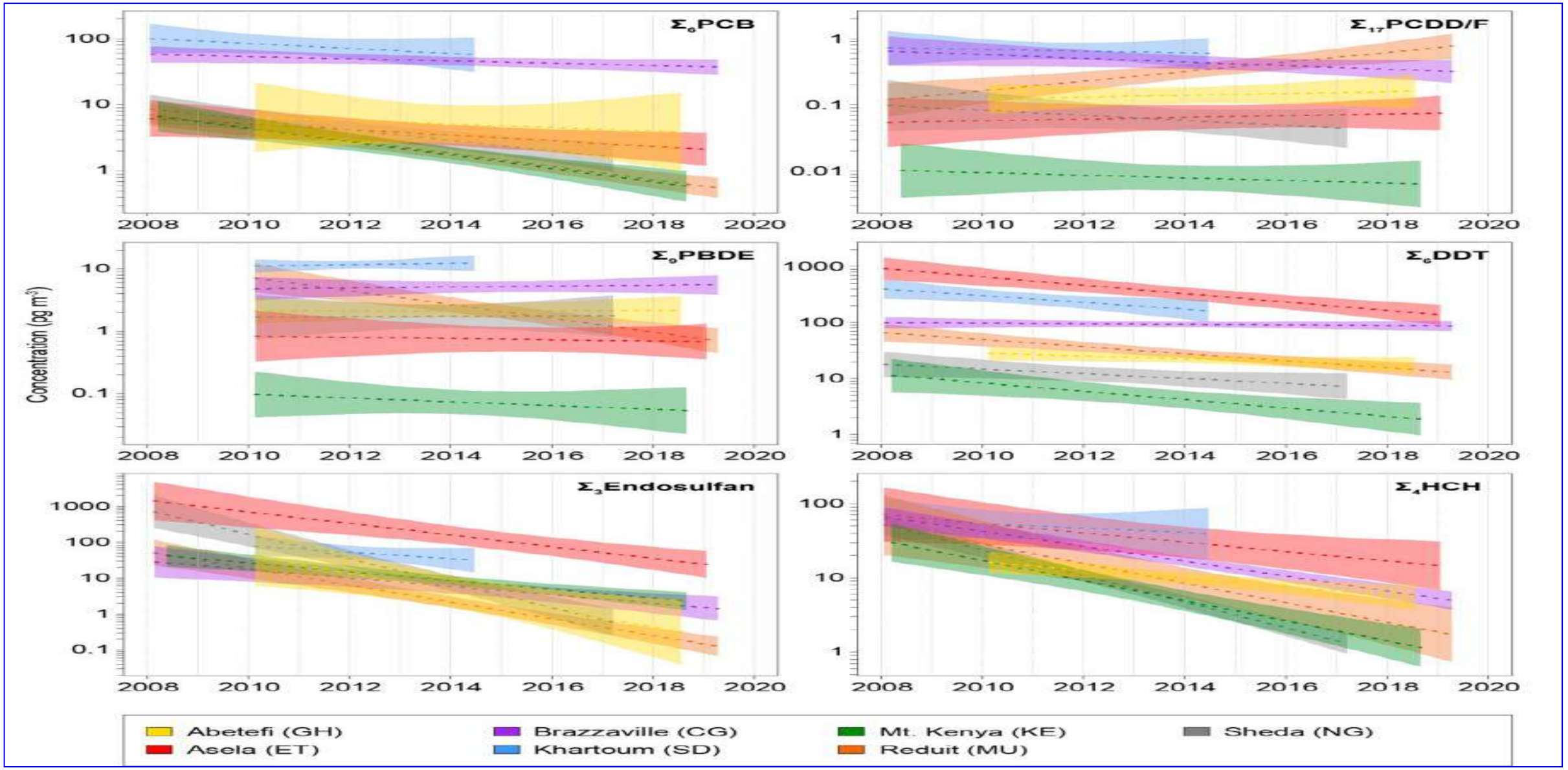
country	site
Canaria Islands	
Congo	Brazzaville
Dem. Congo	Kongo
Ethiopia	Asela
Ghana	Abetafi
Kenya	Mt. Kenya
Mali	Tombouctou
Mauritius	Reduit
Nigeria	Sheda
Senegal	Ngoye
South Africa	Parys
Sudan	Khartoum
Togo	Kouma Konda

● MONET Africa sites
Δ UNEP/GEF GMP project sites

Typical Ambient Sampling for POPs



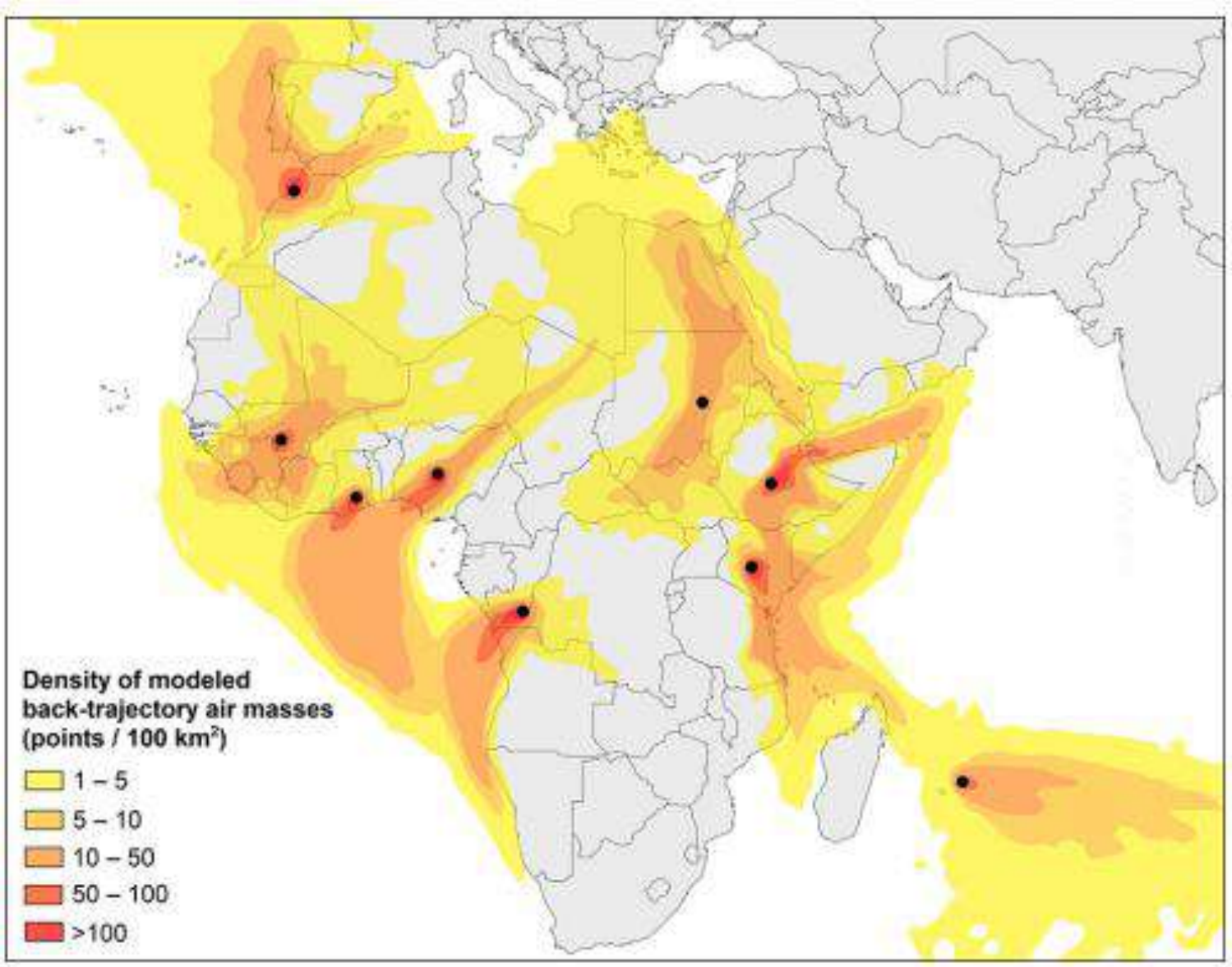
Overview of POPs Monitoring Results



White *et al.*, 2020

Overview of POPs Monitoring Results

- **TRANSPORT OF POPS ACROSS AFRICA**
- Density heat map from back **trajectory analysis of POPs in ambient air** for MONET Africa sites (White *et al.*, 2020).
- Multiple sources, both local and abroad, and the impact of the Sarahan dust.
- e-waste recycling is one of the most significant point sources of POPs and its effect on atmospheric POsP emissions and transport through the air masses (White *et al.*, 2020).

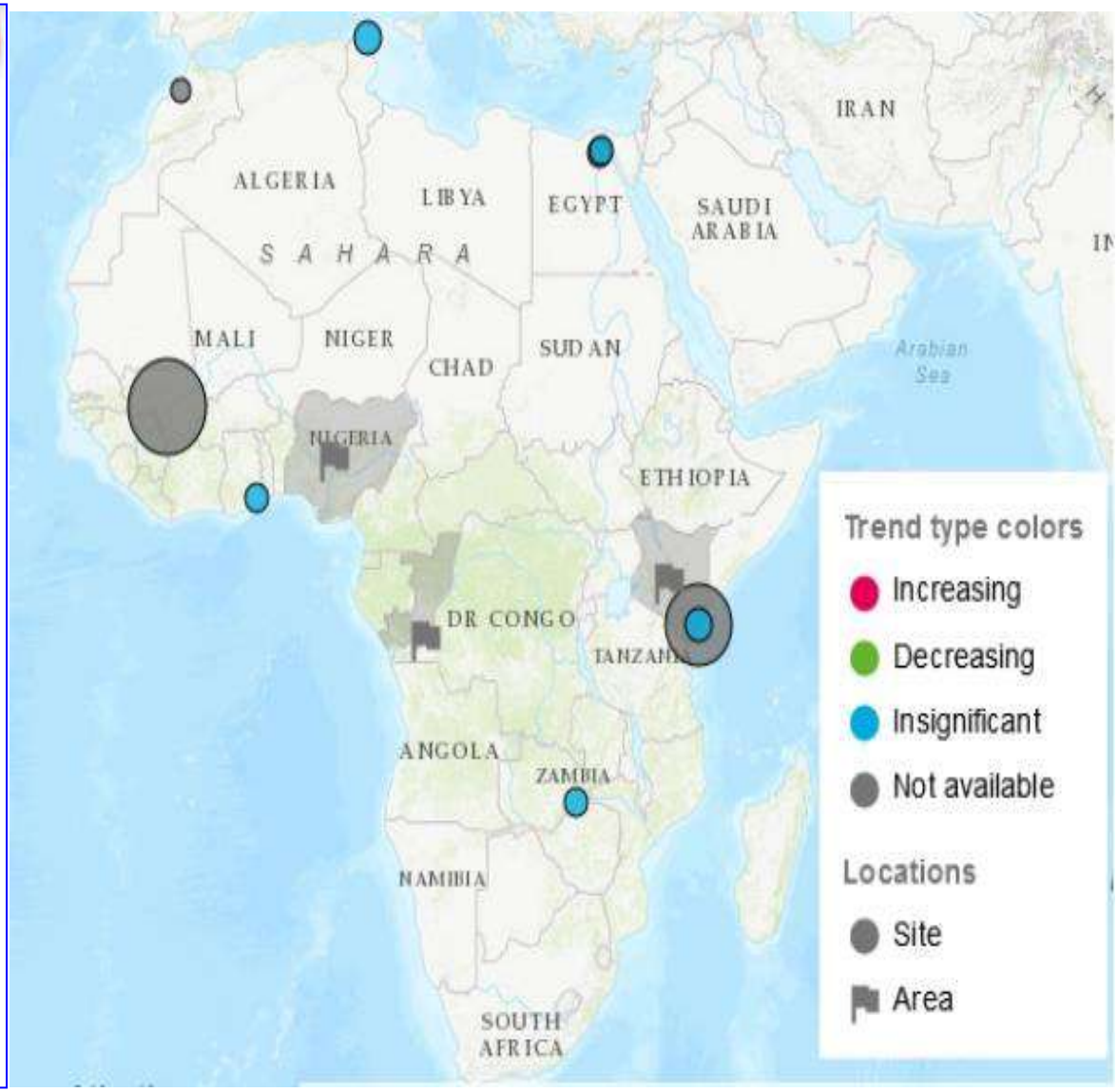


Mothers' milk monitoring- Participating countries

Overview of Milk Monitoring Data

- **Up to date only two mothers' milk survey** have been conducted in the region, with 7/19 having participated only in a single survey
- **Several POPs including pesticides, PCBs, PBDEs, PFOS, SCCPs, PCDDs/Fs** were detected in mothers' milk from background sites.
- **A risk assessment PCDDs, PCDFs and PCBs levels in mothers' milk** samples from the region showed that the levels were significantly above those considered toxicologically safe.
- **Σ**DDTs were below or around those considered safe for majority of the countries for the sample collected from 2002-2019.
- **Potential multiple contamination pathways** including foodstuff, indoor and outdoor air and drinking water that need to be controlled.

Water Monitoring sites



UNEP/GEF GMP2 project 2016-2020

Overview of Water Monitoring Data

- **2013, 2014 MONET Africa**, PFOS range for 5 sites **260-1,390 pg/L.** Nigeria (1,390.60 pg/L), Kenya (260.0 pg/L) Mauritius (242 pg/L), DR Congo and Morocco (35 pg/L). Abu Rawash site Egypt (514 pg/L).
- **2017 from UNEP/GEF GMP2** major Rivers in the West, North, South, East and Central Africa, additional six sites expanded the data set. PFOS range **336.13-1,919.04** pg/L.
- Sabaki River, Kenya, (1,919.04 pg/L), Kafue site Zambezi River, Zambia (999.90 pg/L), Quede site, Tunisia (619.32 pg/L), R. Volta, Ghana (537.46 pg/L), Senegal (363.48 pg/L) and R. Nile, Egypt (336.13 pg/L).
- **2018 annual mean levels of PFOS were 98.39-1,327.97 pg/L.**
- Sabaki River Mouth, Kenya (1,327.97 pg/L), Qued site, Tunisia (646.66 pg/L), River Nile, Egypt (271.00), Senegal (241.90 pg/L), River Volta site, Ghana (150.07 pg/L) and Kafue site, Zambia (98.39 pg/L).
- **2019,** Sabaki River, Kenya (912.77 pg/L) and River Nile, Egypt (378.08 pg/L).

Other media data from UNEP/GEF GMP2 Project

- MONET Africa, UNEP/GEF GMP projects activities have revealed wide contamination of environmental media such as **soil, sediments, fish, water, feed stuff** among others by a variety of POPs compounds.

- Data on POPs in other media provides supplementary information that can help in the interpretation of the POPs levels detected in the core media.

Conclusion

1) Monitoring data revealed high presence of POPs in air and mothers milk. Whereas initial declining trends for sites with over 10 years monitoring have started to emerge for legacy POPs in air, in mothers' milk there are no indication of trends yet.
2) A risk assessment PCDDs, PCDFs and PCBs levels in mothers' milk samples from the region showed that the levels were significantly above those considered toxicologically safe.
   - **i.** **Σ**DDTs were below or around those considered safe for majority of the countries that participated in mothers' milk survey in the region.
   - ii. Health benefits of breastfeeding are far above the health risks of POPs in mothers' milk, hence WHO and other bodies involved in developing the safety standards encourage breastfeeding, while measures to reduce POPs burden are instituted in the countries.
3) POPs levels in mothers' milk were dominated by pesticides particularly DDTs and their metabolites, then PFOS & PFOA, SCCPs, PCBs, PCDDs/Fs and PBDEs.
4) Further monitoring activities to establish trends in levels and continued capacity building is critical for the region.

POPs monitoring challenges in the region

1) **High staff turnover** at regional institution demand regular training to equip the new staff with POPs monitoring knowledge to ensure comparability of data collected.
2) **Increasing number of POPs compounds**: PCN have not been measured nor reported in the regional reports. Three more compounds were listed in 2022.
3) **Intermittent data collection based on project timelines** for supplies that gaps in monitoring frequency at the end of the project.
4) **Accessing distant remote sites** selected for GMP monitoring has incremental burden on the cost of fieldwork.

POPs monitoring challenges in the region …

5) **Limited regional analytical capacities** for POPs monitoring create high dependence on strategic partners.
6) **Challenges associated with shipping of mothers' milk and biota samples** across international boundaries. Limits on sample amounts and causes delays in shipment.
7) **Comparability of POPs levels in other media** from different research entities nonuniformity in protocol for sampling, analysis and data presentation.
8) **Specimen sample banking** at national and regional level.

Recommendations

1) **Further monitoring of POPs in established sites remains of priority to** establish trends in POPs levels and effectiveness of POPs management activities instituted in countries under the convention.
2) **High prevalence of POPs pesticides such as DDTs, HCHs and endosulfans** among others in air reinforces the need to strengthen POPs management and control activities to reduce releases into environment.
3) **The presence of PCBs** in ambient air suggest releases from old transformers, evaporation from contaminated soils and combustions including incineration and open burning of wastes that need to be controlled.
4) **High prevalence of UPOPs** in ambient air and mothers' milk poses a health risk to the regional population and environment, suggest need to strengthen the regional capacity for adoption/integration of BAT and BEP in municipal, industrial and medical wastes, and elimination of open burning of wastes.

Recommendations Cont…

5) **Success in reduction of UPOPs** will depend on creating awareness among the general population to desist from biomass burning and open burning of wastes.
6) **The presence of new industrial POPs** such as PBDEs, PFOS suggests active releases from the industrials activities, products and wastes require integrated waste management schemes to properly address the widespread sources.
7) **Promoting alternatives to industrial POPs such as PBDEs and PFOS** to control further releases from household goods, industrial materials and products.
8) **Newly listed POPs such as SCCPs, PCNs** have not yet included in the most monitoring programmes require capacity building and incorporation into monitoring activities.

Acknowledgement

- All participating Countries in regional GMP work.
- Coordinators for MONET Africa (RECETOX), GAPS, UNEP/GEF GMP (UNEP Chemicals) and SC secretariat.
- Expert laboratories: MTM Orebro University, VU University, etc.
- Organisers of this regional meeting for effective coordination and communications.
- Host country Morocco for the warm welcome.
- All ROG members.

Thank you for your attention

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Stockholm Convention
Regional Centre

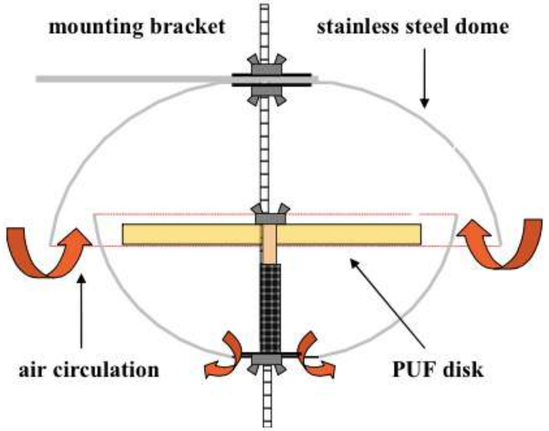
POPs monitoring activities in the Africa Region by RECETOX via MONET network(s)

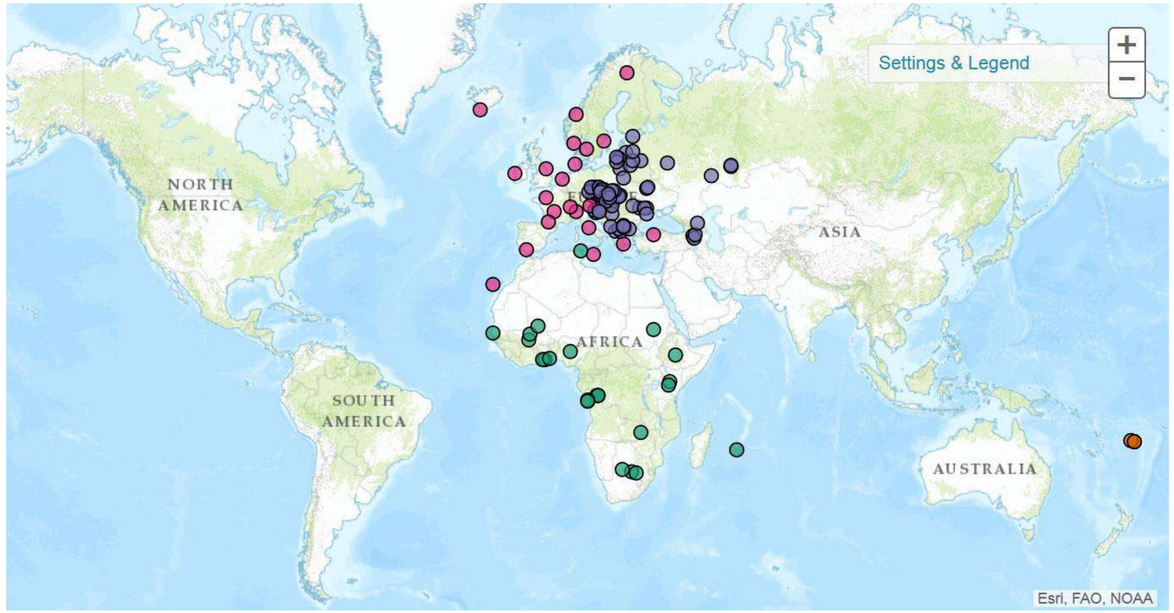
Kevin White, Jiří Kalina, Jana Klánová, Petra Přibylová, Roman Prokeš, Petr Kukučka, Lisa Melymuk and RECETOX RESEARCH INFRASTRUCTURE team

RECETOX, FACULTY OF SCIENCE, MASARYK UNIVERSITY, CZECH REPUBLIC

Final Meeting of the UNEP/GEF project “Support in the Implementation of the Global Monitoring Plan for Persistent Organic Pollutants (POPs) in the countries of the African Region ”, Casablanca, Morocco, 28-30 November 2023

AIR - MONET





MONET, MOnitoring NETwork, is a monitoring program operated by the RECETOX in collaboration of the SCRC and the RECETOX Research Infrastructure, Masaryk University in Brno, Czech Republic.

aims at detection of environmental contaminants (toxic chemicals)
spreads over the three continents - Europe, Africa and Asia.
Ambient air sampling is done by **passive samplers with PUF disks**

sampling records (protocols) and SOP provided to partners with sampling materials
training video for sample preparation + sampler handling - shown at COP2015, used since! Available in EN, FR, ES a

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MONET (MOnitoring NETwork): POPs monitoring in ambient air by passive samplers

- started in 2003 as pilot collaboration project with the University of Lancaster (UK), and Health Canada (ECCC)
- now supported by Stockholm Convention Regional Centre in the Czech Republic and the RECETOX research infrastructure
- expanded from one country to three continents over time (Europe, Africa, Asia)
- supports the implementation of the Global Monitoring Plan (GMP) as strategic partner
- data available online in www.genasis.cz and also www.pops-gmp.org
- we wish to share overview of African and European results with you today

sampling records (protocols) and SOP provided to partners with sampling materials
training video for sample preparation + sampler handling - shown at COP2015, used since! Available in EN, FR, ES and RU

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Evolution of MONET activities in AFRICA region

= ambient air passive sampling monitoring programme supported by RECETOX in cooperation with local partners in Africa - and we are very grateful for their support in performing the sampling on the SOP provided

- **pilot**: 2008 (testing passive samplers)
- **stage 1** : 2010-2011… in 15 countries (23 sites)
- **stage 1.5** : sampling interval prolonged to 3 months (mid 2011)
- **stage 2**: continues in 13 countries (13 sites), but countries gradually drop out (lower return of samples).
- **stage 3** …. new tools introduced in Ghana and Kenya (active samplers, 2014 - 2017

current stage : continued decline in MONET Africa participation

end of 2018: up to 8 countries continued (R.of Congo, Ethiopia, Ghana, Kenya, Mali, Mauritius, Morocco, and Nigeria)

scope:
always OCPs, indicator PCBs and PAHs
but since 2011-mid 2014 all POPs on all sites,
mid 2016 onwards - broader range of POPs including fluorinated ones only by active samplers,
OCPs and some brominated on PAS

MONET Africa samples so far (as of October 2023)

- **Kenya** Mt. Kenya 2013-30/10/2018 (PAS) and active sampler University of Nairobi - we seem to have latest material in end 2017 - PAS collected until end 2022 (or Q1/2023) but not yet shipped back to RECETOX
- **Mauritius** Réduit 2013-5/6/2020 (+ new shipment of exposed PUFs received in August 2022, not yet analyzed), new sampling material sent to Mauritius in January 2023
- **Mali** Bamako 6/3/2019 - (2016-mid 2019) - restarted
- **Ghana** Abetife(2012-2018 - 6/9/2018
- **Congo** Brazzaville (2013-2018) 6/3/2019
- **Ethiopia** Asela 2014 - 6/3/2019
- Nigeria - Sheda (2014-2016, discontinued within MONET)
- Morocco - Ouarzazate? 2014-2016, sampled 2017-8, but not yet shipped to RECETOX - please confirm!
- Sudan - 2013-2014 (discontinued)
- Egypt - 2013 only, discontinued

active samplers:
Kenya (University, Nairobi) 2014, 2015, 2017-18
Ghana (GAEC, Accra) 2014-2017, 2018?

White et al., 2021, Environ. Sci. Technol.

Environmental Science & Technology

pubs.acs.org/est

Article

Temporal Trends of Persistent Organic Pollutants across Africa after a Decade of MONET Passive Air Sampling

Kevin B. White, Jiří Kalina, Martin Scheringer,* Petra Přibylová, Petr Kukučka, Jiří Kohoutek, Roman Prokeš, and Jana Klánová*

Cite This: *Environ. Sci. Technol.* 2021, 55, 9413−9424

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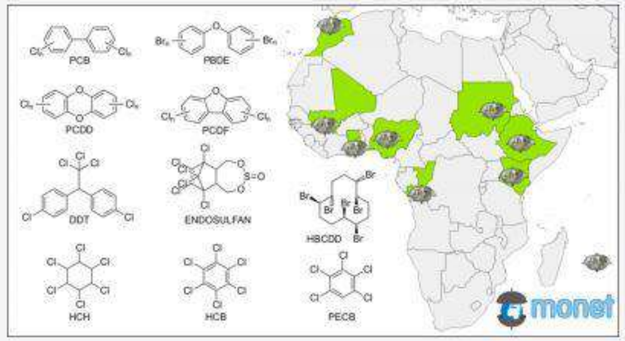
ACCESS | Metrics & More | Article Recommendations | Supporting Information

ABSTRACT: The Global Monitoring Plan of the Stockholm Convention on Persistent Organic Pollutants (POPs) was established to generate long-term data necessary for evaluating the effectiveness of regulatory measures at a global scale. After a decade of passive air monitoring (2008−2019), MONET is the first network to produce sufficient data for the analysis of long-term temporal trends of POPs in the African atmosphere. This study reports concentrations of 20 POPs (aldrin, chlordane, chlordecone, DDT, dieldrin, endrin, endosulfan, HBCDD, HCB, HCHs, heptachlor, hexabromobiphenyl, mirex, PBDEs, PCBs, PCDDs, PCDFs, PeCB, PFOA, and PFOS) monitored in 9 countries (Congo, Ghana, Ethiopia, Kenya, Mali, Mauritius, Morocco, Nigeria, and Sudan). As of January 1, 2019, concentrations were in the following ranges (pg/m^3): 0.5−37.7 ($\sum_6$PCB), 0.006−0.724 ($\sum_{17}$PCDD/F), 0.05−5.5 ($\sum_9$PBDE), 0.6−11.3 (BDE 209), 0.1−1.8 ($\sum_3$HBCDD), 1.8−138 ($\sum_6$DDT), 0.1−24.3 ($\sum_3$endosulfan), 0.6−14.6 ($\sum_4$HCH), 9.1−26.4 (HCB), 13.8−18.2 (PeCB). Temporal trends indicate that concentrations of many POPs (PCBs, DDT, HCHs, endosulfan) have declined significantly over the past 10 years, though the rate was slow at some sites. Concentrations of other POPs such as PCDD/Fs and PBDEs have not changed significantly over the past decade and are in fact increasing at some sites, attributed to the prevalence of open burning of waste (particularly e-waste) across Africa. Modeled airflow back-trajectories suggest that the elevated concentrations at some sites are primarily due to sustained local emissions, while the low concentrations measured at Mt. Kenya represent the continental background level and are primarily influenced by long-range transport.



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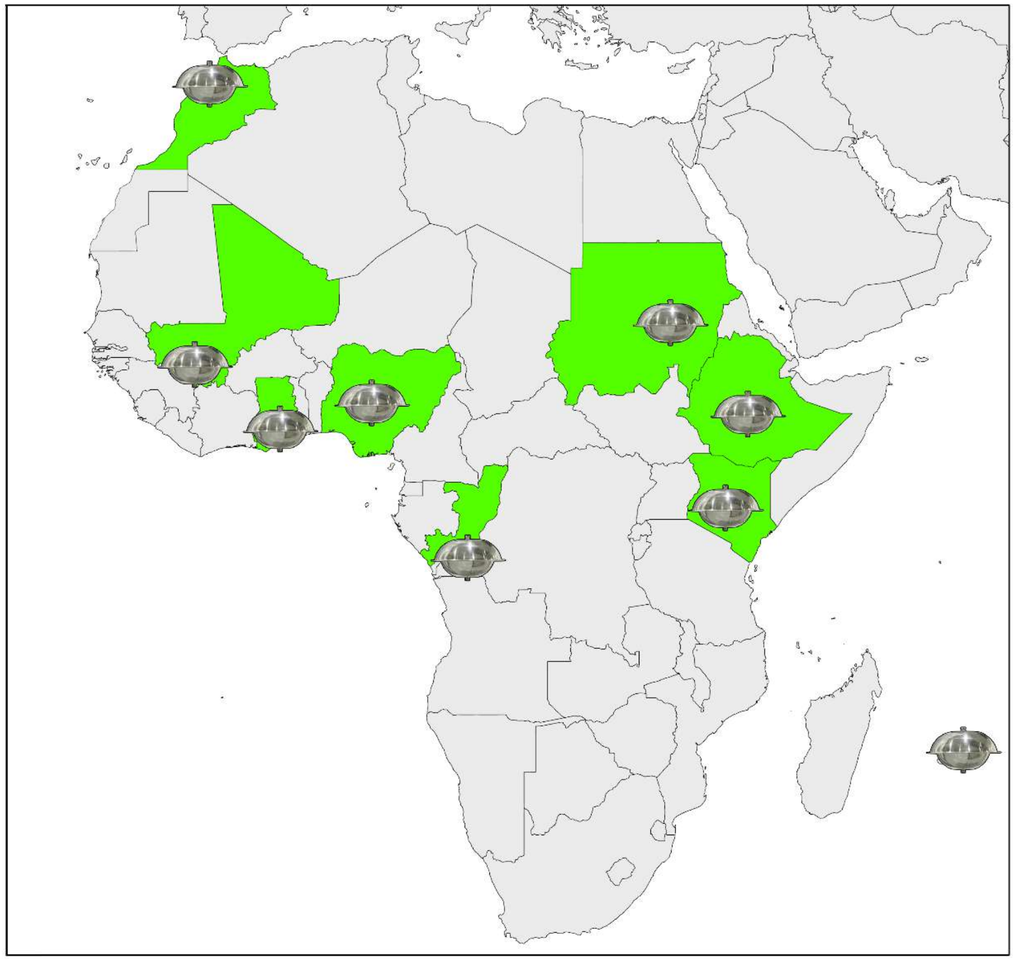
MONET Africa

- Continuous long-term monitoring in 6 countries (2008/2010 – 2019)
  - Congo
  - Ethiopia
  - Ghana
  - Kenya
  - Mauritius
  - Nigeria

- Shorter monitoring in an additional 3 countries
  - Mali (2016 – 2019)
  - Morocco (2014 – 2016)
  - Sudan (2008 – 2014)



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Trends & Source Regions

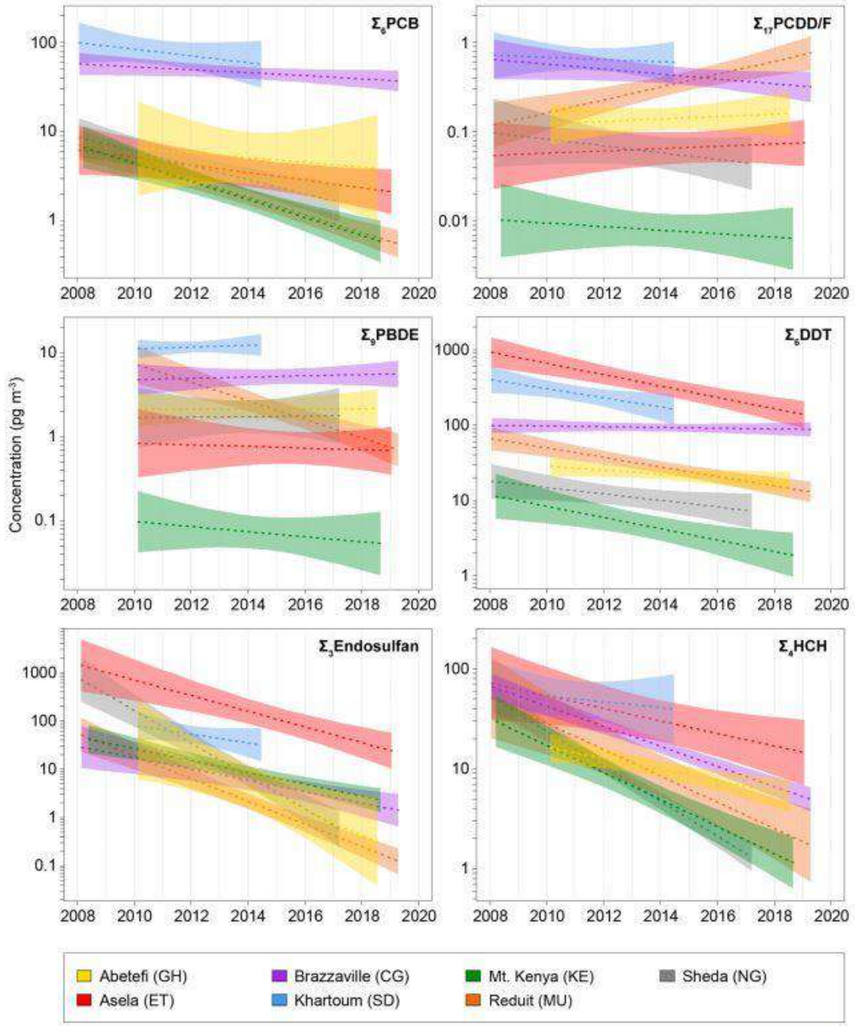

Figure 1. Temporal trends of atmospheric POP concentrations at MONET sites in Africa with long-term monitoring (2008–2019): $\sum_6$PCB (28, 52, 101, 138, 153, 180); $\sum_{17}$PCDD/F (7 PCDDs, 10 PCDFs); $\sum_9$PBDE (28, 47, 66, 85, 99, 100, 153, 154, 183; 209 excluded); $\sum_6$DDT (o,p′-DDD, o,p′-DDE, o,p′-DDT, p,p′-DDD, p,p′-DDE, p,p′-DDT); $\sum_3$endosulfan (α, β, sulfate); $\sum_4$HCH (α, β, γ, δ). Dotted lines depict average exponential trends (percent change per year), and shaded areas depict the 95% confidence intervals. For visual clarity individual sample concentrations are not shown.

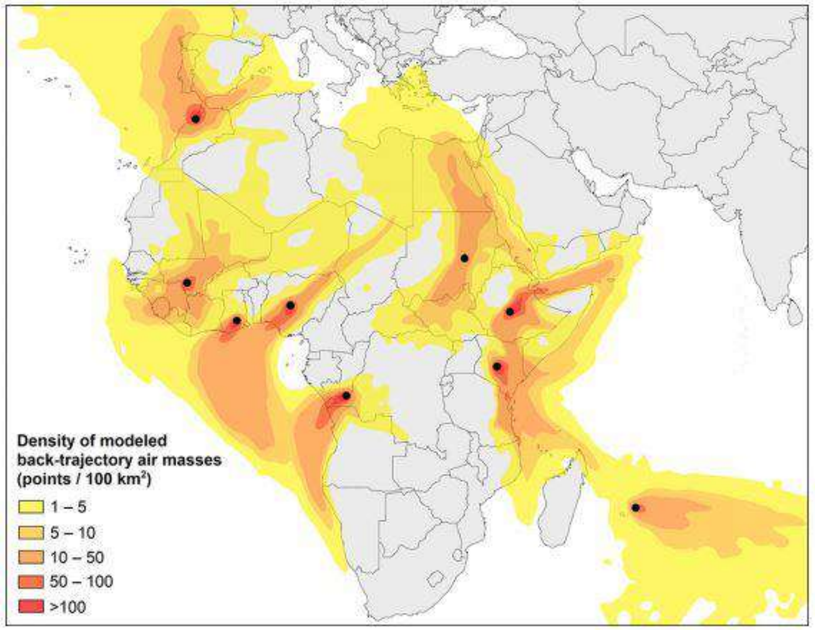

Figure 2. Density heat map of 120-h back-trajectories for each MONET site in Africa modeled every 3 h for 365 days (January–December 2018) using HYSPLIT (v.4.2.0, NOAA).[26] Each individual 120-h back-trajectory line was converted into 120 hourly air mass points. The density of these points within each 100 km^2 grid cell across the continent accounts for both the total distance covered by each air mass and its residence time within each grid cell. Density values are semiquantitative and dependent on the rate of modeled release (3 h) and time resolution of air mass points (hourly). As such, they should be interpreted with caution and used solely to make visual comparisons of the total spatial coverage of each site. This density heat map depicts the sum of all 108 site-specific monthly back-trajectory aggregations presented in Figure S4. The map was created in ArcGIS (v.10.7, Esri).

Work outputs have been used in the GMP 3 Africa report

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Addressing aquatic POPs monitoring as scope of the Stockholm Convention increases

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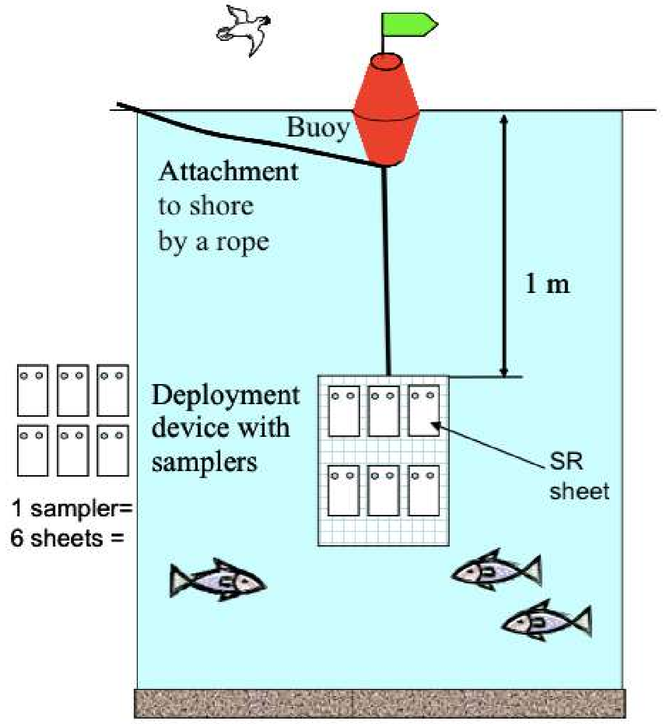
POPs in water pilot in Africa

passive water sampling 2014, 2015/2016 in MONET countries

Samples analysed by the RECETOX

sampling with XAD polymer raisin



sillicone rubber sampling

training video for water sampling in 2017 - available in EN/FR!

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POPs in water pilot in Africa

passive water sampling 2014, 2015/2016 in MONET countries

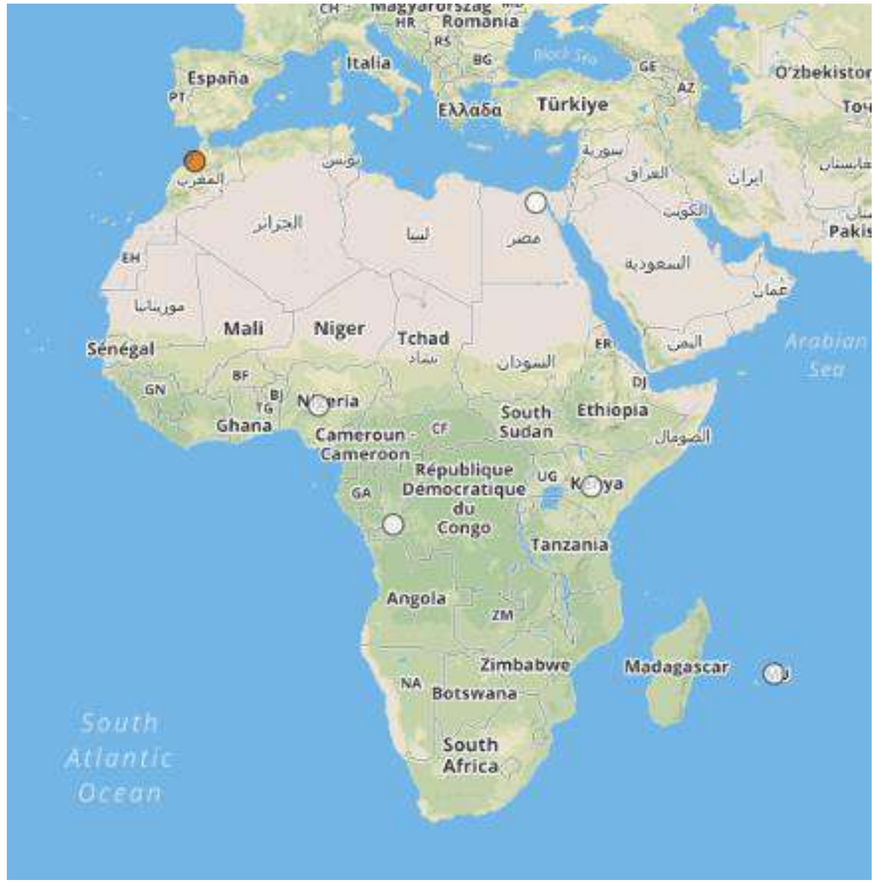
Samples analysed by RECETOX,

data available in www.genasis.cz for 2014

Countries participating (delivering samples)

R.of Congo 2014, 2015/6
Egypt (2013 only)
Ethiopia 2015/6
Ghana 2014, 2015/6
Kenya 2014, 2015/6 2017
Marocco 2014/5 and 2015/6
Mauritius 2014, 2015/2016, 2017
Nigeria 2014, 2015/6

data available: range 0.004-1 ng/l for
various PFC compounds and alternatives



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New global network tracing POPs in water: Aqua MONET first results

Branislav Vrana, Foppe Smedes, Jaromír Sobotka, Jana Klánová
branislav.vrana@recetox.muni.cz

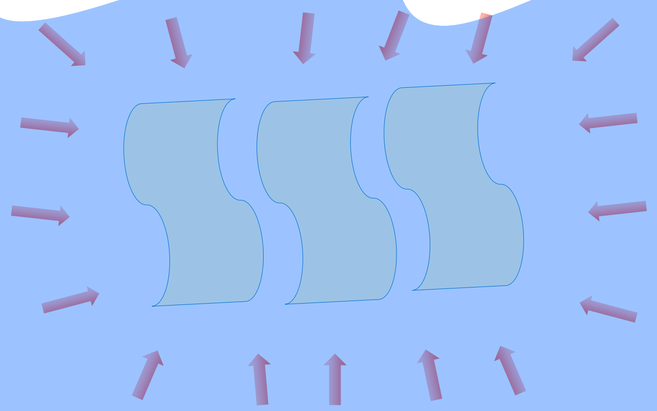
Introduction

- Motivated by Global Atmospheric Passive Sampling program (GAPS)
- Lohmann and Muir (2010) ‘Aquatic Global Passive Sampling (AQUA-GAPS)’
- Aim to understand geographical distributions and temporal trends of organic contaminants, such as
  - persistent organic pollutants (POPs) under SC
  - polycyclic aromatic hydrocarbons (PAHs)
  - novel flame retardants and other contaminants of emerging concern.
- **Aqua MONET** to support Stockholm Convention (SC) on POPs
- Scope of Aqua MONET beyond legacy POPs
- objective - Provide information on levels and trends of POPs in the aqueous environment which are spatially and temporally comparable on a global scale

Why monitoring using passive sampling

Passive sampling is like actively adding/inserting

an artificial compartment -<u>with defined composition and properties</u>- into the environment



Confirms to the major rule in environmental monitoring:

“*the matrix of collected samples*

must have defined (or constant) properties

over time and space”

POPs concentration in the silicone at equilibrium with water are globally comparable

Conversion to other defined matrices:

- ➢ freely dissolved concentration
- ➢ lipid basis

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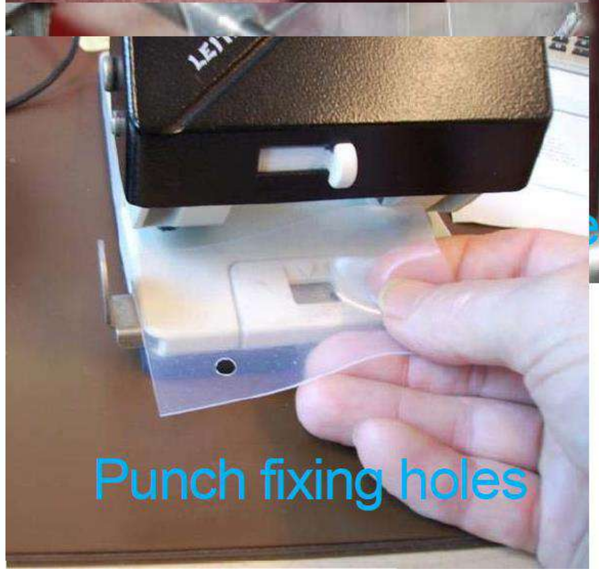
Preparation of silicone passive samplers



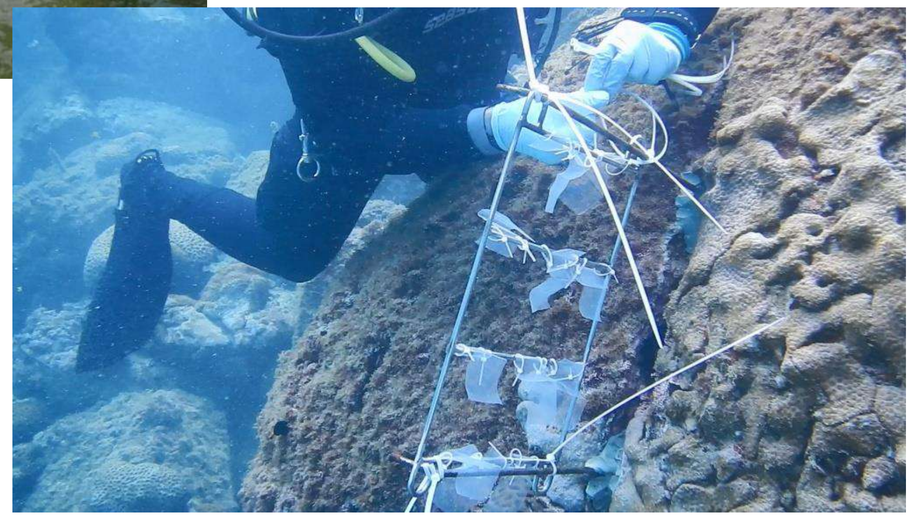
Field deployment

mount the samplers

deploy the samples from a buoy

or a bridge

samplers get fouled and need to be cleaned



After exposure of 6 weeks to one year

participants retrieve the samplers

clean them with local water

and send them back to

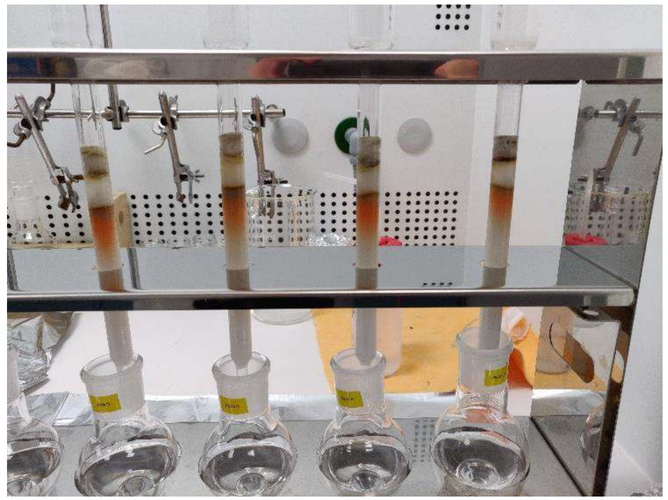
RECETOX

Laboratory procedure at RECETOX

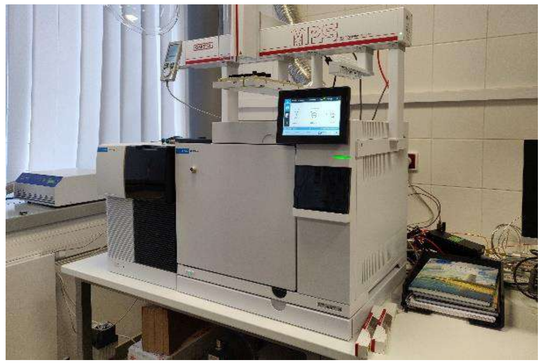
Extraction

Removal of high MW material

Further cleanup POP extract

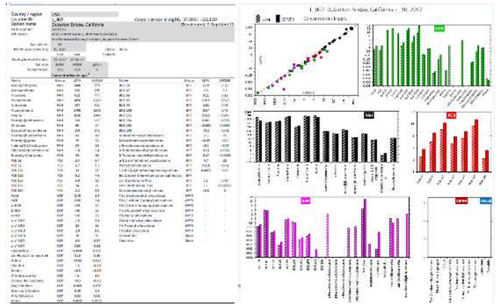


Instrumental quantification



Data processing

Reporting



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Target compounds

- PAH polycyclic aromatic hydrocarbons
- PCB polychlorinated biphenyls
- OCP organochlorine pesticides
- BDE brominated diphenyl ethers
- novel BFR novel brominated flame retardants
- OPFR organophosphate flame retardants
- MUSK musk fragrancies
- PFAS

Environmental Science & Technology

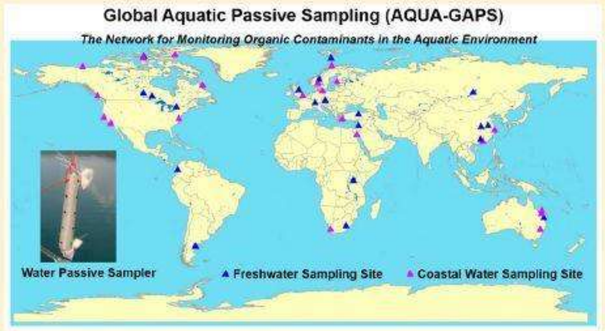
Feature

pubs.acs.org/est

Aquatic Global Passive Sampling (AQUA-GAPS) Revisited: First Steps toward a Network of Networks for Monitoring Organic Contaminants in the Aquatic Environment

Rainer Lohmann,[*,†] Derek Muir,[‡,§] Eddy Y. Zeng,[§] Lian-Jun Bao,[§] Ian J. Allan,[∥] Kenneth Arinaitwe,[⊥] Kees Booij,[#] Paul Helm,[▽] Sarit Kaserzon,[¶] Jochen F. Mueller,[¶] Yasuyuki Shibata,[○] Foppe Smedes,[∞] Manolis Tsapakis,[⊗] Charles S. Wong,[§,▲] and Jing You[§]

ABSTRACT: Organic contaminants, in particular persistent organic pollutants (POPs), adversely affect water quality and aquatic food webs across the globe. As of now, there is no globally consistent information available on concentrations of dissolved POPs in water bodies. The advance of passive sampling techniques has made it possible to establish a global monitoring program for these compounds in the waters of the world, which we call the Aquatic Global Passive Sampling (AQUA-GAPS) network. A recent expert meeting discussed the background, motivations, and strategic approaches of AQUA-GAPS, and its implementation as a network of networks for monitoring organic contaminants (e.g., POPs and others contaminants of concern). Initially, AQUA-GAPS will demonstrate its operating principle via two proof-of-concept studies focused on the detection of legacy and emerging POPs in freshwater and coastal marine sites using both polyethylene and silicone passive samplers. AQUA-GAPS is set up as a decentralized network, which is open to other participants from around the world to participate in deployments and to initiate new studies. In particular, participants are sought to initiate deployments and studies investigating the presence of legacy and emerging POPs in Africa, Central, and South America.



- Proof of concept in 2016/2017
- Freshwater is sampled 2016 –analysis from July 2017
- Fresh-and coastal-water sampling from June 2017
- Learning by doing → logistics and practicalities

Aqua MONET to support POPs monitoring

Challenges/opportunities towards GMP-4

POPs air sampling in outside GMP partner networks very limited, if any

next GEF supported project(s) in preparation - GLOBAL, but not before 2025…

MONET network (operated by RECETOX/SCRC CZ) ready to support air and/or water sampling using PAS. In collaboration with the RECETOX RI potentially some chemical analysis could be performed as well - contact us, please (use my e-mail)

AQUA MONET - passive sampling of water - in large inland lakes or reservoirs (branislav.vrana@recetox.muni.cz)

GEF GMP2 project - grab sampling in large rivers, but we need other sites as the riverine monitoring did not show levels.

Goal = to have samples collected (at least) and available data for GMP4 reports, otherwise almost no new data post 2019

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Support towards GMP-4 - water

Lake Victoria (Uganda OR Kenya)
Lake Turkana in Kenya
Lake Tanganyika in Zambia
Lake Tana in Ethiopia
Lake Volta in Ghana
Lake Malawi (any of the adjacent countries)
Atlantic coast in Morocco
Atlantic coast in South Africa
Indian Ocean coast in South Africa

green - have people ready to sample
yellow - can have

Goal = to have samples collected (at least) and available data for GMP4 reports, otherwise almost no data post 2019

Additional reading - towards sustainability…

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Stockholm Convention
Regional Centre

Ensuring comparability in global air monitoring: global intercomparison of polyurethane foam passive air samplers

Lisa Melymuk[1], Pernilla Bohlin Nizzetto[2], Tom Harner[3], Kevin B. White[1], Xianyu Wang[4], Maria Yumiko Tominaga[5], Jun He[6], Jun Li[7], Jianmin Ma[8], Wan-Li Ma[9], Beatriz H. Aristizábal[10], Annekatrin Dryer[11], Begoña Jiménez[12], Juan Muñoz-Arnanz[12], Mustafa Odabasi[13], Yetkin Dumanoglu[13], Baris Yaman[13], Carola Graf[14], Andrew Sweetman[14], Jana Klánová[1]

1 - RECETOX, Masaryk University, Brno, Czech Rep.; 2 - NILU - Norwegian Institute for Air Research, Kjeller, Norway; 3 - Air Quality Processes Research Section, Environment and Climate Change Canada, Toronto, Canada; 4 - Queensland Alliance for Environmental Health Sciences (QAEHS), The University of Queensland, Australia; 5 - CETESB - São Paulo State Environmental Company, São Paulo, Brazil; 6 - Department of Chemical and Environmental Engineering, University of Nottingham Ningbo China, Ningbo, China; 7 - State Key Laboratory of Organic Geochemistry, Guangzhou Institute of Geochemistry, Chinese Academy of Sciences, Guangzhou, China; 8 - College of Urban and Environmental Sciences, Peking University, Beijing, China; 9 - International Joint Research Center for Persistent Toxic Substances (IJRC-PTS), Harbin Institute of Technology, Harbin, China; 10 - Hydraulic Engineering and Environmental Research Group (GTAIHA), Universidad Nacional de Colombia, Manizales, Colombia; 11 - Eurofins GfA GmbH (now operating under the name ANECO Institut für Umweltschutz GmbH & Co); 12 - Department of Instrumental Analysis and Environmental Chemistry, IQOG-CSIC, Madrid, Spain; 13 - Department of Environmental Engineering, Dokuz Eylul University, Buca-Izmir, Turkey; 14 - Lancaster Environment Centre, Lancaster University, UK

lisa.melymuk@recetox.muni.cz

RECETOX, MASARYK UNIVERSITY, BRNO, CZECHIA

Side event: Tracing POPs in the environment - strategic partnerships, knowledge management and capacity building at the global scale, 28 July 2021, 6-7 pm
online segment of the meetings of the COPs to the Basel, Rotterdam and Stockholm conventions (26-30 July 2021)

Rationale

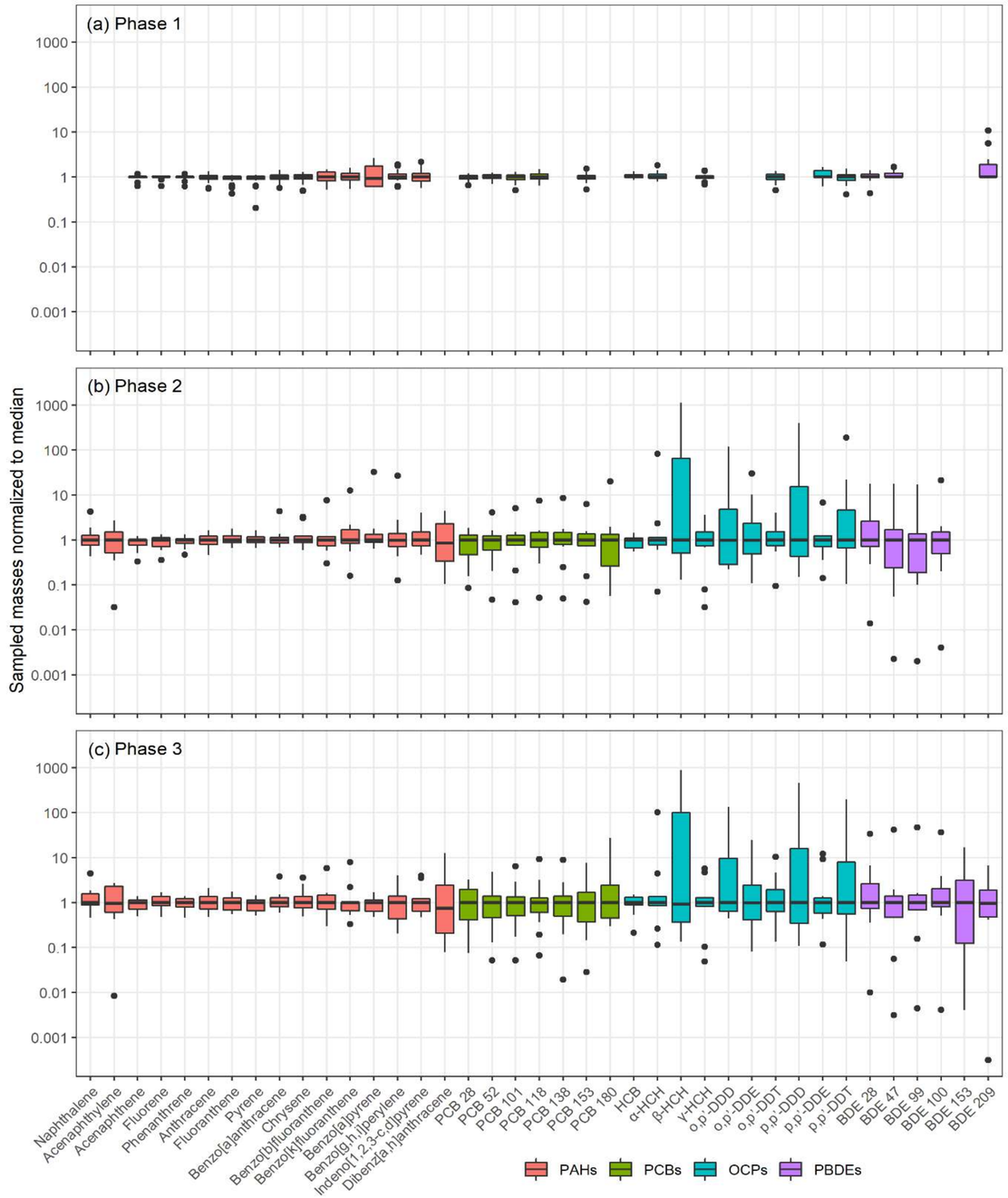
- Polyurethane foam passive air samplers (PUF-PAS) are widely used in international air monitoring of POPs
- Enabled the development of international air monitoring programs such as GAPS and MONET
- Simple design of the PUF-PAS is key advantage, but has led to many individually-designed versions around the world
  - All following the same original PUF-PAS concept of Shoeib and Harner of a PUF disk protected by a metal double-dome housing, but there is no standardized geometry
- We established an international intercomparison in 2015 to evaluate sources of variability in PUF-PAS-generated data.
- Involving institutes from 12 countries (Australia, Brazil, Canada, China, Colombia, Czechia, Germany, Mexico, Norway, Spain, Turkey, UK)
- Key objective is to understand the comparability of PUF-PAS generated data from different networks/monitoring programs, using PAS of different geometries and analyzed in different labs

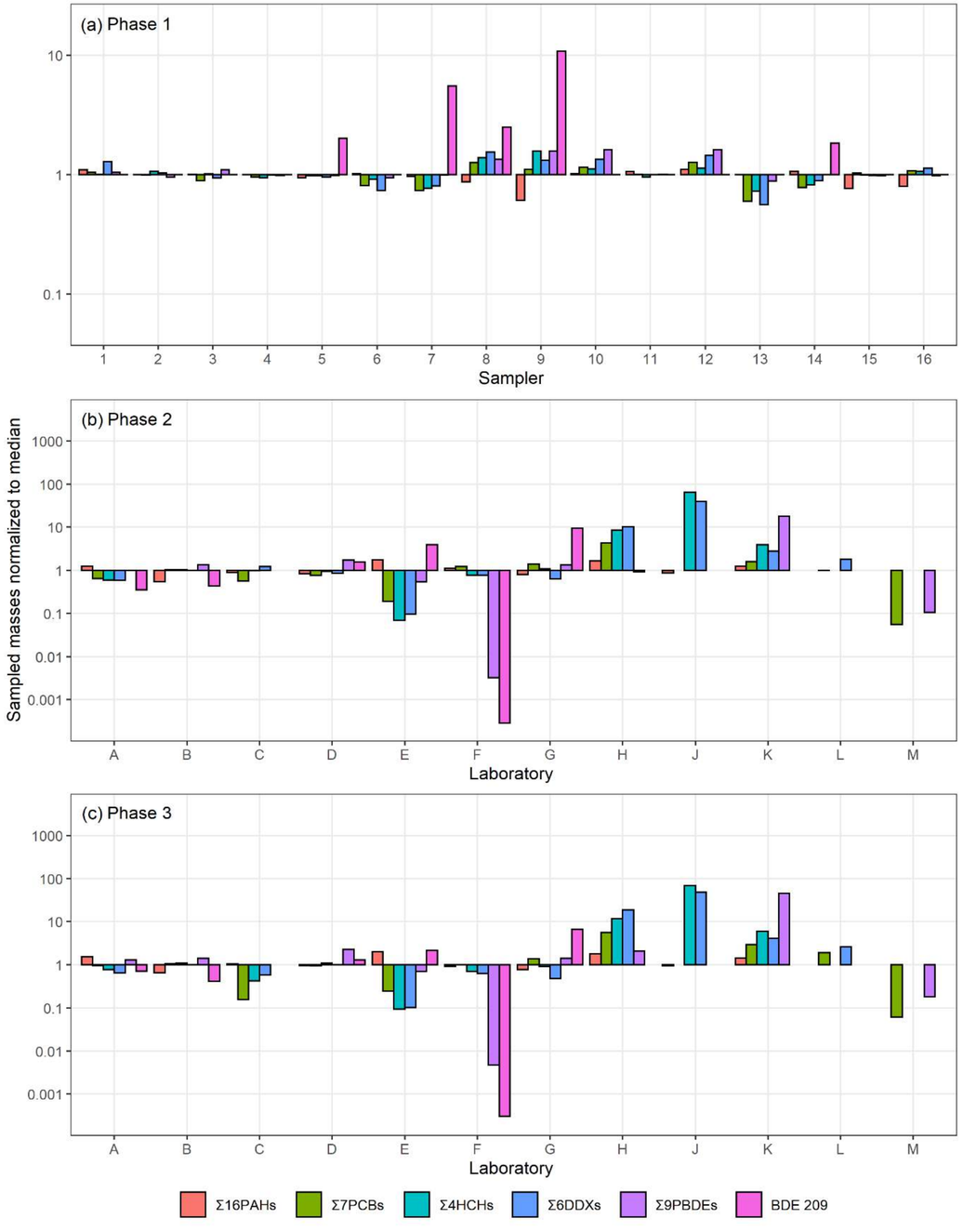





1. What is the variability introduced by differences in PUF-PAS sampler designs and deployment practices?
2. What is the variability introduced by differences in analytical methods/performance between laboratories?
3. What is the overall variability/comparability between PUF-PAS-derived air concentrations for POPs from different programs/laboratories?

- Phase 1: Different samplers, same lab
- Phase 2: Same samplers, different labs
- Phase 3: Different samplers, different labs


(a) Phase 1
(b) Phase 2
(c) Phase 3
Sampled masses normalized to median
Naphthalene
Acenaphthylene
Acenaphthene
Fluorene
Phenanthrene
Anthracene
Fluoranthene
Pyrene
Benzo[a]anthracene
Chrysene
Benzo[b]fluoranthene
Benzo[k]fluoranthene
Benzo[a]pyrene
Benzo[g,h,i]perylene
Indeno[1,2,3-c,d]pyrene
Dibenz[a,h]anthracene
PCB 28
PCB 52
PCB 101
PCB 118
PCB 138
PCB 153
PCB 180
HCB
α-HCH
β-HCH
γ-HCH
o,p'-DDD
o,p'-DDE
o,p'-DDT
p,p'-DDD
p,p'-DDE
p,p'-DDT
BDE 28
BDE 47
BDE 99
BDE 100
BDE 153
BDE 209
PAHs
PCBs
OCPs
PBDEs


(a) Phase 1
Sampler
(b) Phase 2
Sampled masses normalized to median
Laboratory
(c) Phase 3
Laboratory
Σ16PAHs
Σ7PCBs
Σ4HCHs
Σ6DDXs
Σ9PBDEs
BDE 209

Implications for comparability

- Differences in sampler design (especially spacing between upper and lower bowls) account **for up to 50%** differences in masses collected by samplers
- Differences introduced by analysis in different laboratories span **orders of magnitude** for POPs (PCBs, DDT, HCHs, PBDEs) and PAHs

- Cannot assume comparability between laboratories/monitoring programs for current data.
  - Largest networks (GAPS, MONET) provided similar results but many other laboratories had substantial differences

- To mobilize more SVOC data to contribute to effectiveness evaluation, intercalibration exercises should be routine, repeated at regular intervals, to avoid biases in global-scale assessments of SVOCs that can be caused by differences in laboratory performance.

- Interlaboratory comparisons must replicate real sampling scenarios (background concentrations, including all steps from extraction to analysis)

المملكة المغربية
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Royaume du Maroc

MINISTÈRE DE LA TRANSITION ENERGETIQUE ET DU DEVELOPPEMENT DURABLE
DÉPARTEMENT DU DEVELOPPEMENT DURABLE
وزارة الانتقال الطاقي والتنمية المستدامة
قطاع التنمية المستدامة

Atelier Final du projet GMP2 (UNEP/GEF)

« Soutien Régional Continu au Plan de Surveillance Mondial des POPs dans le Cadre de la Convention de Stockholm en Afrique »

Durabilité de la surveillance des POPs au Maroc

LNESP | LABORATOIRE NATIONAL DES ETUDES ET DE SURVEILLANCE DE LA POLLUTION

Principales Réalisations

Actualisation en 2019 des Inventaires de Pesticides

Données nationales sur les stocks de pesticides

Inventaire des HBCD et PFOS

Inventaire des E.E. HT et THT

Lancement des opérations de dépistage.

Plateforme de Décontamination

Démantèlement sécurisé et décontamination des appareils contaminés par les PCB

Projet d'Élimination des Pesticides

Lancement d'une initiative d'envergure pour l'élimination des pesticides obsolètes, y compris les POPs

Valorisation des Données IMAP

Utilisation des résultats d'analyses des biotes et des sédiments pour les POPs

(Projet IMAP)

Retombées des Actions réalisées

Amélioration de la Gestion Environnementale : contribution à la gestion des risques environnementaux liés aux POPs.

Renforcement des Capacités Techniques :

Acquisition d'équipements et formation des laborantins

Prévention des Risques Sanitaires : dépistage pour la réduction des risque d'exposition pour les populations

Contribution à la Sécurité Alimentaire

minimiser la contamination des produits agricoles en gérant proactivement les stocks de pesticides

Collaborations Fructueuses

synergie entre le GMP2 et d'autres initiatives a stimulé la collaboration intersectorielle.

Stratégies pour la Surveillance Durable

Fondations Établies pour un Avenir Durable

Intégration des POPs dans les Programmes :

Incorporation des initiatives de surveillance des POPs dans divers programmes nationaux pour assurer une approche cohérente et intégrée.

Renforcement des Capacités :

- **Essais Inter-laboratoires : Organisation d'essais collaboratifs pour améliorer la précision des analyses.**
- **Formation des Laborantins : formation pour améliorer les compétences techniques pour la surveillance des POPs.**

Moyens Techniques :

- **Acquisition de Matériel : Investissement dans des équipements de pointe pour les laboratoires.**
- **Maintenance des Équipements**
- **Fournitures de Laboratoire**

Partenariat et R&D :

- **Collaborations Stratégiques : avec des institutions nationales et internationales pour la recherche et le développement de méthodes de surveillance innovantes.**
- **Réseau de Laboratoires : Création d'un réseau national de laboratoires**

Actions Envisagées pour le Futur
Perspectives et Initiatives Proactives

Gestion des Données et Reporting

- Développement de systèmes avancés pour la collecte, la gestion et l'analyse des données environnementales

Transfert du Savoir-Faire :

- Partage actif des connaissances et des compétences avec d'autres institutions et laboratoires.

Base de Données Nationale:

- Création d'une base de données centralisée pour recueillir, stocker et analyser les informations relatives aux POPs

Gestion des Sites Pollués :

- Identification proactive et gestion des sites pollués par les POPs.

Coopération Internationale Étendue :

- liens avec des partenaires internationaux pour échanger des expériences, des connaissances et des ressources.

Continuité avec le Projet GMP3 :

- Assurer une transition harmonieuse et une continuité stratégique dans le cadre du projet GMP3

Vers un Avenir Collaboratif et Engagé

Importance de la Collaboration Intersectorielle : coopération entre les différents secteurs et acteurs pour une gestion efficace des POPs.

Renforcement des Partenariats Existantes.

Élargissement du Réseau International : collaborations internationales pour bénéficier d'expertises.

Innovation et Recherche : la recherche et le développement de nouvelles méthodes pour la surveillance des POPs.

Engagement Communautaire : l'implication des communautés locales et des parties prenantes dans la surveillance des POPs,


شكرا
Merci
Thank you

Item 18: Follow-up analysis and activities in Mauritius

Mauritius pertinent activities at national level after the GMP II project

- POPs monitoring project (ISLANDS project)
- Monitoring of background level POPs near Transfer Station and Landfills
- Set up of a pesticides residues testing facility in 2022 for monitoring of pesticides in the environment (Acquisition of GC-MS and UHPLC-MS/MS).
- Data derived from the GMP II project is being used in the National Implementation Plan (NIP).
- Review/reinforcement of present legislation- National Standards for Air Quality.
- Review of EIA Conditions for Incinerators to restrict Dioxin/Furans emission.
- Enforcement of Regulations and Prohibition Notices.

Overview of the outputs of the UNEP/GEF POPs GMP2 project (Extension)

Assessment of Environmental and Public Health Implications of Using Wastewater Treatment Plants Sludge in Agriculture Soil Amendment and produced Crops Content of POPs in EGYPT

Project Egypt perspective

Prof. Dr. Yasser Mohamed Nabil

Head of POPs and FCMs labs and Environmental Health Consultant

Dr. Shaimaa El-Sayed Mohammed Ali

Stockholm Convention National Focal Point

Final Meeting of the UNEP/GEF GMP of POPs projects in: African Region

Casablanca, Morocco 28-30 November 2023

Potential Risks of POPs (Dioxin, DL-PCBs, I-PCBs and PAHs) in Treated Sludge, Soil, Water, and Vegetable Crops

Introduction

- According to the environmental, Egyptian law emphasizes that sewage sludge that doesn't fit the standards must be disposed of at controlled landfills and prevented from being used in agriculture.
- The agronomic value of sewage sludge depends on its nutrients, trace elements, and organic matter content. The sludge contains agronomically valuable amounts of major plant nutrients, including nitrogen, phosphorus, potassium, and other macronutrients such as calcium, magnesium, and iron. It is complicated to place actual monetary values for the trace elements or organic matter applied to the soil. Organic matter is essential in maintaining and improving a wide range of soil properties that improve the plant root environment. Plants are better able to withstand drought conditions, extract water, and utilize nutrients. Especially in sandy soils, adding organic matter increases the water-holding capacity, soil aggregation, and cation exchange capacity, which is a significant property for supplying plant nutrients. Moreover, it reduces surface runoff, erosion, and soil bulk density [1] .

[1] Eliot Epstein, (2003). ''Land application of sewage sludge and biosolids". Lewis publishers, USA.

Potential Risks of POPs (Dioxin, DL-PCBs, I-PCBs and PAHs) in Treated Sludge, Soil, Water, and Vegetable Crops

Objective of this Study

- **Assessment of Environmental and Public Health Implications of Using Wastewater Treatment Plants (WWTPs) Sludge in Agriculture Soil Amendment and produced Crops Content of POPs**

- The project activities and the data it will generate are highly needed to end a decision-making debate raised between agriculture development experts and public health experts to give the allowable limits that should be tolerated in case of sludge application to reclaimed agriculture land in desert virgin areas.
- The generated compiled data will give the scientific evidence needed to evaluate the contaminated lands, dictating the types of crops that should be grown with minimal possible POP accumulation and not exceed the permissible limits stated by EU countries to improve agriculture exportation from Egypt to those countries.
- Assess the levels of POP contamination, including **heavy metals**, **chlorinated and halogenated organic compounds,** and **trace pesticide residues** in **the sludge** generated at variable-sized wastewater treatment plants near agriculture areas.
- Assess the levels of POPs chemicals in **the soils** where air dried sludge or sludge effluents have been used to amend their organic content to be used as a source for helping plants to grow.
- Assess the accumulation levels in grown **plants** entering the food cycle as produced in those lands.
- Accumulate data to support the establishment of the absent POPs limits in the Egyptian health laws, which should control the levels of sewage sludge application to prevent their further concentration in the human food cycle, leading to the observed
- Create scientific evidence-based facts towards giving more attention to other ways of sludge treatment before it is used as a soil amendment or even consider using it as an alternative fuel.

Potential Risks of POPs (Dioxin, DL-PCBs, I-PCBs and PAHs) in Treated Sludge, Soil, Water, and Vegetables

Sampling:

- 4 Treated Sludge (WWTPs) – (location: Abou rawash and Zenin wastewater plants
- 6 Irrigated Water –(location: Kafer Hamza Elsharky- Qliuobyia)
- 8 Soil - (location: Kafer Hamza Elsharky- Qliuobyia)
- 18 Vegetable Crops - (location: Kafer Hamza Elsharky- Qliuobyia)

SN	POPs	Sludge	Vegetables	Soil	Water
1	Dioxin	EU: 50-100 ng TEQ/kg dwt	0.1 ng TEQ/kg wwt (ppt)	FAO2023: 120 pg/g 1,2,4,250 pgTEQ/g dwt	EPA 0.03 ng/L Japan: 0.001, UK: 0.01ngTEQ/L (10 pgTEQ/L)
2	Dioxin + DL-PCBs	EU: 30 ng TEQ/kg dwt	0.2 pg TEQ/g wwt	5mg/kg	
3	I-PCBs	EU: 0.8 mg/kg dwt	1 ug/kg wwt	100 ug/kg dwt	0.5 ug/L EPA: 0.17 ng/L
4	PAHs	6*	2008 EFSA 2.0 and 10.0µg/kg for BaP and PAH4,	{EU: 0.2 mg/kg FAO: 16 mg/kg} (benzo(a)pyrene)	EU: 0.1ug/L EPA**: 0.2ug/L

(* PAHs: Sum of Acenaphthene, Benzo(a)Pyrene, Benzo(b)Fluoranthene, Benzo(g,h,i)Perylene, Benzo(k)Fluoranthene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)Pyrene, Phenanthrene, and Pyrene)

** for benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene

Figure 1. Profile average of PCDD/Fs (pgTEQ/g) wwt in Vegetables

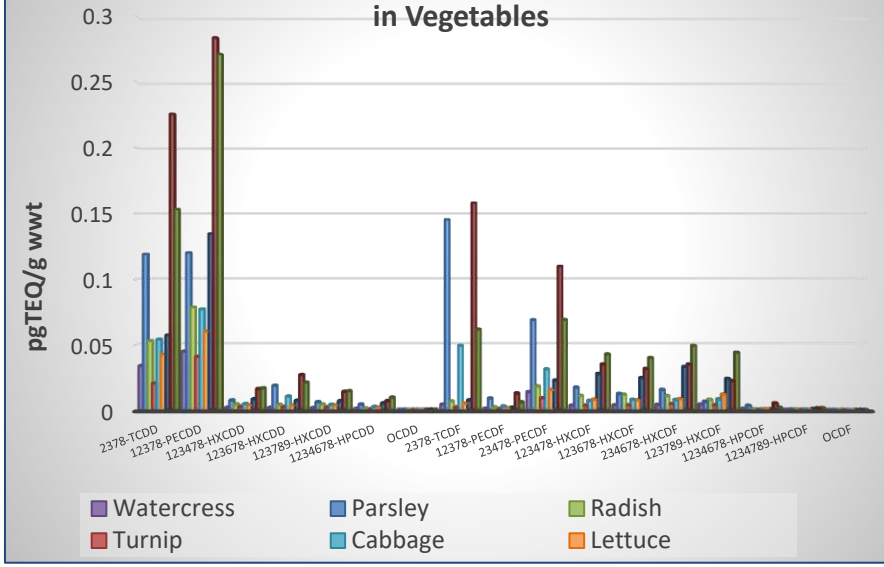


Figure 2. Average PCDD/Fs (pgTEQ/g) wwt catagory by Vegetables

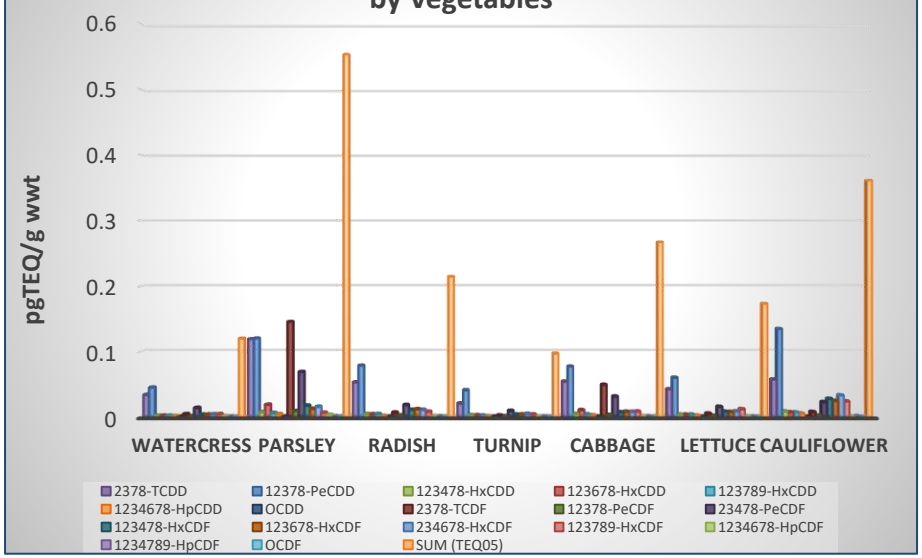


Figure 4. Average of PCDD/Fs pg/g TEQ05 in treated Sludge, Soil and Vegetables

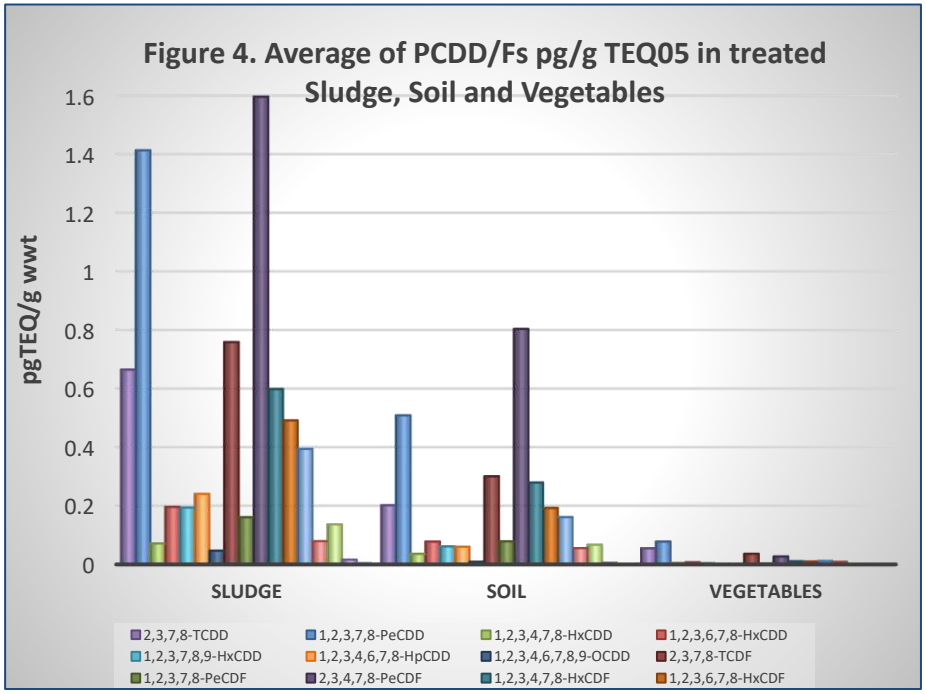
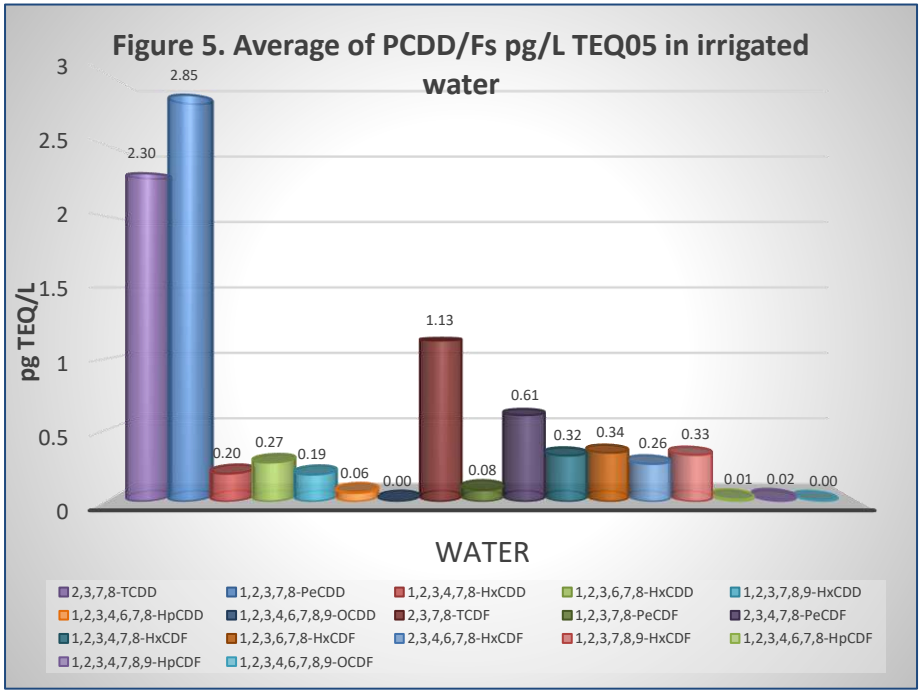


Figure 5. Average of PCDD/Fs pg/L TEQ05 in irrigated water



- From the data presented in Figures 1 and 2, it is evident that root vegetables such as Parsley have a higher concentration of dioxin than leafy vegetables. This is supported by the average profile of PCDD/Fs (pgTEQ/g) wet.
- The dioxin pattern found in treated sludge and soil is similar, as illustrated in Figure 4.
- Moreover, irrigated water has a higher concentration of dioxin, and both irrigated water (pgTEQ/L) and vegetables (pgTEQ/g) wwt have a significant profile, as shown in Figures 4 and 5.
- The highest levels of dioxin congeners found are in the order of PeCDD, followed by TCDD, TCDF, and PeCDF (PeCDD > TCDD > TCDF > PeCDF).

Figure 6. Profile average of DLPCBs (pgTEQ/g) wwt in Vegetables

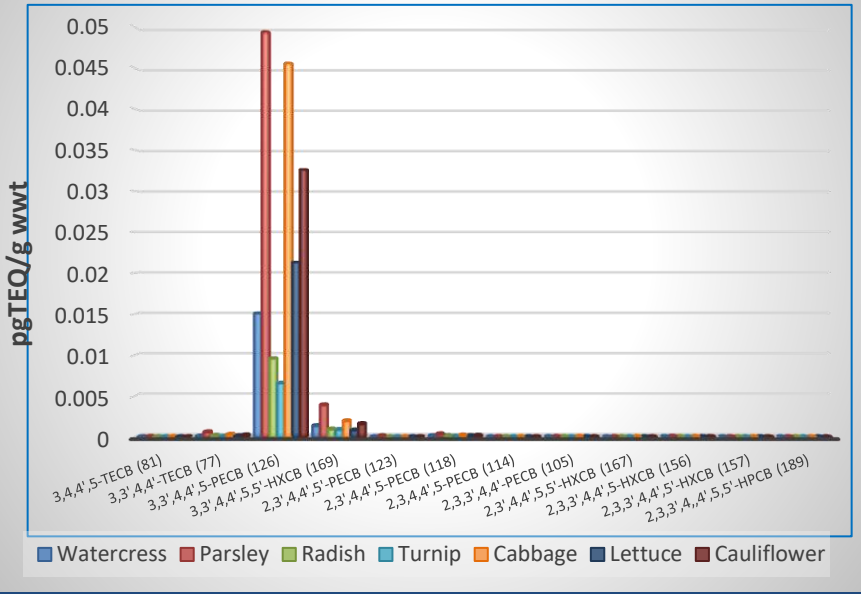


Figure 8. Average DLPCBs (pgTEQ/g) wwt catagory by Vegetables

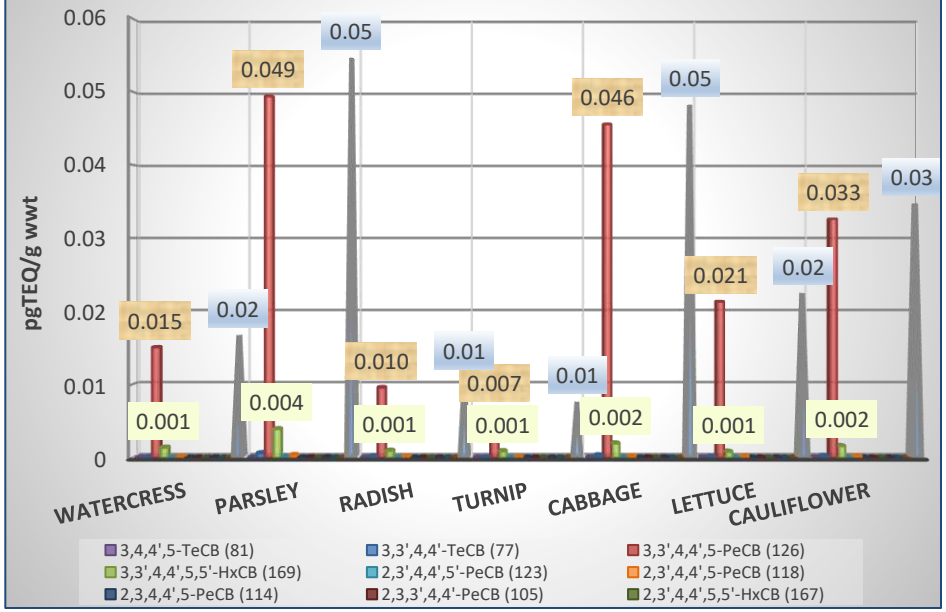


Figure 7. Average of DLPCBs in Sludge, Soil and Vegetables samples

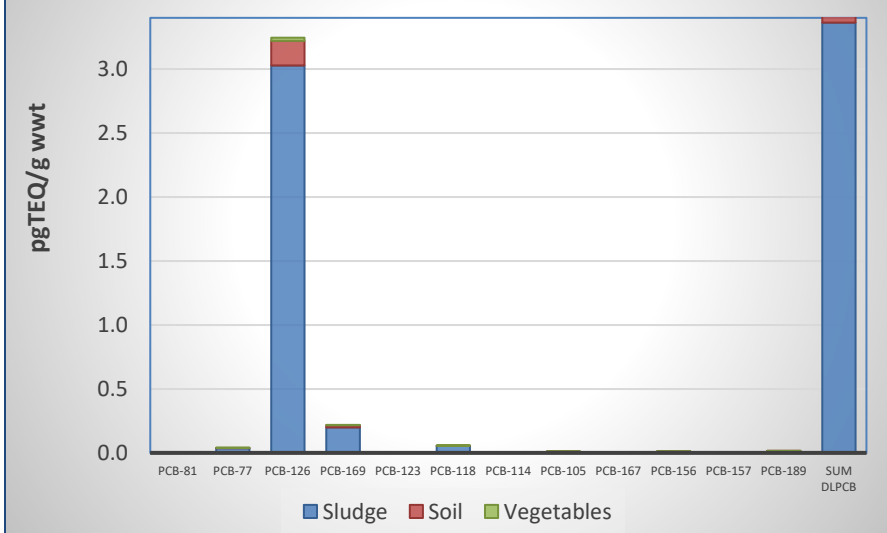
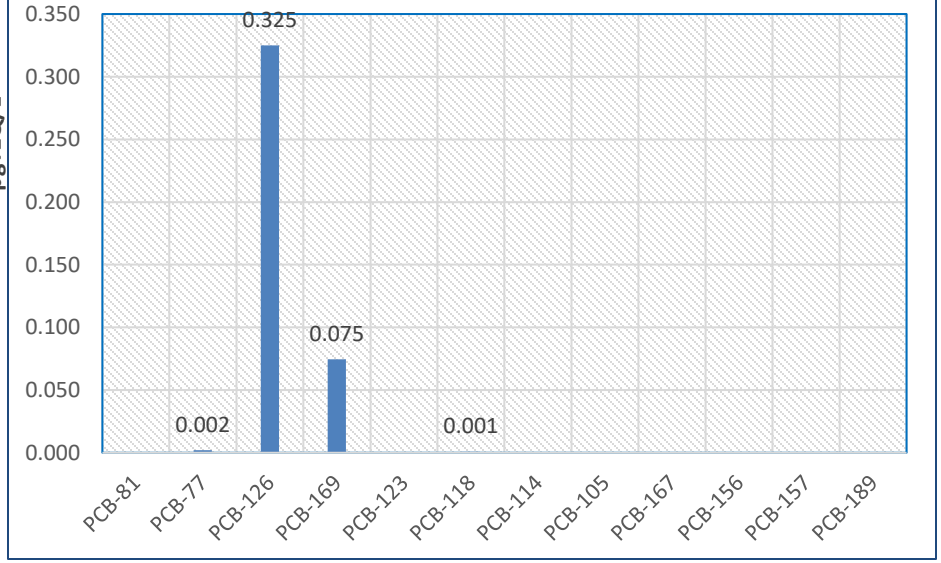


Figure 9. Average of DL-PCBs (pg/L TEQ05) in irrigated water



- Based on the information in Figures 6 and 8, it is clear that root vegetables such as Parsley contain more dioxin-like PCBs than leafy vegetables. This is supported by the average concentration of DL-PCBs (pgTEQ/g) in wet samples.
- The highest levels of DL-PCB congeners are found in the following order: dioxin-like PCBs, PCB-169, PCB-118, and PCB-77 (PCB-126 > 169 > 118 > 77).
- Based on the information presented, there is evident consistency in the concentration and profile of dioxin-like PCBs in irrigated water. This is supported by the fact that there was a high level of consistency between the GMP2 performed in 2018 and the GMP2 extension completed in 2023, as shown in Figure 9.
- It seems that the sampling and analysis processes were conducted competently at an accredited national lab (QCAP-Egypt), indicating reliable results. However, the level of DL-PCB in the environment with high concentrations of DL-PCB-126 and 169 denotes a stable source emission of contamination DL-PCB that is not yet under control.
- Furthermore, treated sludge and soil have a similar pattern of dioxin-like PCBs, as shown in Figure 7; however, their level in the Sludge is higher (DL-PCB-126 and 169) than in the Soil samples. while the contaminated sludge transfers to root vegetables rather than leafy vegetables.
- Additionally, there is a significant correlation between the concentration of dioxin-like PCBs 126 and 169 in irrigated water (pgTEQ/L) and vegetables (pgTEQ/g) in wet samples, as shown in Figures 7 and 9.

- Persistent compounds such as PCBs, PCDD/Fs and PAHs are generally not transferred from soil to crops, meat and milk although the possible evaporation of PCBs and foliar uptake needs more attention. Little is known about the uptake of phtalates and nonylphenol which are present in relatively high levels in sludge (RUDLING et al. 1997).

(6) Persistent compounds such as PCBs, PCDD/Fs ar
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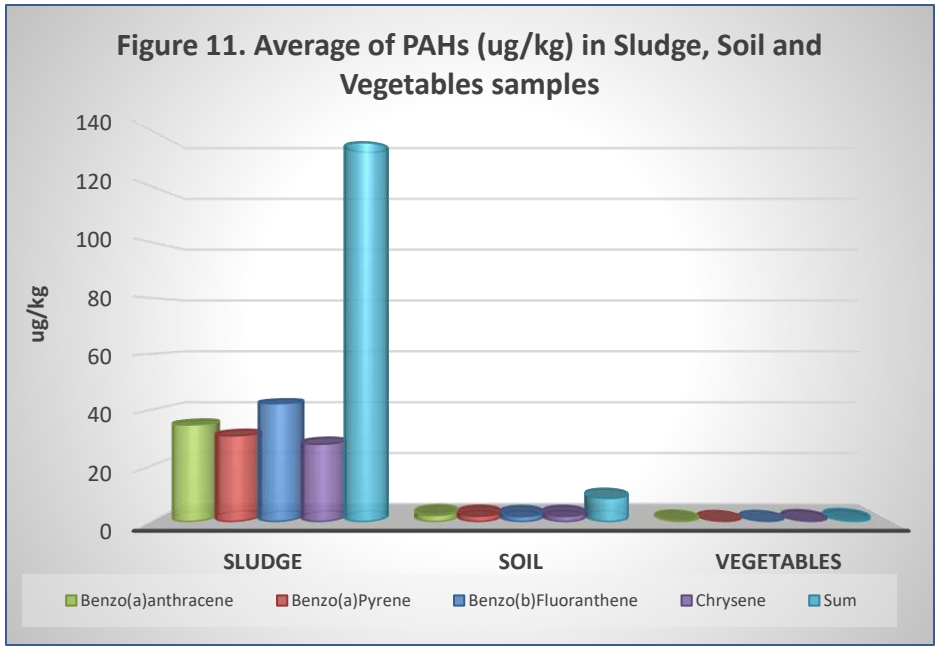


Figure 11. Average of PAHs (ug/kg) in Sludge, Soil and Vegetables samples
140
120
100
80
60
40
20
0
ug/kg
SLUDGE
SOIL
VEGETABLES
Benzo(a)anthracene
Benzo(a)Pyrene
Benzo(b)Fluoranthene
Chrysene
Sum

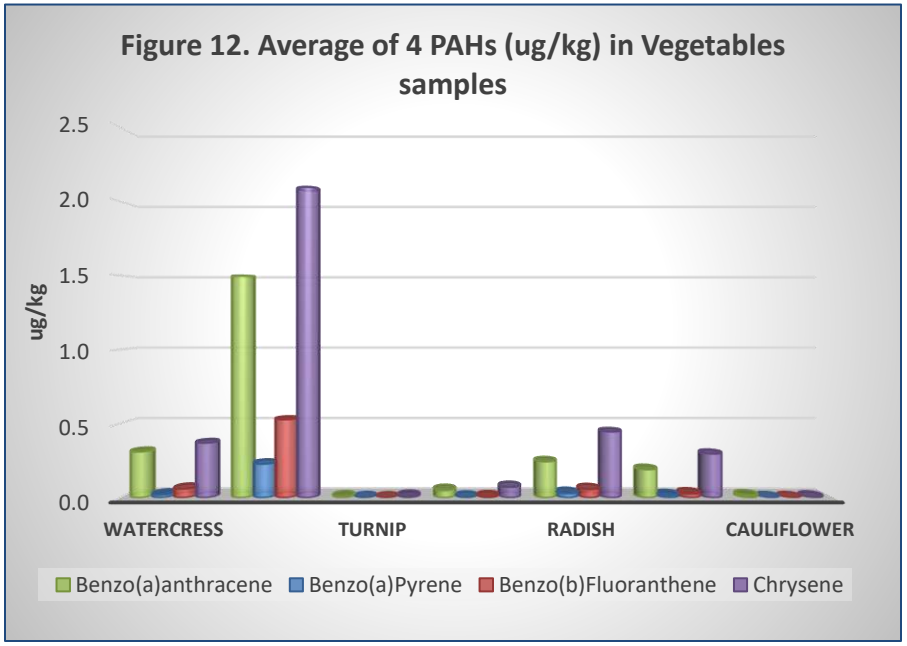


Figure 12. Average of 4 PAHs (ug/kg) in Vegetables samples
2.5
2.0
1.5
1.0
0.5
0.0
ug/kg
WATERCRESS
TURNIP
RADISH
CAULIFLOWER
Benzo(a)anthracene
Benzo(a)Pyrene
Benzo(b)Fluoranthene
Chrysene

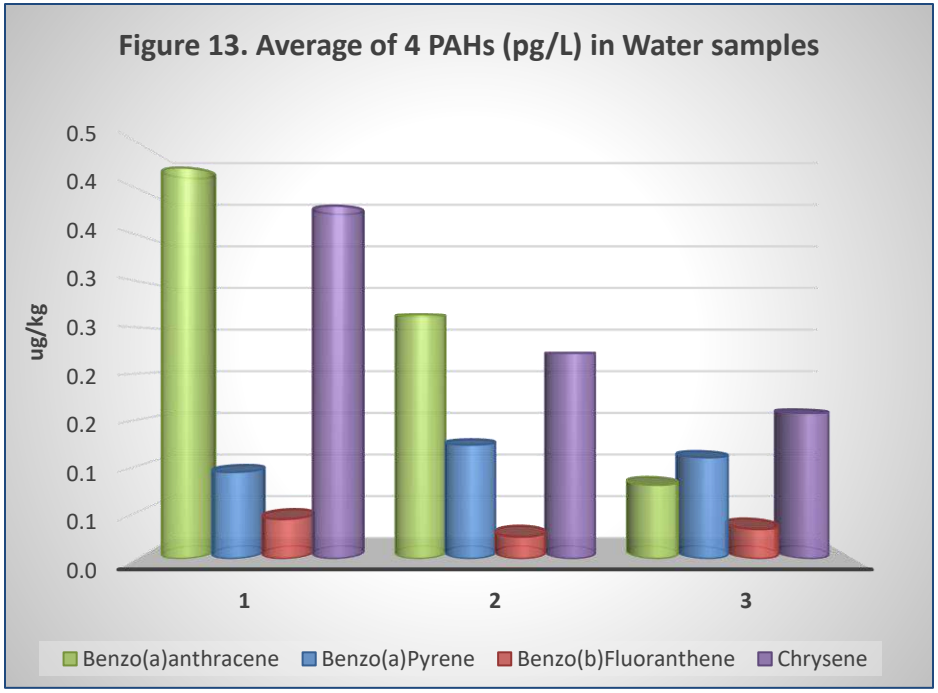


Figure 13. Average of 4 PAHs (pg/L) in Water samples
0.5
0.4
0.4
0.3
0.3
0.2
0.2
0.1
0.1
0.0
ug/kg
1
2
3
Benzo(a)anthracene
Benzo(a)Pyrene
Benzo(b)Fluoranthene
Chrysene

Conclusions

As a solution, recycling sludge for agricultural purposes is an alternative to handle the increasing quantities of sludge produced in recent years. With appropriate use, the application of sewage sludge to agricultural fields has benefits for soils and crops. The transport of pollutants between the environmental matrices may lead to soil contamination and indirect emissions to air and water.

1. **According to the GMP2 and GMP2 extension study found that:**

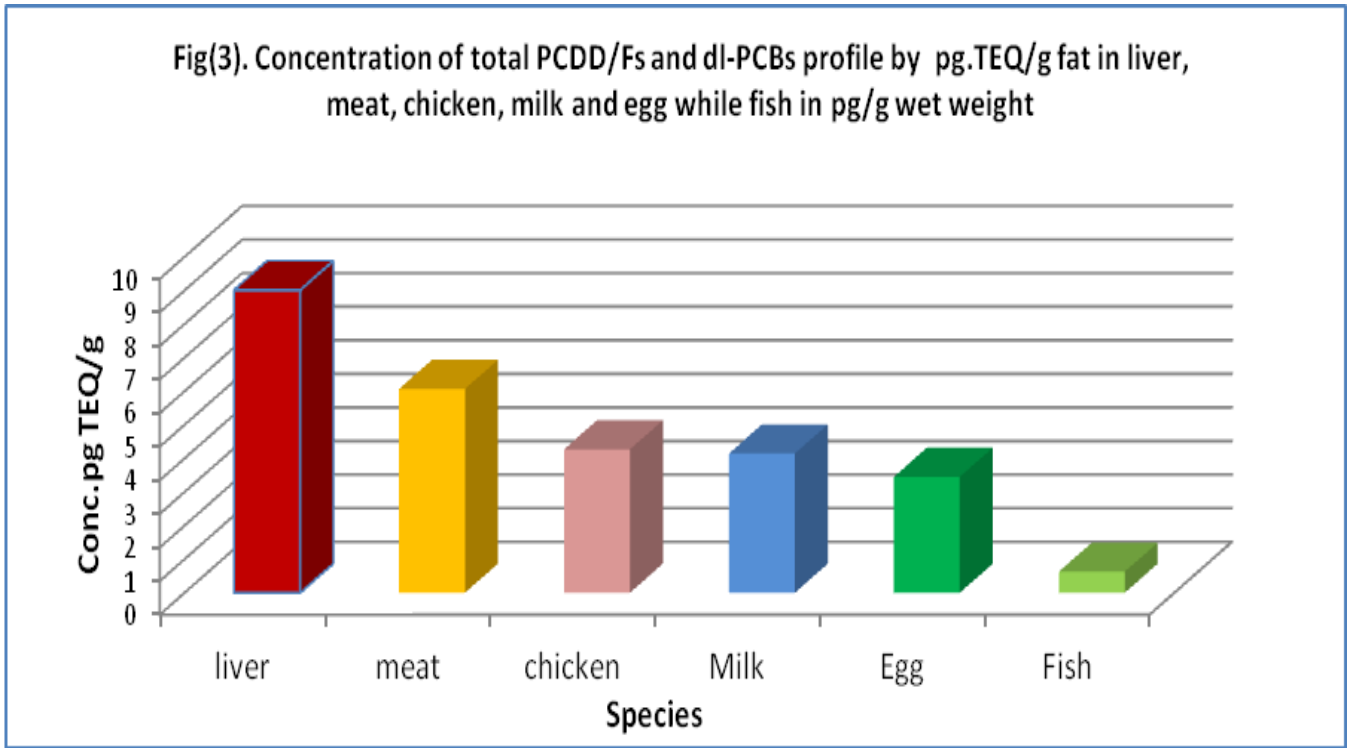
1.1 there is a low risk of **Dioxin and PAHs in irrigated water** **(GMP2 + Ext. results)**

1.2 while there is a high potential risk for DL-PCBs and I-PCBs contamination from **irrigated water**. Therefore, it does not affect the agronomic properties of agriculture except with **Rooty vegetables and oily crops. (GMP2 Ext. results)**

1.4 The **Air (PAS/PUF)** results indicate highly potential risks for **TEQ PCDD/Fs, DL-PCBs, and FAPAS**. (**GMP2 results)**

1.5 According to the data presented in Figure 60, the **Mother milk** study concluded that the levels of **HCH, dl-PCBs and PCDD/PCDF (TEQs)** are potential risks . (**GMP2 results)**

Master Thesis fatty Food 2011



Master Thesis Non fatty Food 2017

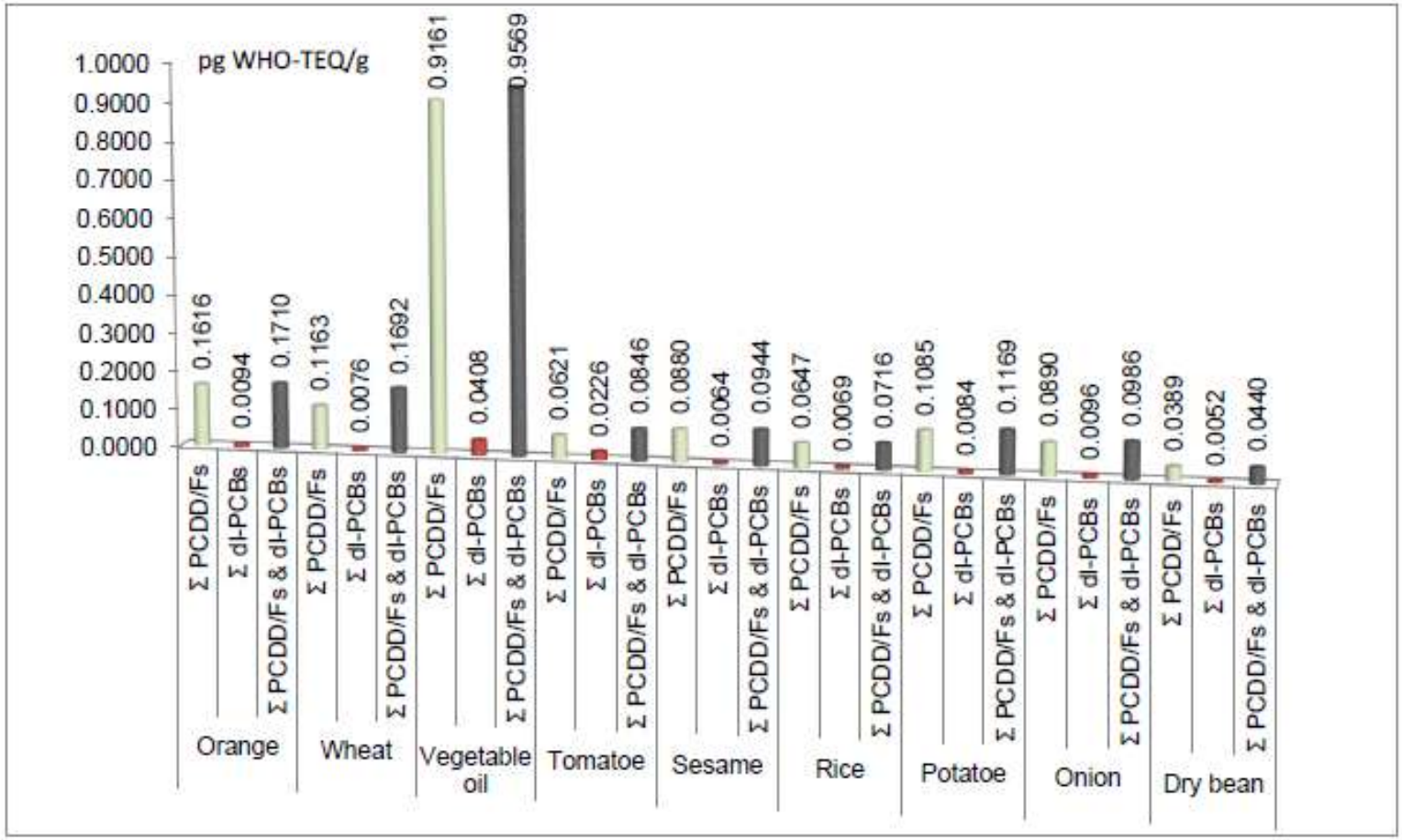


Figure (3): Mean concentrations (pgWHO-TEQ$_{2005}$/g w.w.) of (ΣPCDD/Fs), (Σdl-PCBs) and (ΣPCDD/Fs & dl-PCBs) profile in orange (n=18), vegetable oil (n=18), tomato (n=18), sesame (n=18), rice (n=18), potato (n=18), onion (n=18) and dry bean (n=18); (n=18), wheat where (n) is number of analyzed samples.

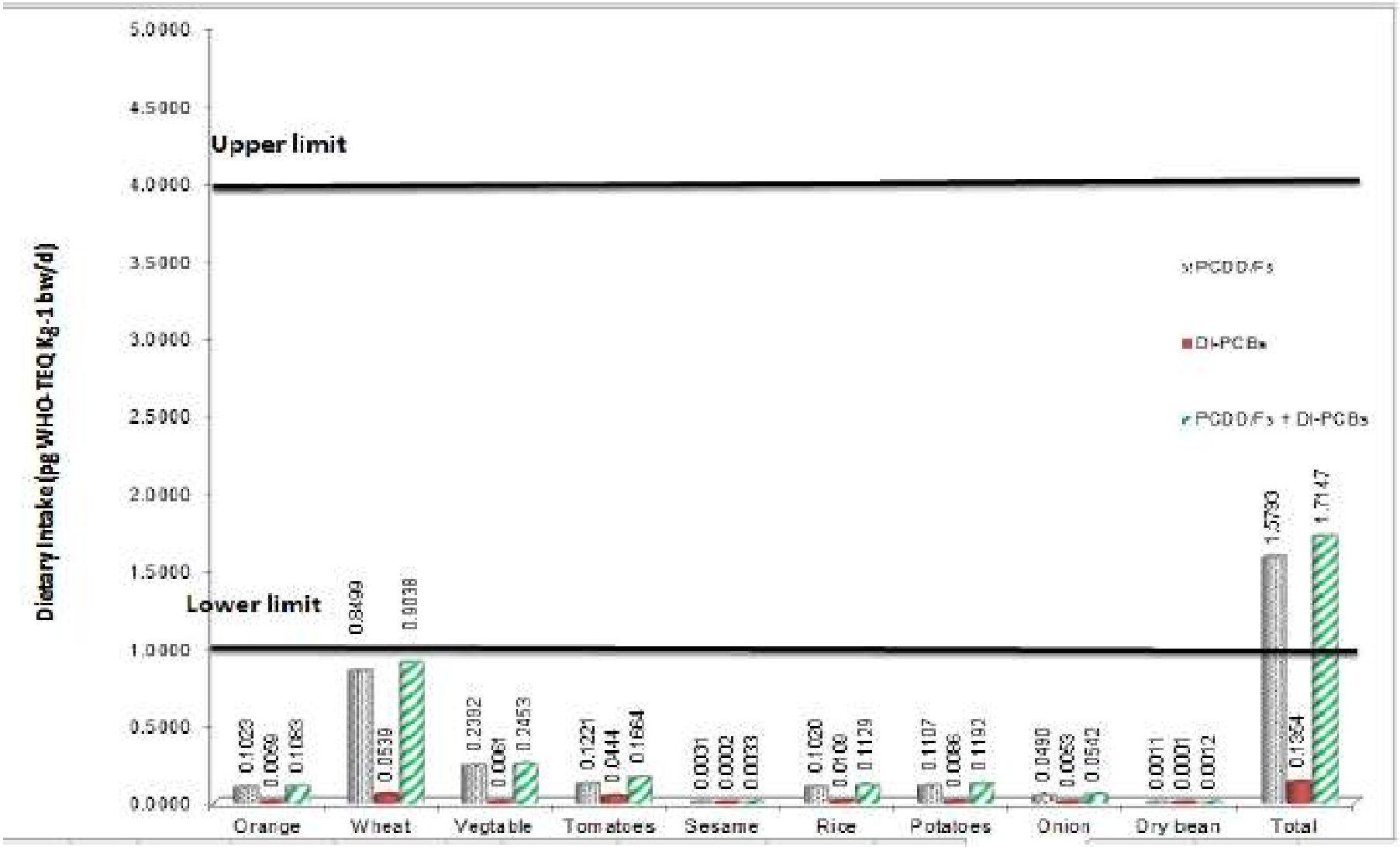


Figure (49): Estimated dietary exposure to PCDD/Fs , dl-PCBs and sum (PCDD/Fs & dl-PCBs) for Egyptian consumer from orange, wheat, vegetable oil, tomato, sesame, rice, potato, onion and dry bean.

Recommendations (Outcomes- GMP4)

Egyptian is recommended the following:

1. Ministry of environment has the following plans to address the issue of PCB contamination in Egypt. First, we will complete an inventory of PCBs throughout the country with the help of MEDPOL and CP/RAC. This will involve getting rid of 200 tons of highly contaminated oil.
2. Ministry of environment will establish an intermediate storage area to collect all transformers, condensers, and oil-contaminated PCBs. MEDPOL will finance the project.
3. Ministry of environment will conduct awareness programs about POP's health and environmental effects for different community categories.
4. Additionally, Ministry of environment will work with the World Bank to inventory, safeguard, and manage POP in Egypt.
5. Develop a waste management technical guideline for sludge use in agriculture.
6. Update the waste management technical guidelines for wastewater treatment plant operation.

Recommendations – (Outcomes- GMP4)

RISK ASSESSMENT EGYPT STRATEGY PLAN 2024-2030 (under discussion):

I. Monitoring sustainability for ecological and environment:

1. The new monitoring plan for the contamination map should include the following indicator matrices:

   fresh blood, mother milk, meat, meat products, eggs, Rooty vegetables, and oily crops, drinking water, irrigated water, other water sources, sludge, feed, and soil samples, moreover, the chemical composition of soil and water samples

2. Continually monitor the following:

   2.1 DL-PCBs and I-PCBs in **irrigated water**

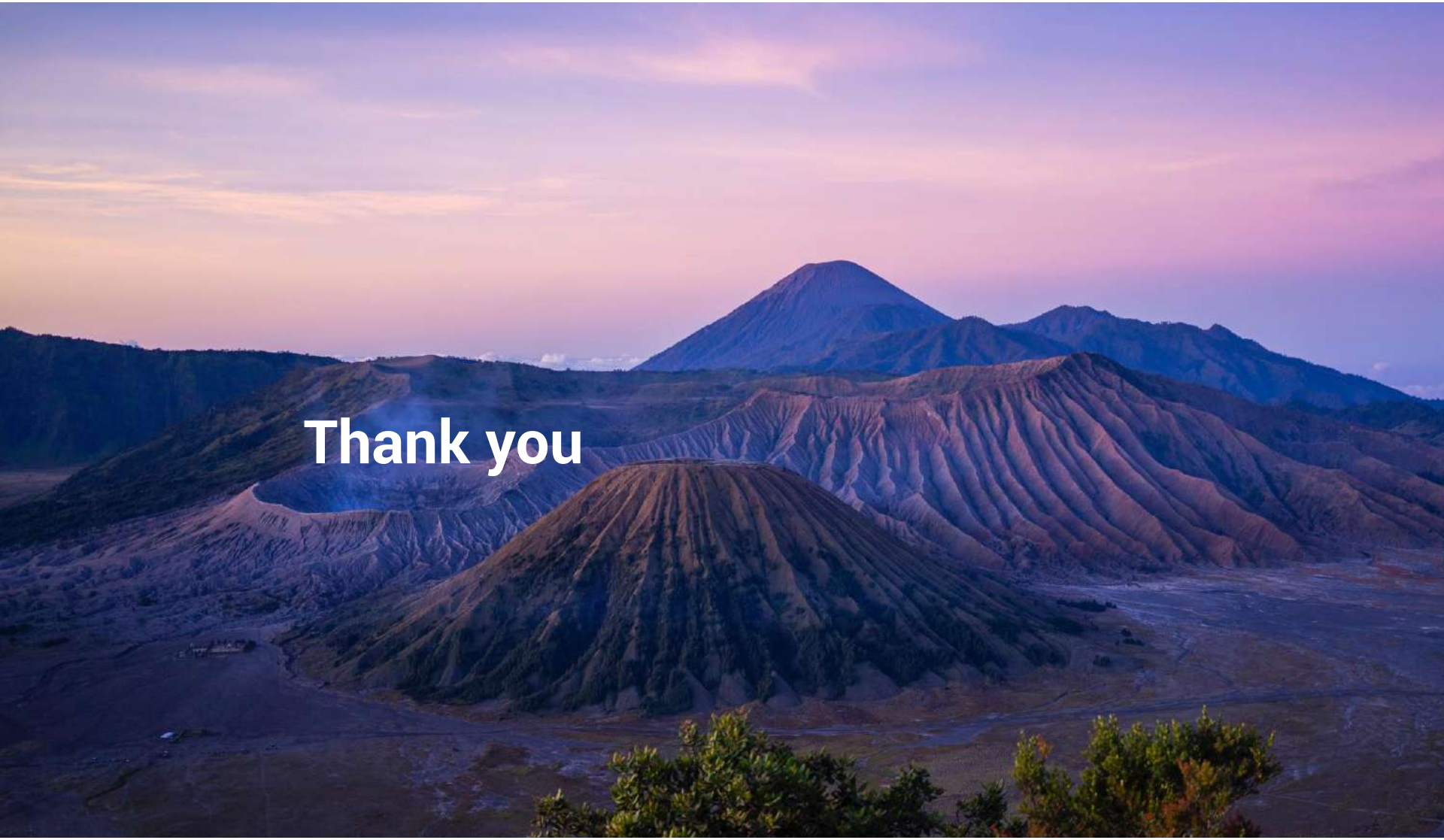
   2.2 POPs in r**ooty vegetables and oily crops**.

   2.3 POPs in **Sludge.**

   2.4 Dioxin, DL-PCBs, and FAPAS in **Air (PAS/PUF)**

   2.5 HCH, FAPAS, Dioxin, and DL-PCBs in **Mother milk**

   2.6 POPs and UPOPs effectively; this can be achieved by establishing accredited advanced laboratories that can detect micropollutant concentrations, **such as Brominated Flame Retardant, PFAS, and microplastics** in locally produced and imported **foodstuff, environment, and**


Thank you