

Role of Human Biomonitoring in the Global Agenda to Prevent and Control Releases of Persistent Toxic Contaminants

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Stockholm Conventions*

Outline

❑ Context and history

What are we talking about
Where it started and why

❑ MEAs on chemicals and waste

Basel, Rotterdam and Stockholm Conventions,
mercury, CLRTAP...

❑ SAICM

Mandate and activities

❑ Effectiveness of the global chemicals agenda

Examples of success

What are we talking about ?

☐ Intentional production and use

☐ More than 43,000,000 chemicals substances commercially available (Chemical Abstracts Service)

☐ of these 248,000 are in some way regulated and inventoried

☐ 143,835 substances pre-registered in REACH

☐ Global chemical output valued at US\$171 billion in 1970. By 2010, it had grown to **\$4.12 trillion**

What are we talking about?

- ❑ Unintentional releases

- ❑ Releases to air, water, soil, waste, **products**

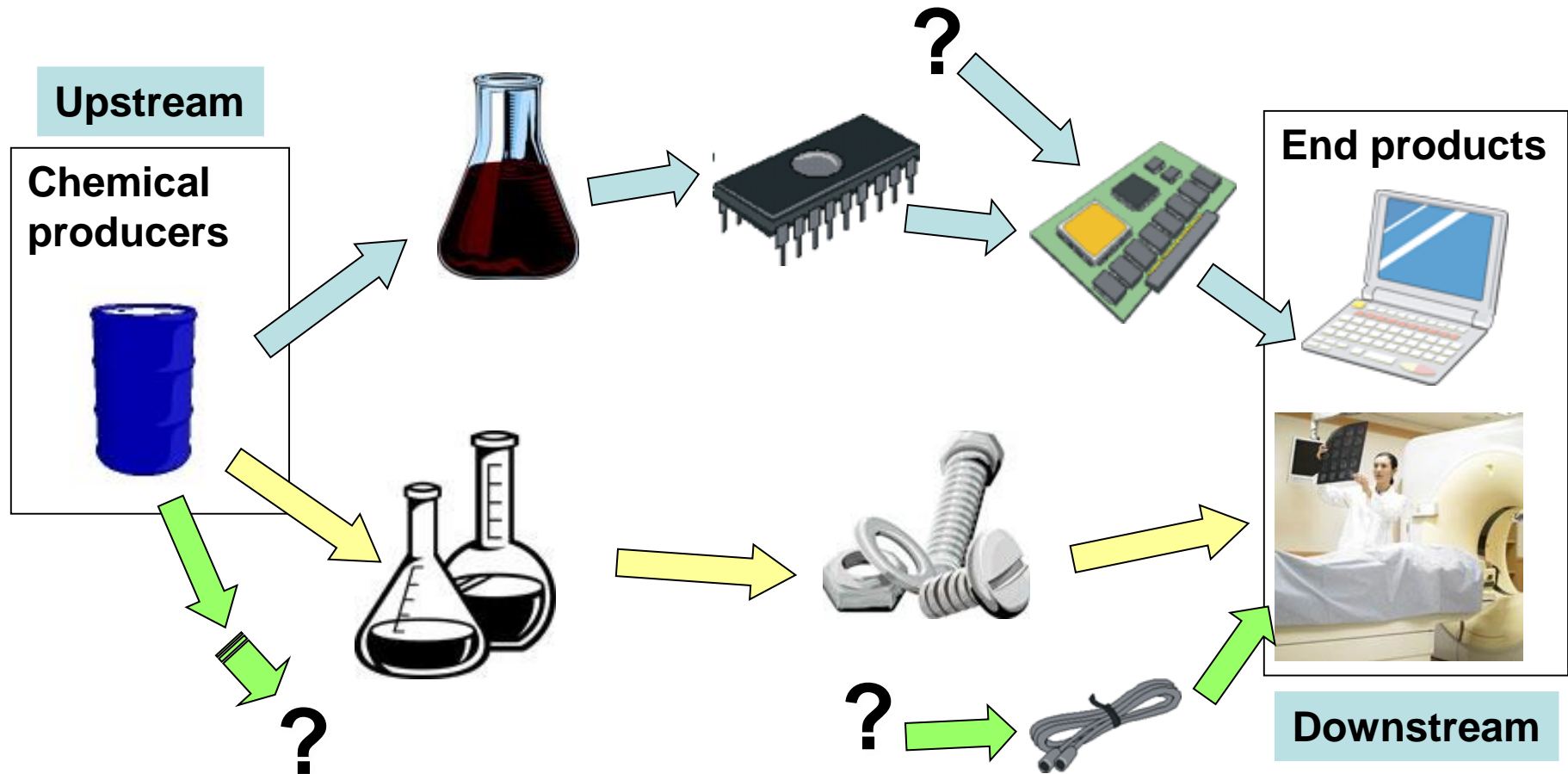
Of the 5.7 million tons of pollutants released, 1.8 million tons were of chemicals considered persistent, bioaccumulative or toxic, 970,000 tons were known or suspected carcinogens and 857,000 tons were of chemicals that are considered reproductive or developmental toxicants.

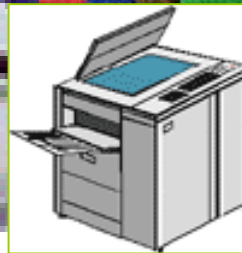
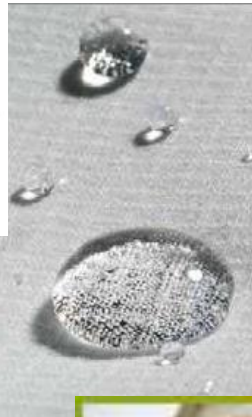
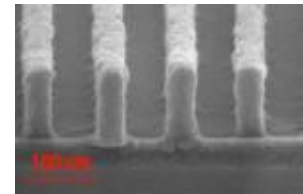
(UNEP Chemicals, 2012)

Where are these chemicals?

- ☐ Virtually everywhere
- ☐ Raw material for chemical industry and other industrial/non-industrial production processes
- ☐ Agrochemicals
- ☐ Industrial products
- ☐ Consumer goods including food

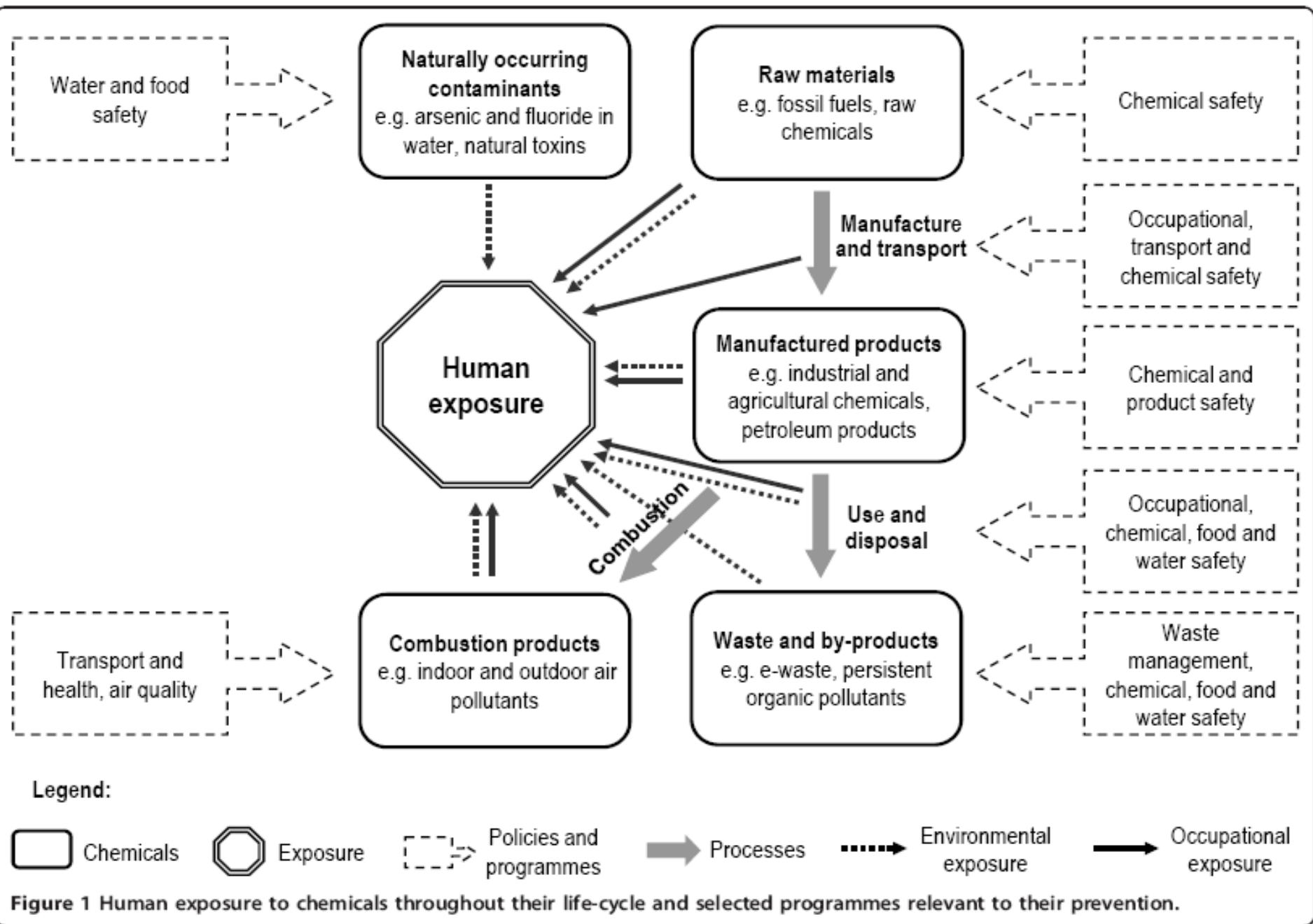
CHALLENGE: Industrial chemicals are used in numerous processes and parts





travis jon allison on flickr



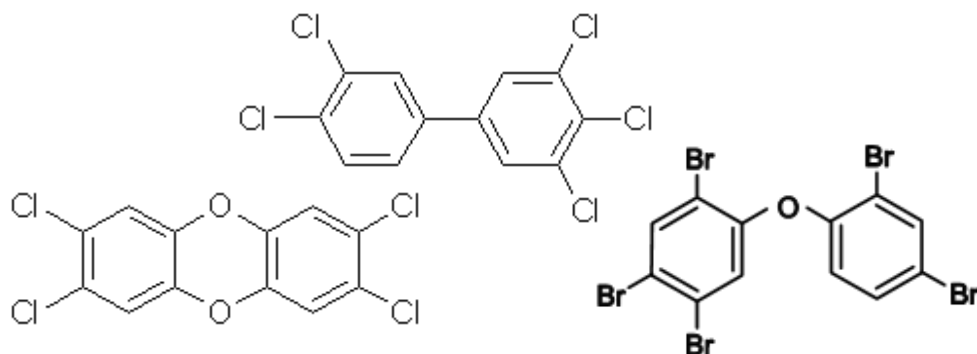


History- where it began

- ❑ Discovery of new chemicals 30s – 70s
- ❑ Toxic shock 70s - 90s;
mass poisonings
omnipresence of some chemicals
- ❑ 1962 Rachel Carson published *Silent Spring* first to draw attention to pesticides that had toxic effects beyond those intended and introduced the concept of chemical persistence whereby a chemical could cause toxicity long after its initial release
- ❑ 70s evidence of chemical pollution of the Arctic

Persistent Toxic Substances/Persistent Organic Pollutants

POPs/PTS properties



- remain intact in the environment for a long time;
- accumulate in living organisms;
- become widely distributed throughout the environment; and
- are toxic to humans and wildlife.

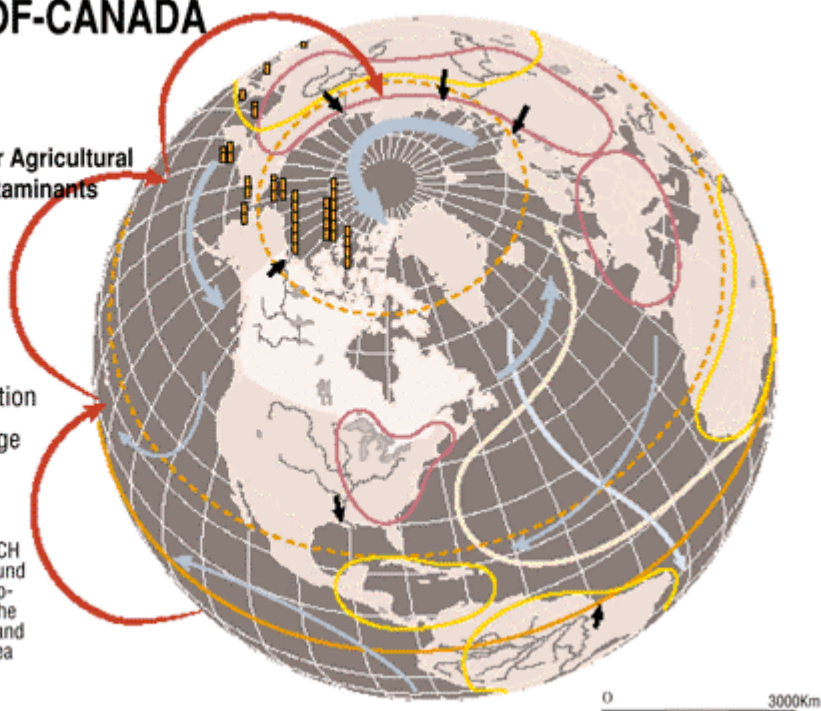
THE GRASSHOPPER EFFECT AND OUT-OF-CANADA SOURCES

Source Regions for Agricultural and Industrial Contaminants

- Agricultural
- Industrial
- Dominant Air Currents
- Atlantic Water Circulation
- River discharge

Alpha-HCH in seawater ng/litre

Concentrations of one HCH compound have been found to increase from south-to-north along a line from the Java Sea (off Indonesia and China) to the Beaufort Sea (AMAP, 1997).



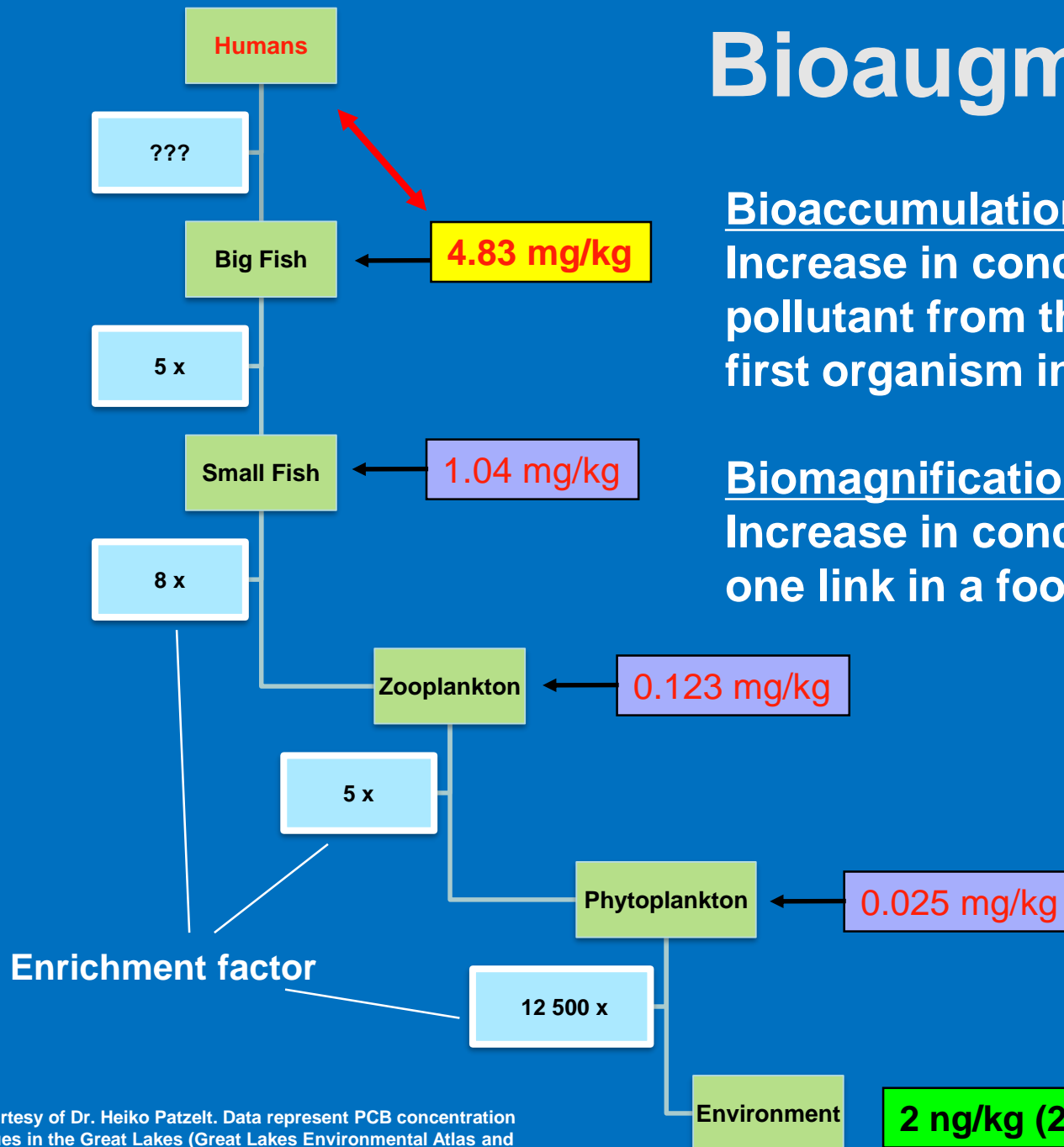
Bioaugmentation

Bioaccumulation:

Increase in concentration of a pollutant from the environment to the first organism in the food chain

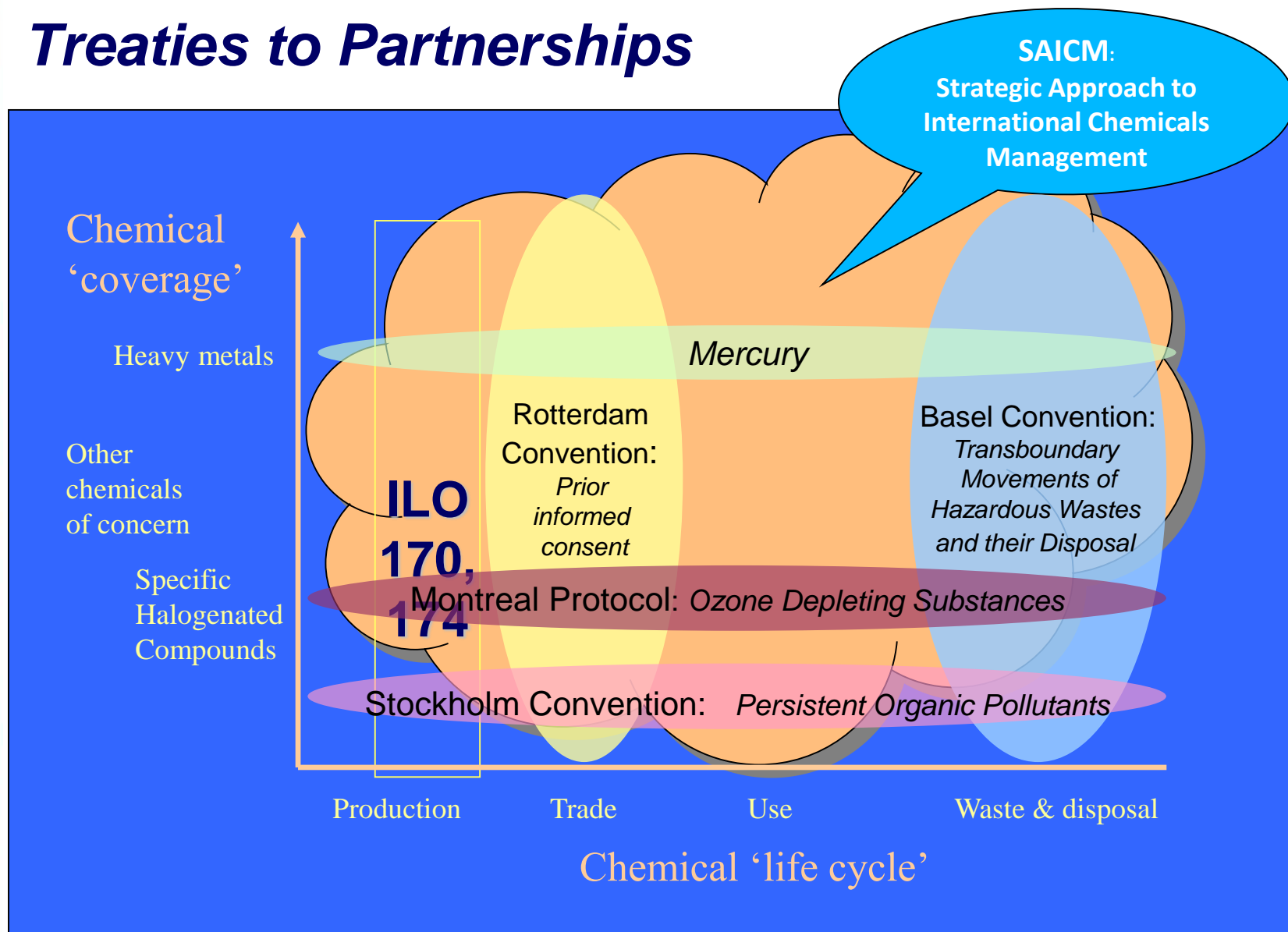
Biomagnification:

Increase in concentration from one link in a food chain to another.



2 ng/kg (2ppb), really only a trace

Words to Actions: *Treaties to Partnerships*



The three chemicals conventions

- ❑ Common objective
“To protect human health and the environment”
- ❑ Covers “cradle-to-grave” management
- ❑ Basel Convention adopted in 1989
186 Parties
- ❑ Rotterdam Convention adopted in 1998
157 Parties
- ❑ Stockholm Convention adopted in 2001
181 Parties

Basel Convention

☐ Basel Convention on Control of Transboundary Movement of Hazardous Wastes and their Disposal

‘Ensure that the transboundary movement of hazardous wastes and other wastes is reduced to the minimum consistent with the environmentally sound and efficient management of such wastes, and is conducted in a manner which will protect human health and the environment against the adverse effects which may result from such movement’

☐ Control system for transboundary movements

☐ Principle of the environmentally sound management of waste

Rotterdam Convention

❑ Rotterdam Convention on prior informed consent

‘...promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm and to contribute to their environmentally sound use, by facilitating information exchange about their characteristics...’

❑ Criteria for listing chemicals and a list of agreed chemicals.

Stockholm Convention

- ❑ The Stockholm Convention on POPs requires parties

‘Prohibit and/or take the legal and administrative measures necessary to eliminate: Its production and use of chemicals listed in Annex A subject to the provisions of the Annex; Its import and export of the chemicals listed in Annex A in accordance with the provisions of paragraph 2; and restrict its production and use of the chemicals listed in Annex B in accordance with the provisions of that Annex; as well as minimize and where feasible eliminate unintentionally produced and released POPs, listed in Annex C’

- ❑ Criteria for listing include persistence, bioaccumulation, toxicity and long-range transport

Chemicals covered by the three conventions

- **Basel** covers hazardous wastes that are explosive, flammable, reactive, poisonous, infectious, corrosive, toxic or ecotoxic
- **Rotterdam** covers 43 pesticides and industrial chemicals that have been banned or severely restricted for health or environmental reasons
- **Stockholm** covers 14 pesticides, and 12 industrial chemicals and by-products (2 new chemicals listed in '19)

Common Link

Most POPs are covered by all three Conventions

Many pesticides are subject to the three Conventions

Examples of other relevant activities

- UN ECE Convention on Longrange Transboundary Air Pollution (1979)
 - POPs Protocol (1998)
 - Heavy Metals Protocol (1998)
- Global Mercury Convention (2018)
- Chemical toxicity inventories such as the European REACH -**R**egistration, **E**valuation, **A**uthorisation and Restriction of **C**hemical substances

Common goal

Elimination of PTS production and use and **prevention** of introducing chemicals with PTS properties on the market

Strategic Approach to International Chemicals Management - SAICM

- Policy framework to promote chemical safety globally
- Overall objective (WSSD 2002)
“achievement of the sound management of chemicals throughout their life cycle so that, by 2020, chemicals are produced and used in ways that minimize significant adverse effects on human health and the environment”
- Comprehensive scope; ambitious “2020” goal for sound chemicals management; multi-stakeholder and multi-sectoral character; endorsement at the highest political levels; emphasis on chemical safety as a sustainable issue; provision for resource mobilization (QSP); and formal endorsement or recognition by the governing bodies of key intergovernmental organizations

Effectiveness of the global chemical agenda

How do we evaluate it?

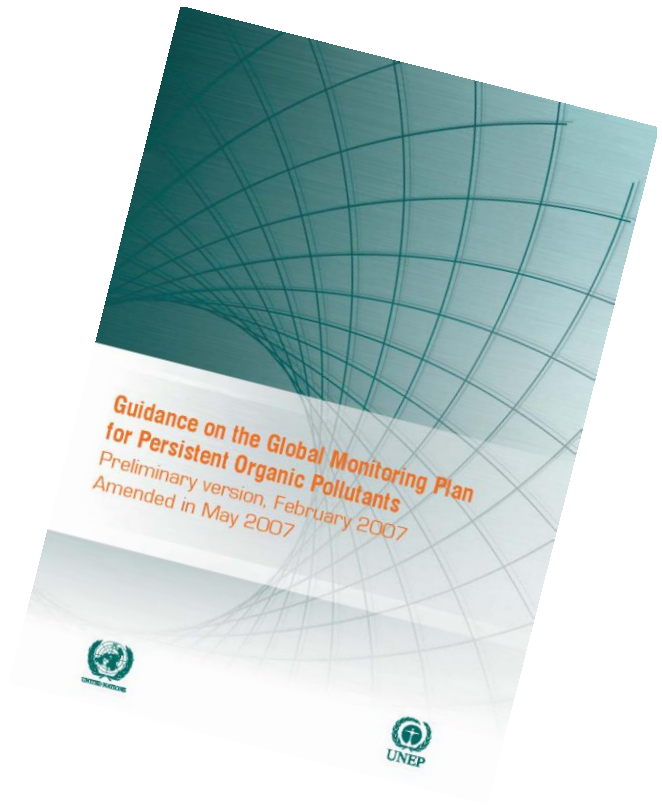
- Global assessment reports such as:
 - UNEP GEO-5 Chapter on Chemicals and Waste(2012)
 - UNEP Chemicals Global Chemical Outlook and Cost of Inaction (2012)
- Effectiveness evaluation under Article 16 of the Stockholm Convention
- Monitoring of chemicals in humans and the environment
- Assessment and interpretation of changes in levels over time

Global Monitoring Plan for POPs

To provide a harmonized organizational framework for the collection of comparable monitoring data and / or information on the presence of the POPs listed in annexes A, B and C of the Stockholm Convention in order to identify trends in levels over time as well as to provide information on their regional and global environmental transport

Harmonized framework

Global monitoring programme with regional and global organization structure following a uniform harmonized framework for sampling, analysis and presentation of POPs monitoring data



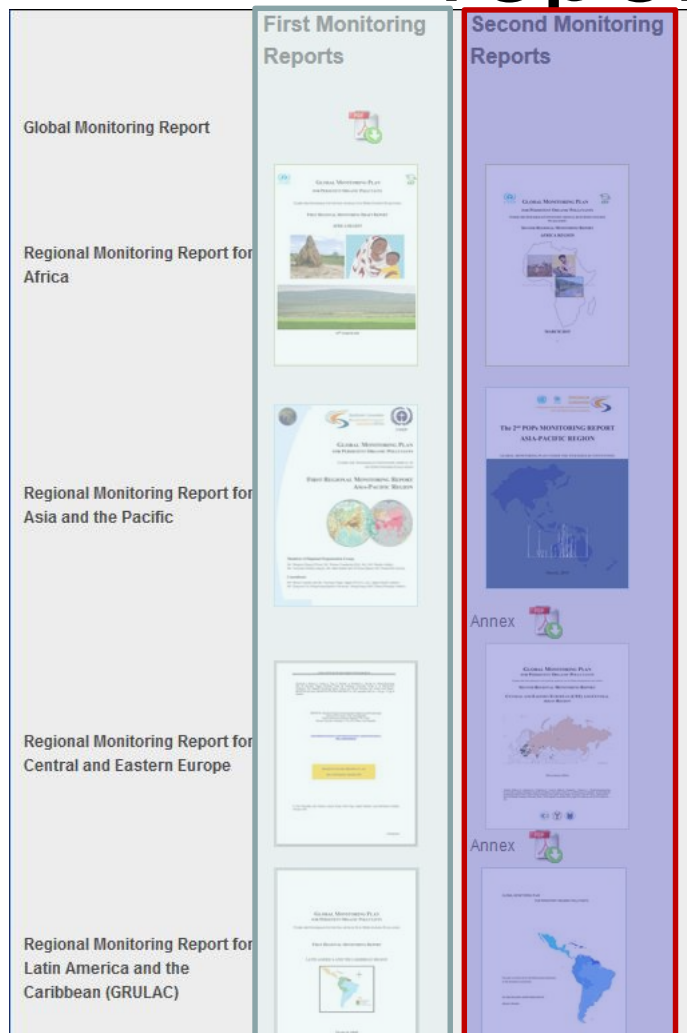
Monitoring activities

The objective of monitoring activities is to generate comparable data on levels of POPs in core media:

- **ambient air,**
- **human milk and human blood,**
- **surface water for water-soluble POPs (PFOS)**
- POP substances to be monitored = Annexes of the Stockholm Convention
- Substances are in more detail in Chapter 2 – GMP Guidance Document = congeners, isomers, degradation products or parent compounds that bring most comprehensive information
- Existing monitoring programmes (air: AMAP, EMEP, GAPS, IADN, MONET... human milk / blood: UNEP WHO, AMAP, national programmes..).



Regional and global monitoring reports



Second Global POPs Monitoring report

was presented in May 2017 at the 8th meeting of the Conference of the Parties to the Stockholm Convention

Global synthesis of 11 years of POPs monitoring data collection under the GMP since the entry into force of the Convention

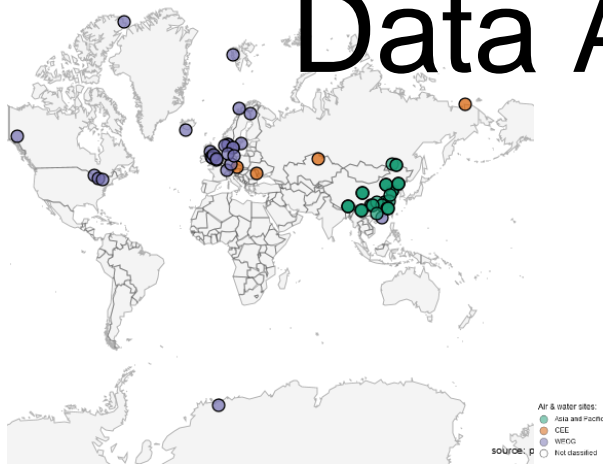
Key input to effectiveness evaluation

Comparable POPs monitoring data

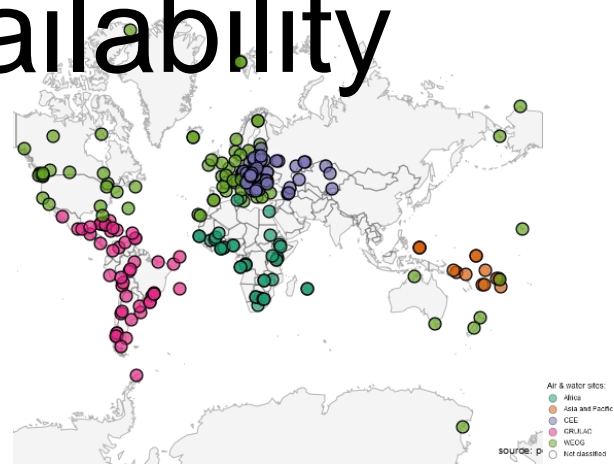


- National and international regulation of POPs has achieved **significant decreases of some POPs in recent decades by controlling primary sources.**
- Secondary sources dominate the **persistent low levels of legacy POPs** (PCBs, DDTs, HCH, PCDD/Fs).
- **Newly listed POPs** (PBDE, PFOS, HBCD) do **seem to be slowing or reversing increases** in most samples.
- **The coverage and abundance of good quality monitoring data on POPs has increased** very significantly since 2009, in particular in Africa, GRULAC, and Asia and the Pacific.
- **Long Range Transport Modeling has shown to be central in the interpretation** and improvement of available data.

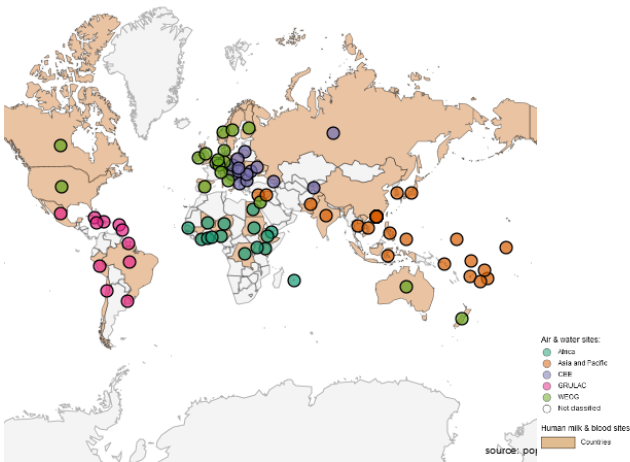
Data Availability



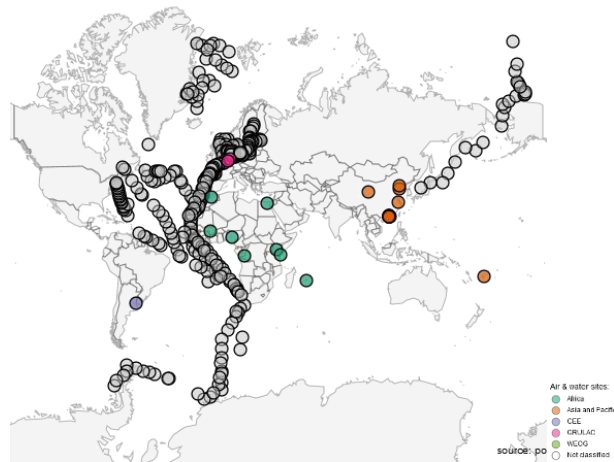
(a) Air monitoring: active sampling



(b) Air monitoring: passive sampling

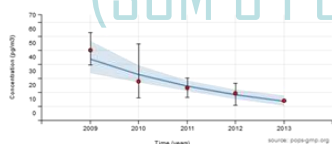


(c) UNEP/WHO human milk survey

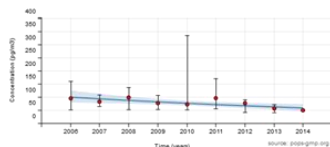


(d) Sampling of PFOS in water

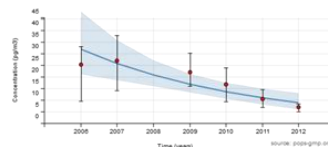
CHANGES OVER TIME IN AIR CONCENTRATIONS OF INDICATOR PCB (SUM 6 PCB)



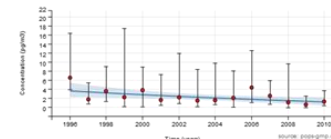
Payerne, Switzerland



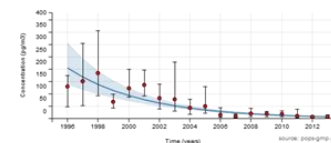
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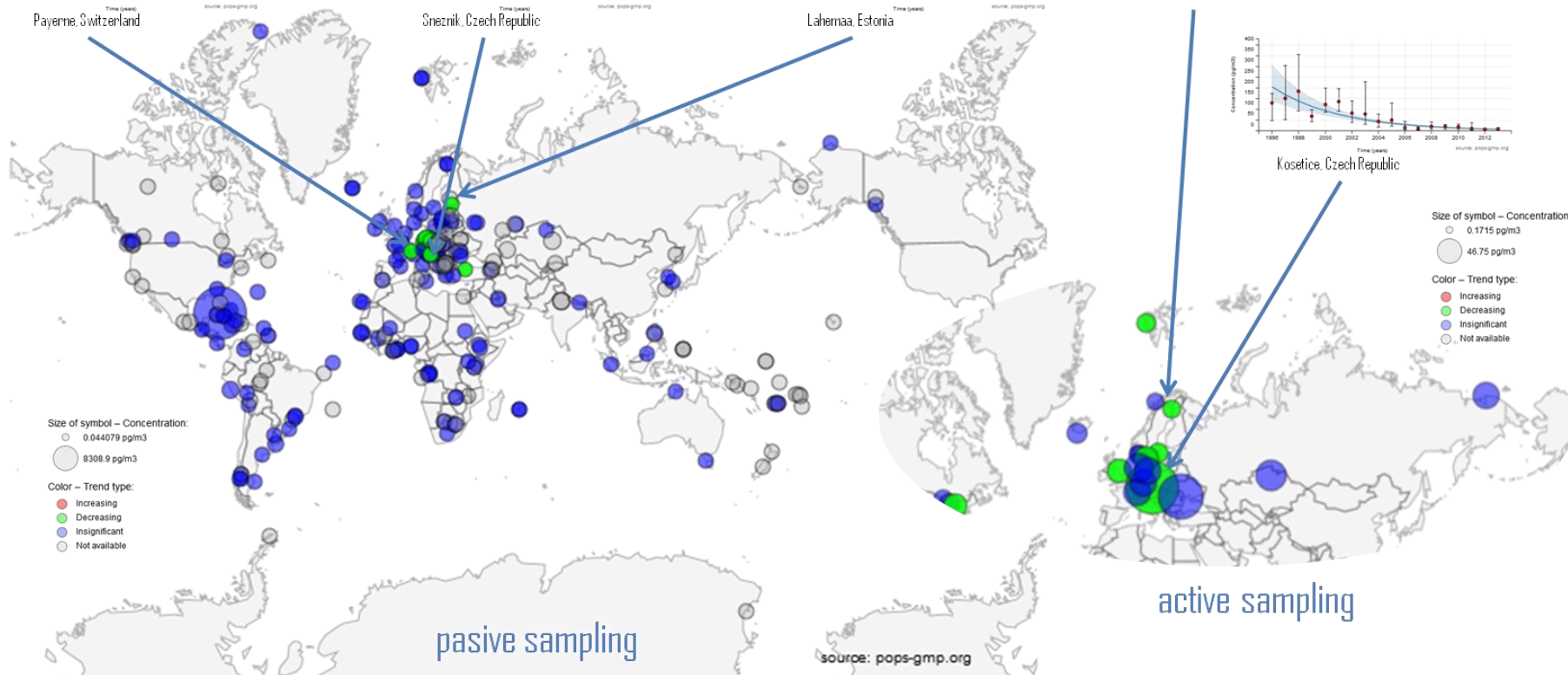
Lahemaa, Estonia



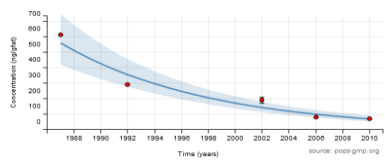
Pallas, Finland



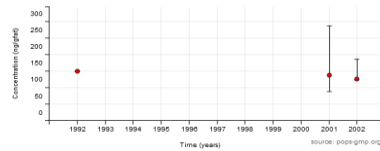
Kosetice, Czech Republic



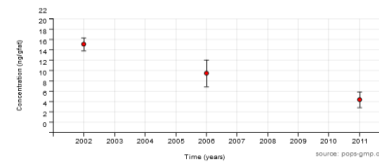
CHANGES OVER TIME IN CONCENTRATIONS OF INDICATOR PCB IN HUMAN MILK (SUM 6 PCB)



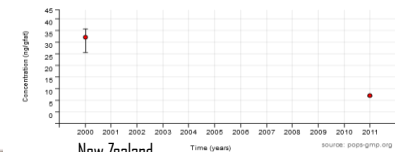
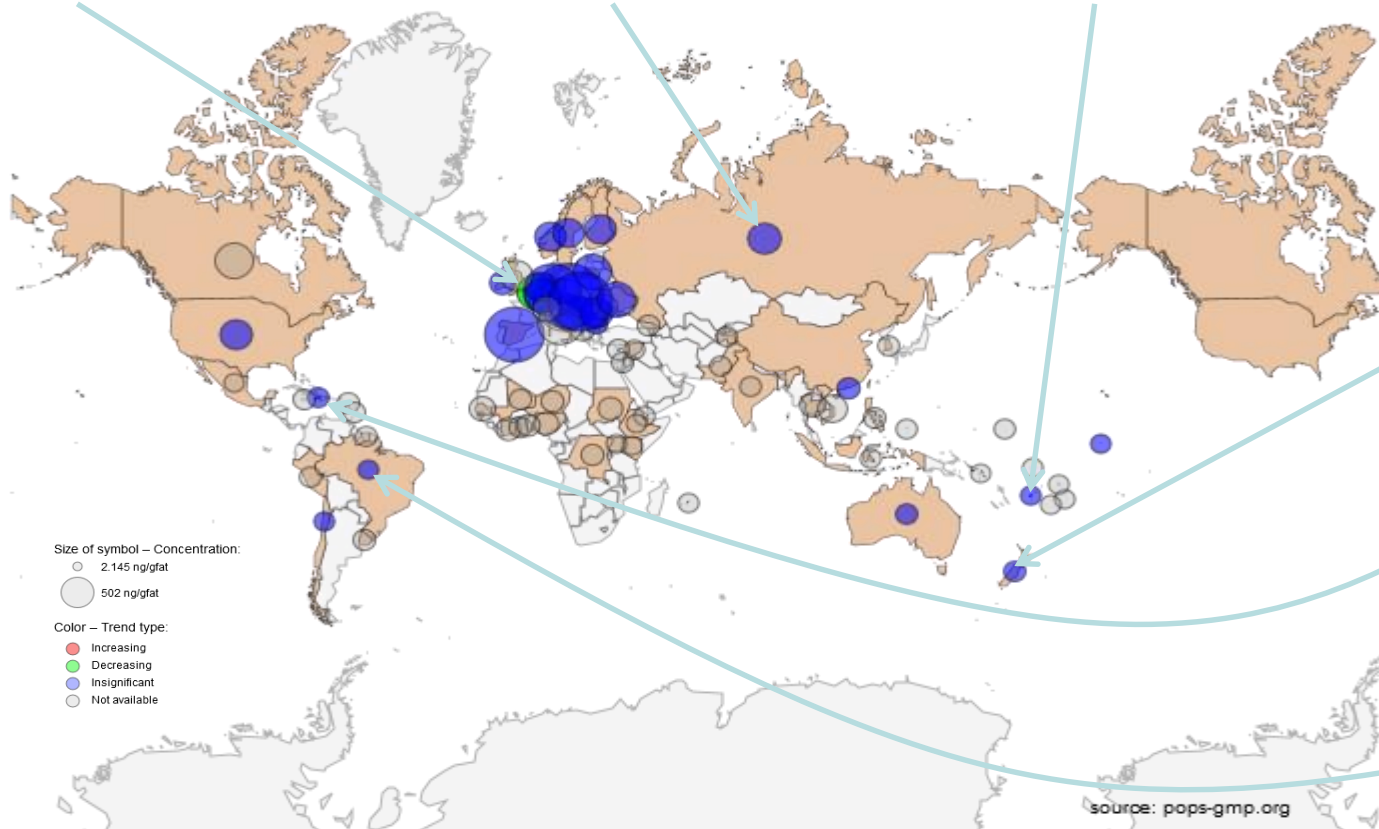
Belgium



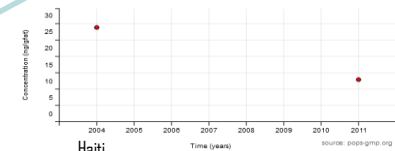
Russian Fed.



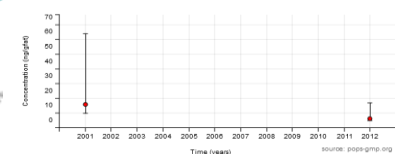
Fiji



New Zealand

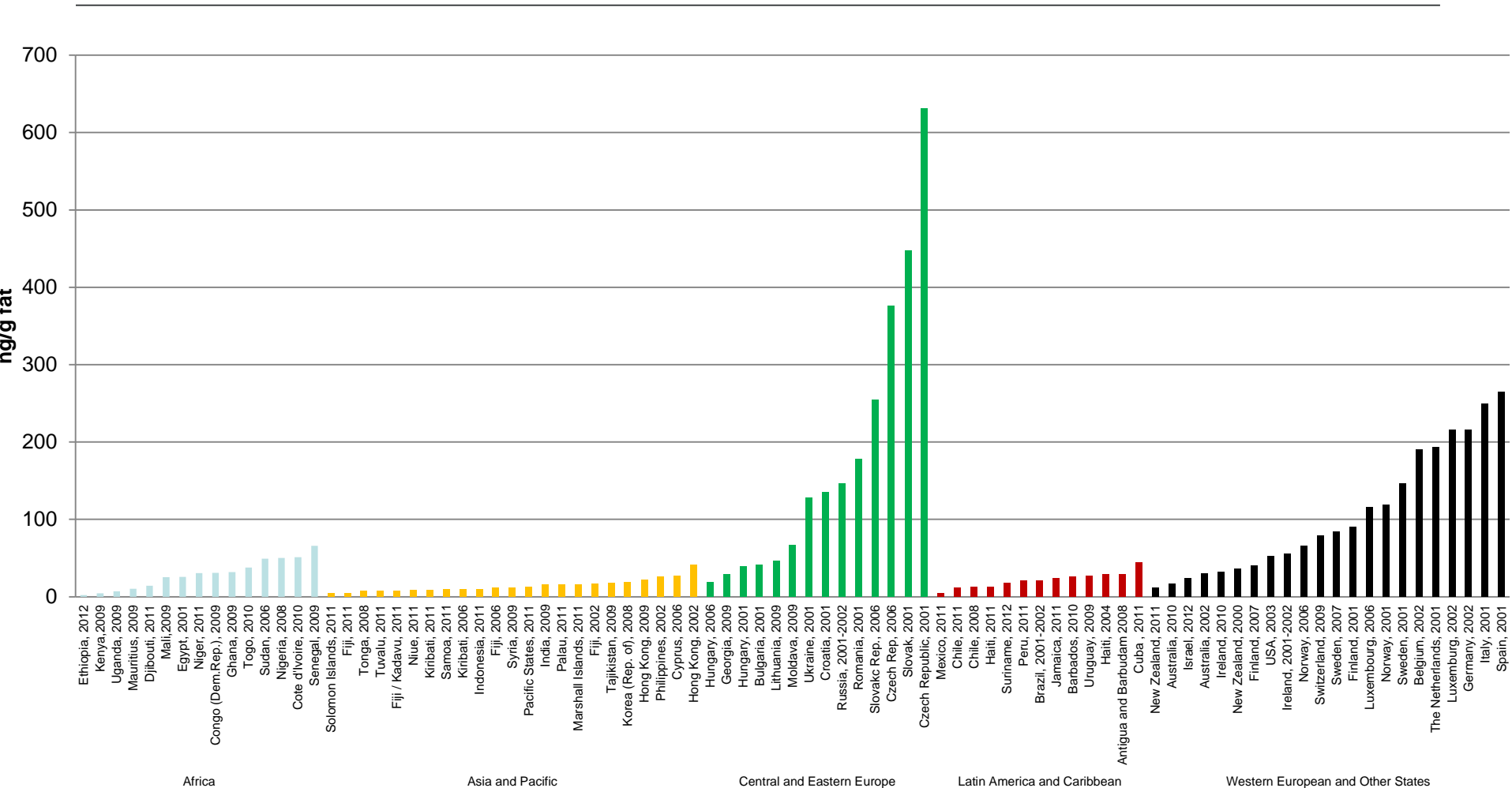


Haiti

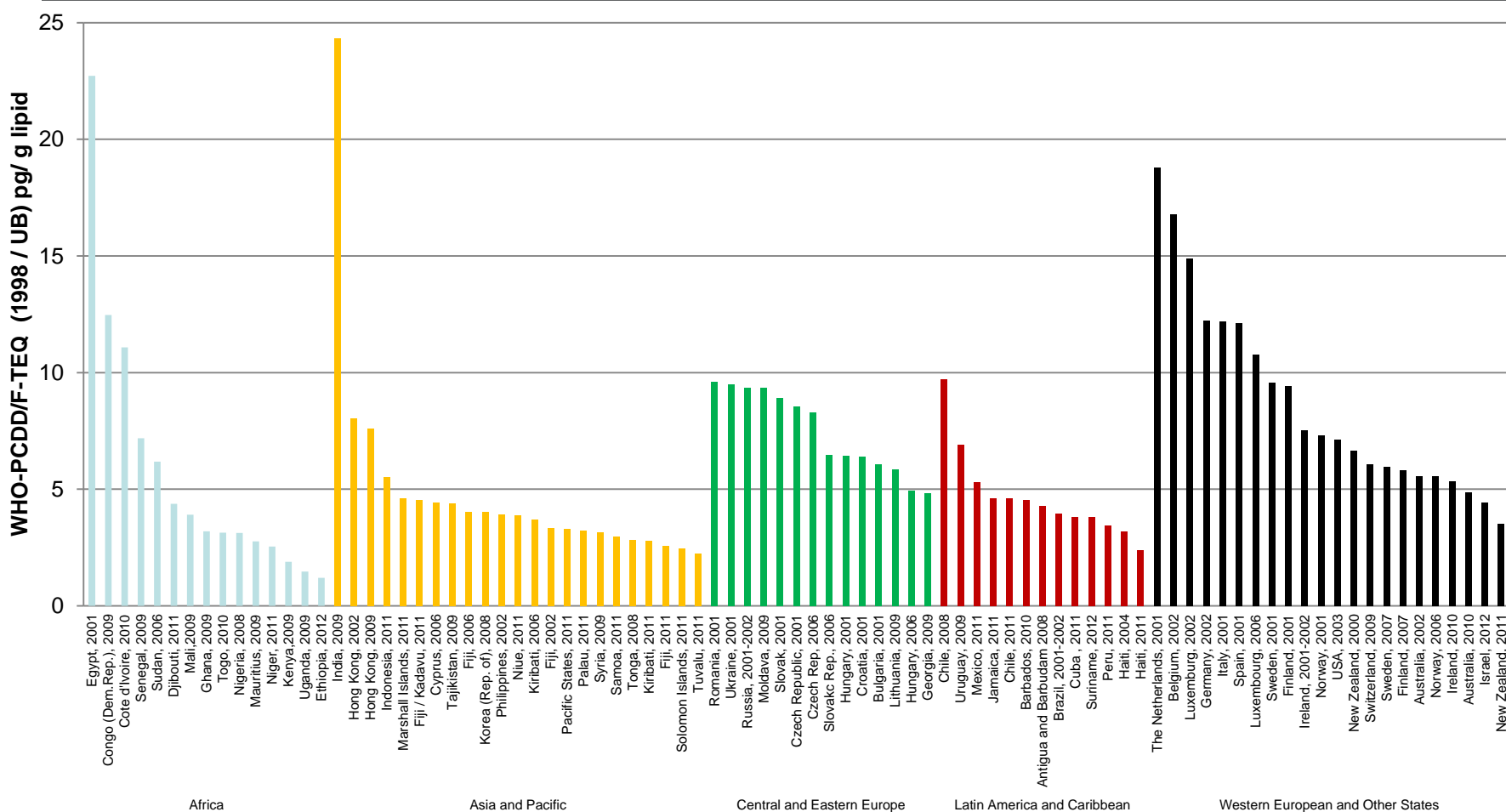


Brazil

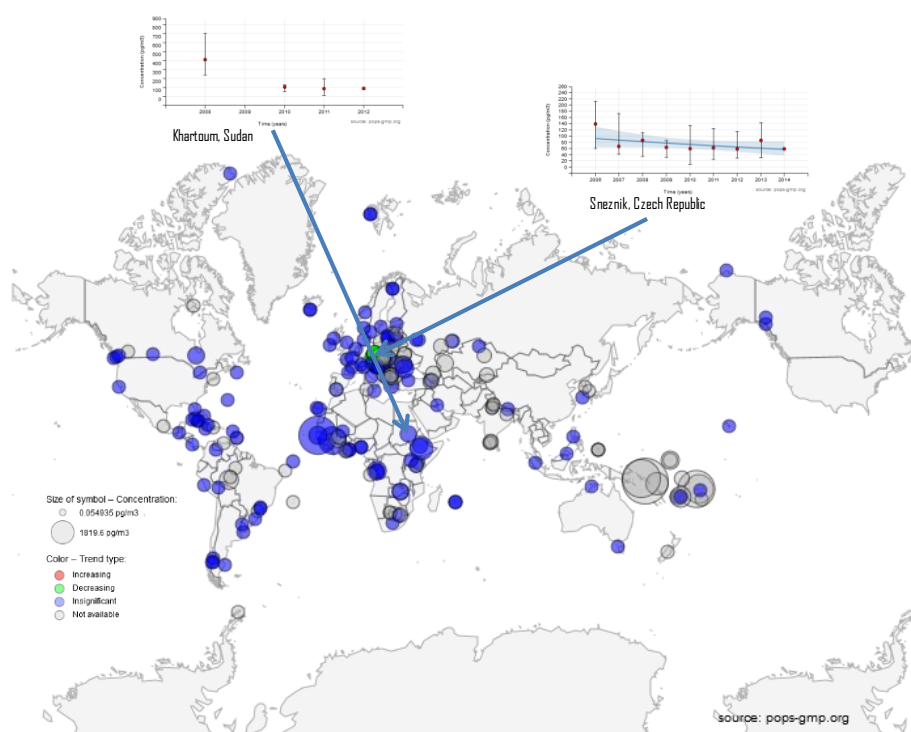
CONCENTRATIONS OF INDICATOR PCB IN HUMAN MILK (SUM 6 PCB)



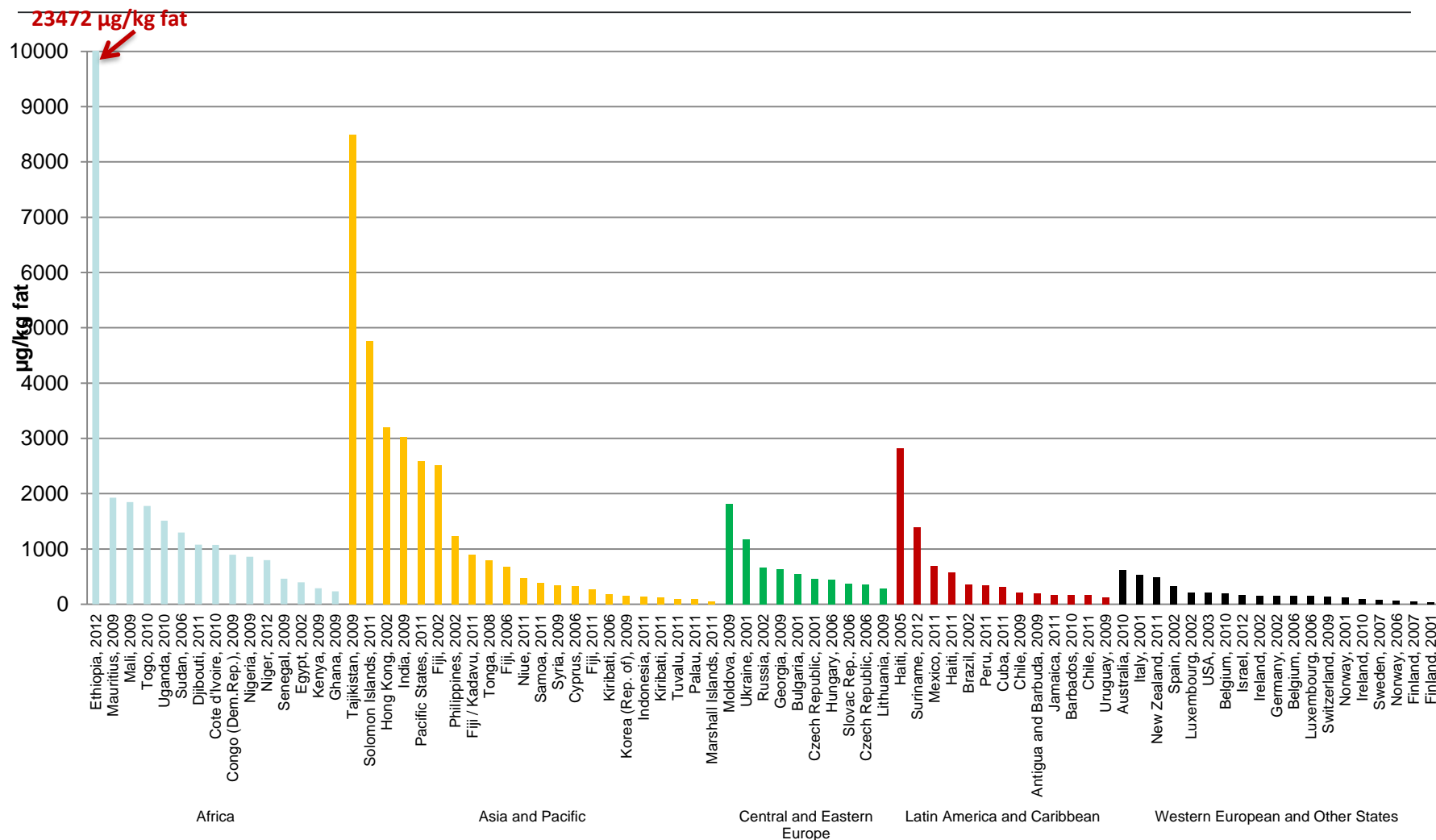
CONCENTRATIONS OF PCDD/PCDF IN HUMAN MILK (SUM 17 PCDD/PCDF)



CHANGES OVER TIME IN AIR CONCENTRATIONS OF DDT (SUM 3 DDT)

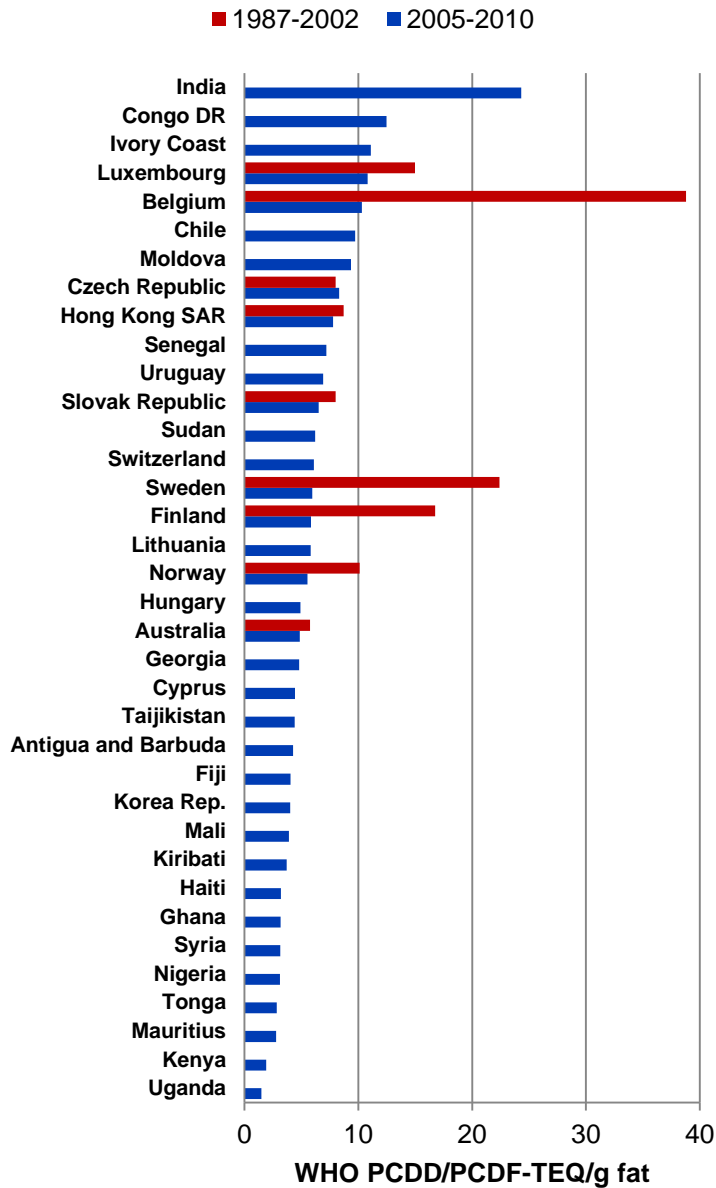


CONCENTRATIONS OF DDT IN HUMAN MILK (SUM 6 DDTs)



Concentration of dioxins and furans in human milk

pg TEQ/g fat



Changes in levels over time

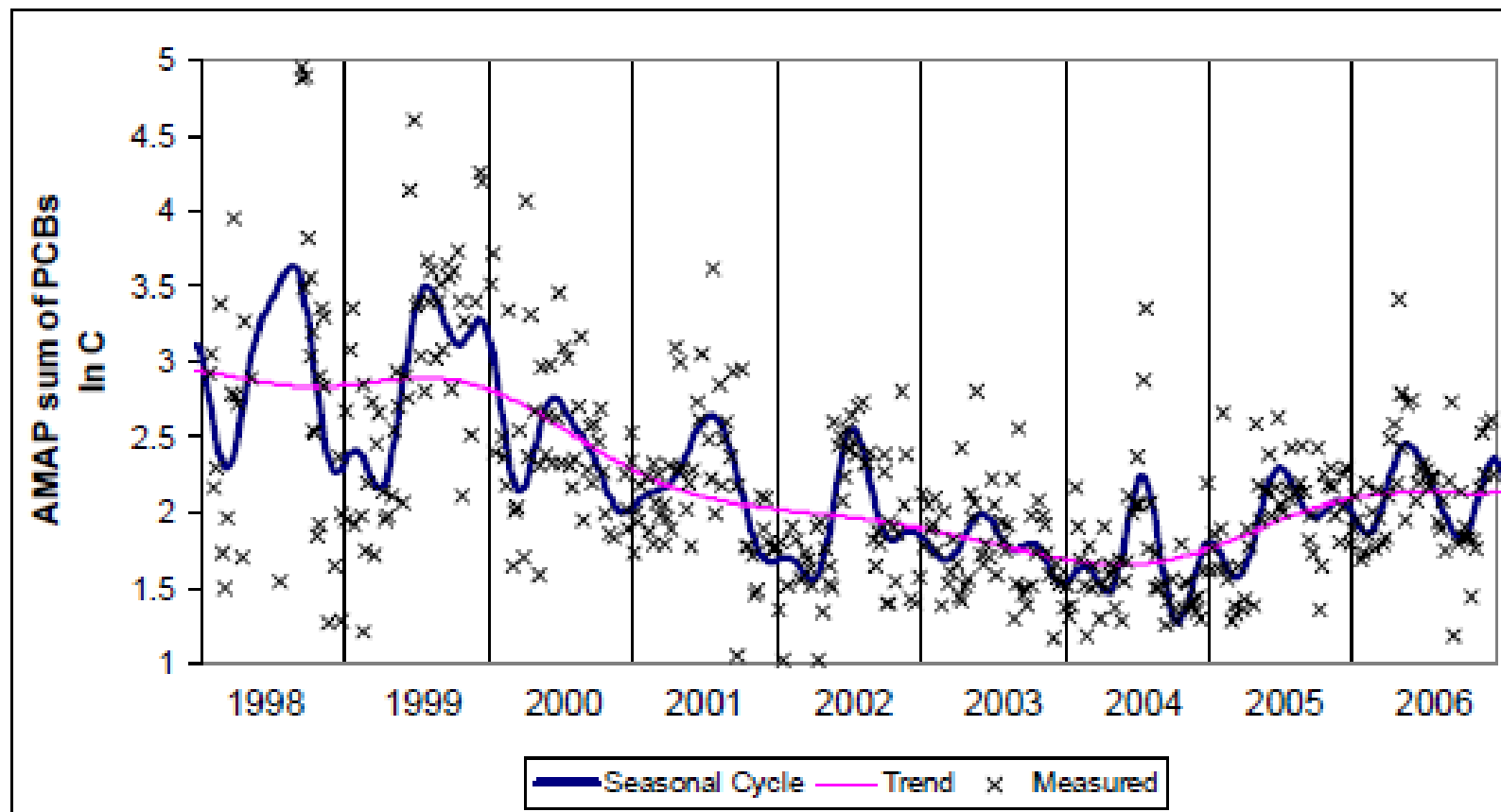
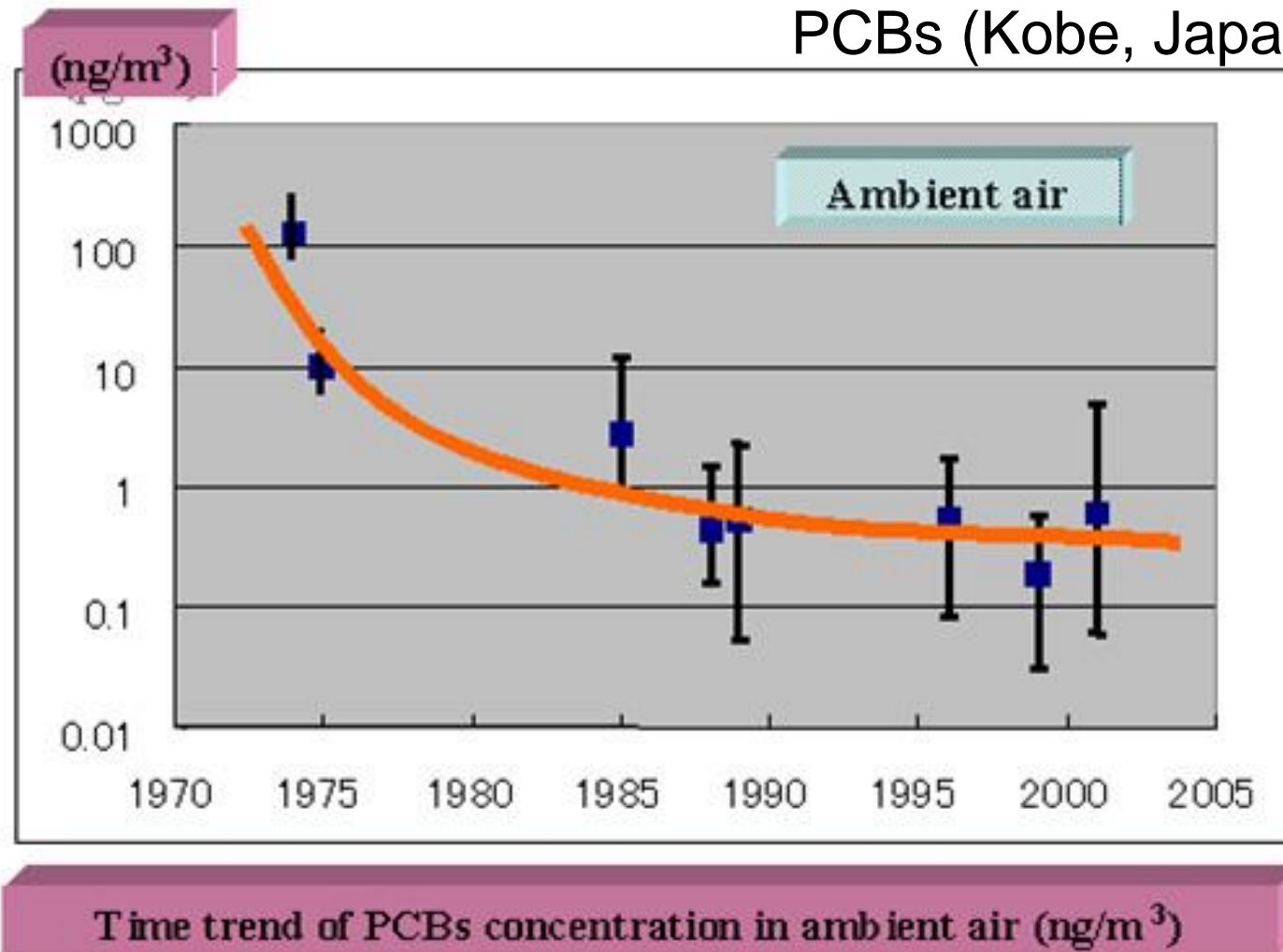


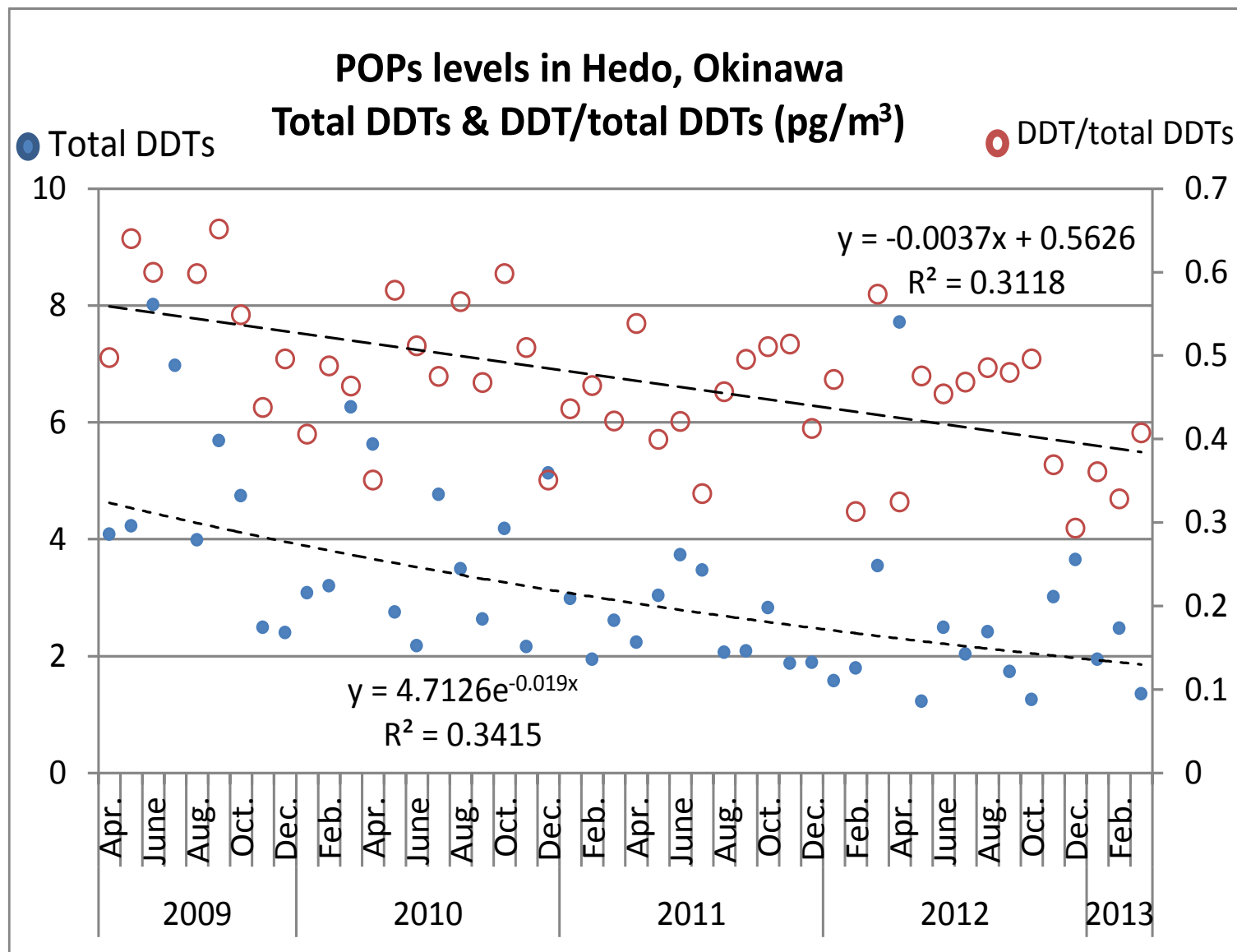
Figure 4: DF analysis of PCB levels in Zeppelin air [pg/m^3] from 1993 – 2006. Measured data, seasonal cycles and trend line is presented.

Changes in levels over time

PCBs (Kobe, Japan)



Trends – DDT in air, Japan



Trends – Dioxins (Japan)

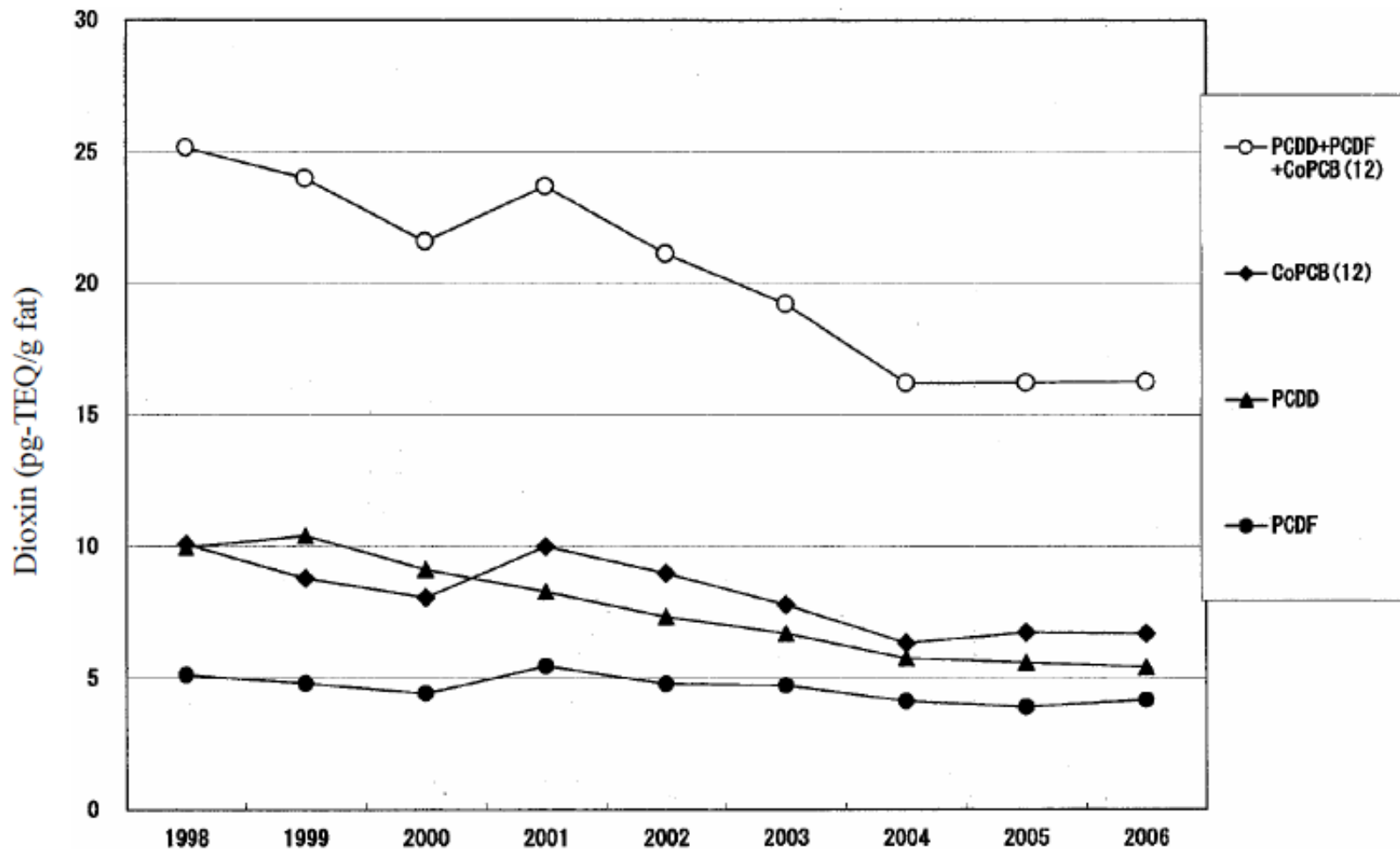
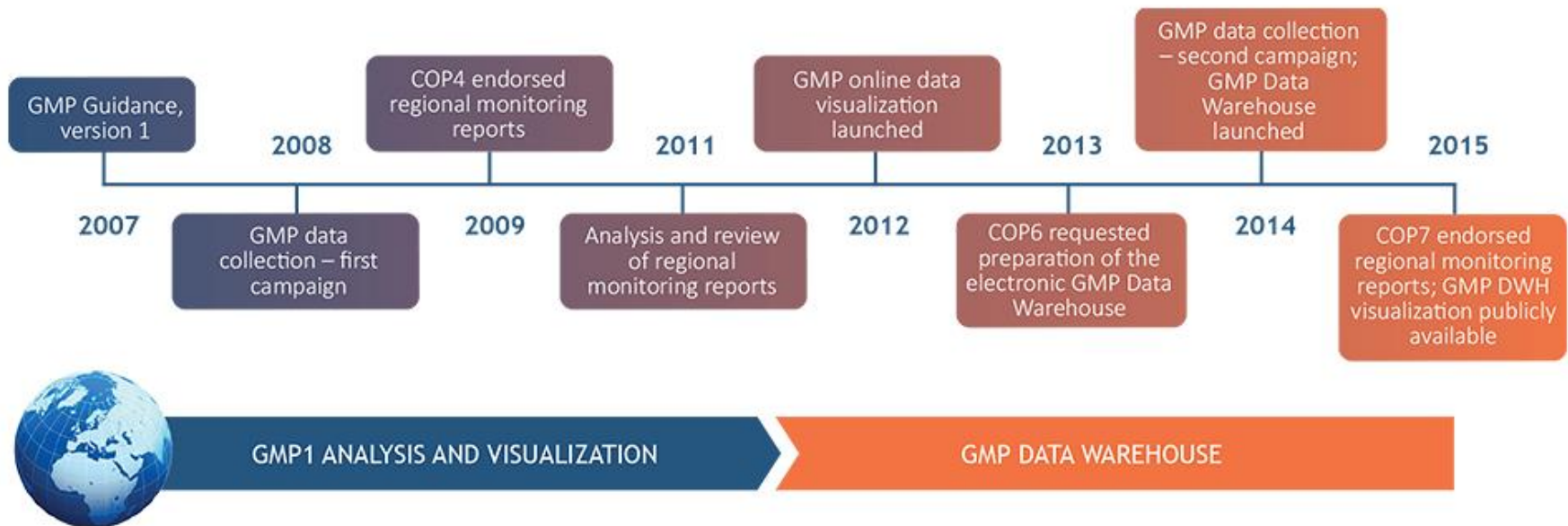


Figure D.2-1 Temporal trends of the dioxins concentration in the human milk in Japan (Iwate, Chiba, Niigata, Ishikawa, Osaka and Shimane prefectures)

GMP Data warehouse

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



More information at:

chm.pops.int



The screenshot displays the Stockholm Convention website. At the top, there are navigation tabs for 'Basel Convention', 'Rotterdam Convention', 'Stockholm Convention', and 'Synergies'. Below these is a header banner with the Stockholm Convention logo and the text 'Protecting human health and the environment from persistent organic pollutants'. A navigation bar includes links for 'HOME', 'THE CONVENTION', 'PROCEDURES', 'IMPLEMENTATION', 'COUNTRIES', and 'PARTNERS', along with a search bar and a 'Login' link. The breadcrumb trail reads: 'You are here: Stockholm Convention > Implementation > Global Monitoring Plan > Monitoring Activities'. The left sidebar, titled 'GMP', lists links for 'Overview', 'Decisions', 'Regional organization groups', 'Monitoring Activities' (which is highlighted), 'Monitoring Reports', 'Meetings', 'Capacity building', 'Additional Resources', and 'Partnerships'. The main content area is titled 'Monitoring Activities' and contains the following text: 'Monitoring activities under the global monitoring plan are focused on generating measurement data from core media: ambient air, human milk and human blood, and surface water for water-soluble POPs (perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride).' It also states: 'Monitoring data from the first phase global monitoring plan are available through the online GMP data warehouse, while data from the second phase global monitoring plan will become accessible further to their approval by the Conference of the Parties in 2015.' and 'Click here to access the GMP data warehouse.' Below this text is a graphic titled 'GMP DATA WAREHOUSE' featuring a globe and four circular icons labeled 'AIR', 'HUMAN BLOOD', 'WATER', and 'HUMAN MILK'.

The worldwide implementation of the Global Monitoring Plan is made possible thanks to the generous contributions to the Stockholm Convention Voluntary Trust Fund from the Governments of Japan, Norway, Sweden, and through the European Commission's Thematic Programme for Environment and Sustainable Management of Natural Resources, including Energy (ENRTP). Further, the contribution of the projects to support POPs monitoring activities in regions, funded through the Global Environment Facility (GEF) and the Strategic Approach to International Chemicals Management (SAICM), is greatly acknowledged. Monitoring activities, and data collection and analysis are implemented in the five UN regions in cooperation with strategic partners and through involvement of Regional Organization Groups and Global Coordination Group.

Thank you

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