Global NIP Update Webinar -“Introduction to PFAS and SCCP/MCCP and related Inventories”,
17. September 2024, 14:00 -16:15 CEST, GMT 2

STOCKHOLM CONVENTION

Developing Inventories for Newly Listed Industrial POPs

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https://scholar.google.com/citations?user=-Cexto4AAAAJ&hl=en

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22 POPs newly listed in the Stockholm Convention 2009-2023

Chemical	Pesticides	Industrial chemicals	Unintentional production	Annex
Chlordecone	+			A
α- and β- hexachlorocyclohexane	+		By-product of lindane	A
Lindane (gamma HCH)	+			A
Endosulfan, Dicofol	+			A
Pentachlorophenol (PCP)	+	+		A
Commercial PentaBDE		+		A
Commercial OctaBDE (hexa/hepta)		+		A
DecaBDE		+		A
Hexabromobiphenyl (HBB)		+		A
Hexabromocyclododecane (HBCD)		+		A
Perfluorooctane sulfonic acid (PFOS), its salts and PFOSF	+	+		B
PFOA and related compounds		+		A
PFHxS and related compounds		+		A
Short Chain Chlorinated Paraffins		+		A
Hexachlorobutadiene (HCBD)		+	+	A/C
Pentachlorobenzene (PeCBz)		+	+	A/C
Polychlorinated Naphthalene (PCN)		+	+	A/C

Now 34 POPs listed with 22 newly listed since 2009.

- Three perfluoroalkyl substances (PFAS) groups **PFOS, PFOA, PFHxS** and related compounds
- **Short-chain chlorinated paraffins (SCCPs)**
- **5 brominated flame retardants**
- Chlorinated naphthalene (PCN), Hexachlorobutadiene (HCBD), Pentachlorobenzene (PeCBz**)**

Three POPs listed 2023 @COP11:

- The first **non-halogenated** POP was listed in 2023 (**UV-328**)
- Flame retardant **Dechlorane Plus**
- Pesticide **Methoxychlor**

POP Review Committee: PBDD/F & PXDD/F; Chlorpyrífos. And MCCPs & LC-PFAA are proposed @COP12 2025.

Inventory guidance documents for the listed POPs and other guidance documents on POPs for the Stockholm Convention

General guidance

- Guidance for **developing** a NIP
- Guidance for **action plan costing**
- Guidance for **socio-economic assessments**

Inventory guidances

- **POP Pesticide materials**
- **PCB guidance materials**
- **POP-PFAS inventory** guid.
- **PBDE inventory** guidance
- **HBCD inventory** guidance
- **PCN inventory** guidance
- **PCP inventory** guidance
- **HCBD inventory** guidance
- **SCCP inventory** guidance
- **Sectoral POP Inventory G**
- **Dioxin/U-POP Toolkit**
- **Guidance on POPs Data**
- **QA/QC Guidance**

Action plan development

BAT/BEP

- Guidelines for **BAT /BEP Unintentional POPs**
- Guidance for **BAT /BEP** for production & use **PFOS**
- Guidance for BAT /BEP for **recycling & disposal of articles** containing **PBDEs**
- Draft Guidance for **BAT/ BEP for the production and use of HBCD**
- Draft Guidance for **BAT/ BEP for production and use of PCP**

Alternatives

- **General guidance on alternatives to POPs**
- **Guidance Alternatives to HBCD**
- Consolidated **Guidance Alternatives to PFOS**
- Prelim. **Draft Guidance Alternatives to SCCPs**
- Prelim. **Draft Guidance Alternatives decaBDE**

Others

- Guidance for the **control of the import and export** of POPs
- **Monitoring of POPs in products & recycling**
- **Guidance on Labelling** of products and articles

Webinars on the other guidance documents are coming…

http://www.pops.int/Implementation/NationalImplementationPlans/Guidance/tabid/7730/Default.aspx

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Objectives of POPs inventories

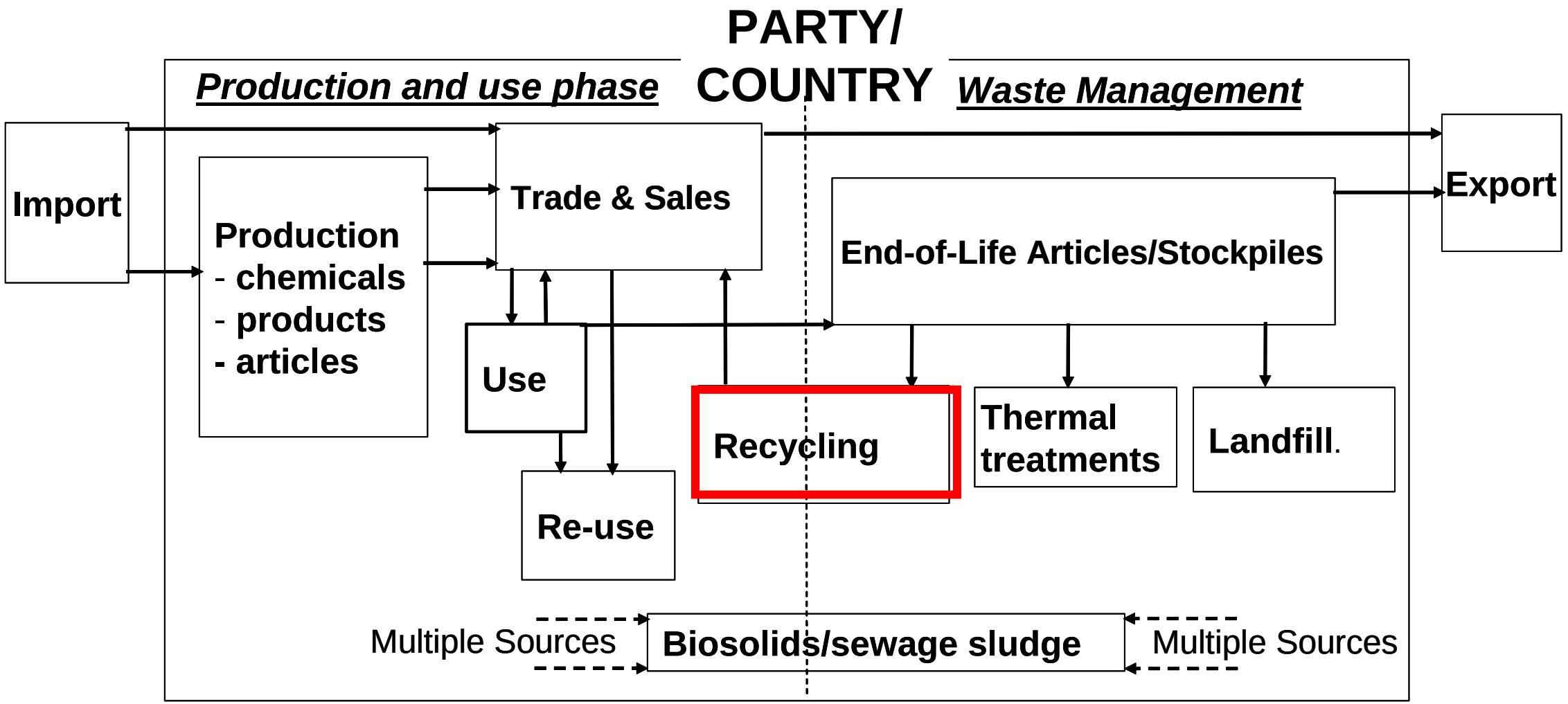
POPs inventories

- provide the basis for **prioritization**, **action plan development** and for deciding on **management strategies by**
  - **determining the quantities of the POPs that are produced, used, stored as stockpiles, and generated as waste in the country:**
  - **identifying the important economic sectors and operators and the type of actions required for those sectors, estimate the capacities needed for implementation;**
  - **identifying sources that should be prioritized;**
- provide a basis for the evaluation **if current national use, production, and chemical & waste management meet the requirements of the Convention and identify areas where not;**
- provide a basis for the **Stockholm Convention reporting obligations (Article 15)**;
- help to **identify gaps for prioritization & action plans within the NIP development (Article 7);**
- help to identify the need for **financial or technical support**.

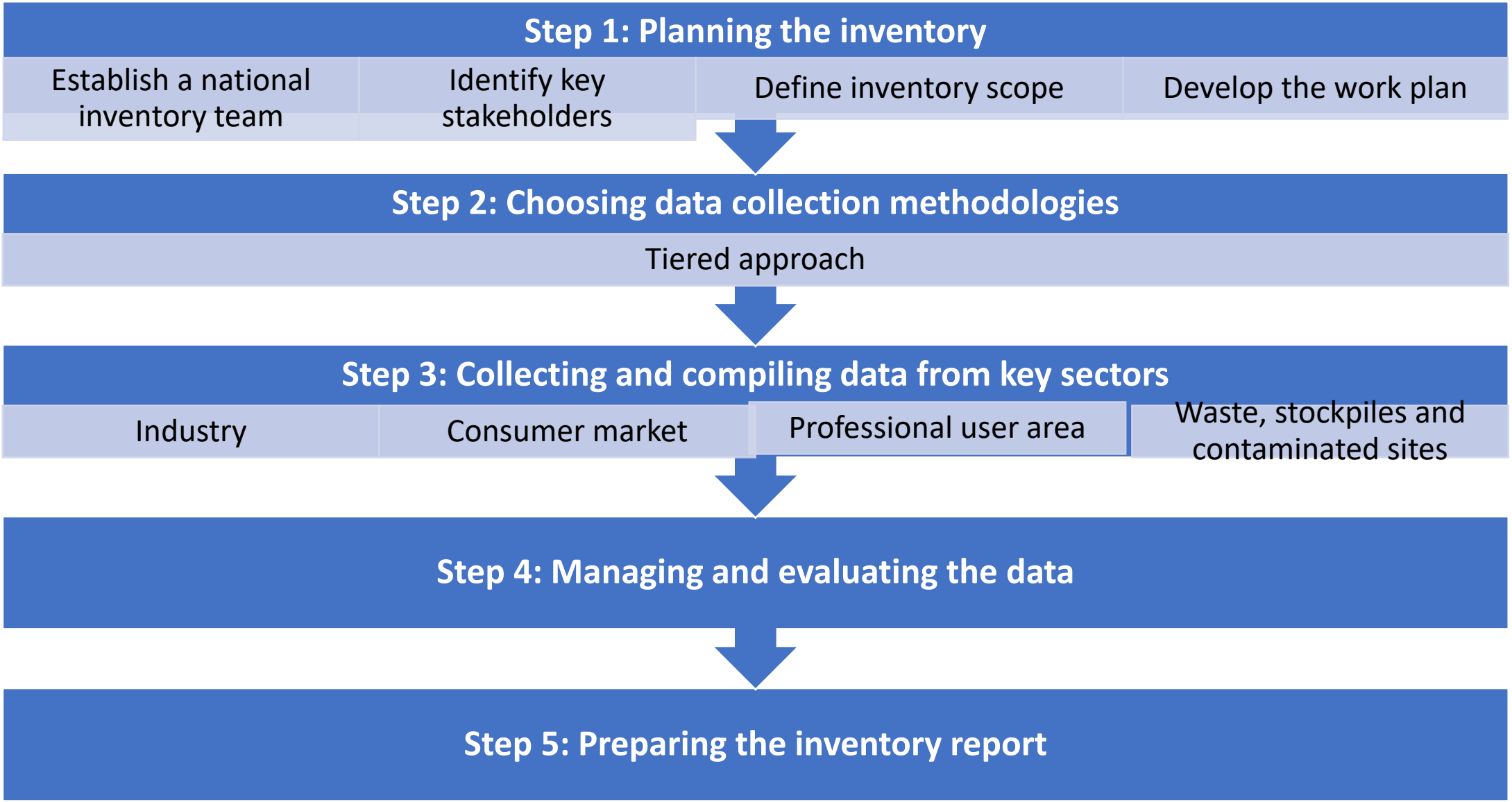
Identification/control of new listed POPs in the life cycle stages

For new listed industrial POPs still produced (PFOA, SCCPs, decaBDE, UV-328) the inventory need to assess the **entire life cycle (interesting „exercise“ to understand gaps of chemical managem.).**

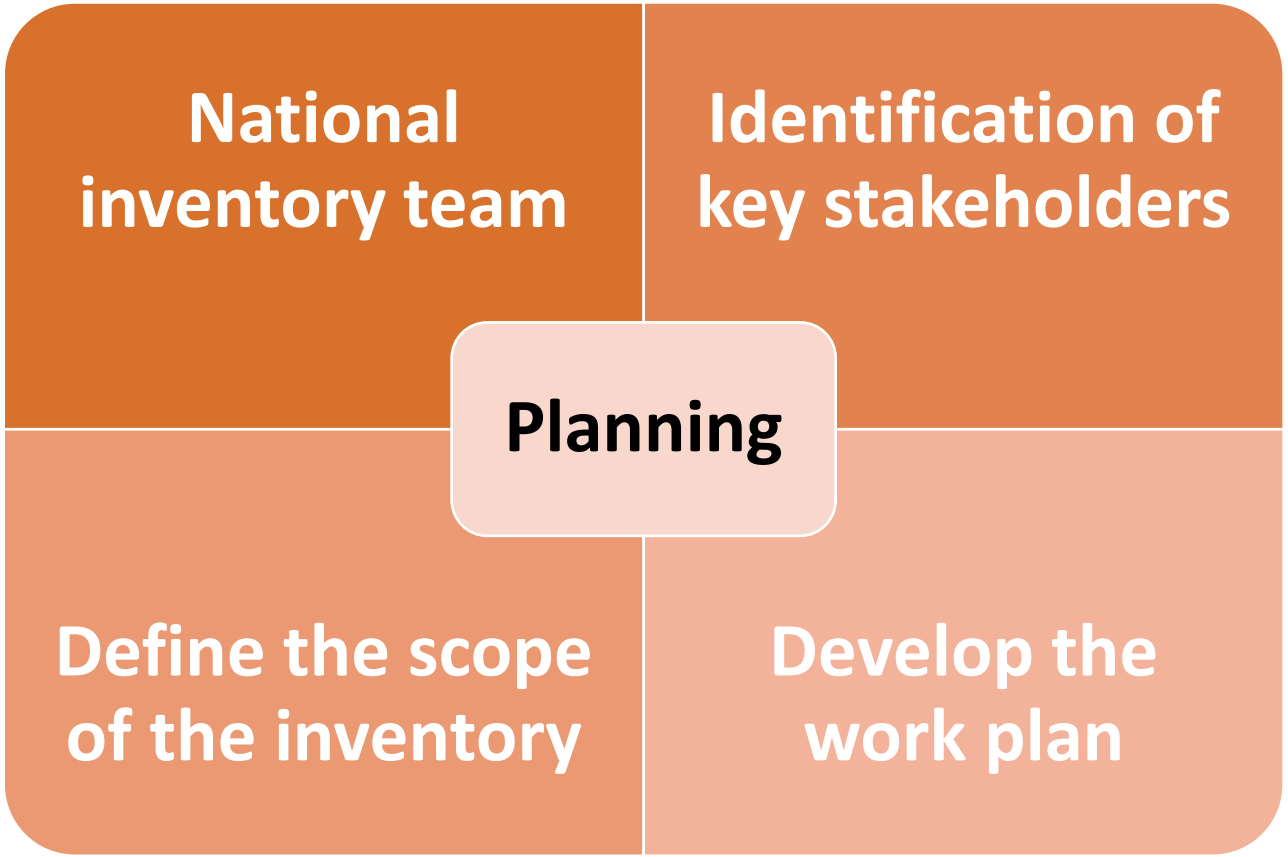
For industrial POPs in the end-of-life, recycling needs to be considered **(circular economy).**



Steps for developing industrial POP inventories



Step 1 – Planning of the inventory



Step 1 – Planning of the Inventory

1. National inventory team:

- Multi-stakeholder inventory team with necessary competences and access to relevant inventory information for the different sectors.
- This team would comprise government ministries (chemicals and waste management), customs, private sectors, NGOs (CSO and industry associations), research (working on POPs and resource/waste management and possibly material flows).

2. Identification of key stakeholders

- For the different sectors key stakeholders need to be identified (Web search; National registers) which have access to the necessary information in the different sectors.
- Depending on the needs and availability, stakeholders could become inventory team members or just support with data/information (approach of industrial countries - consultancy).

Step 1 – Planning of the inventory

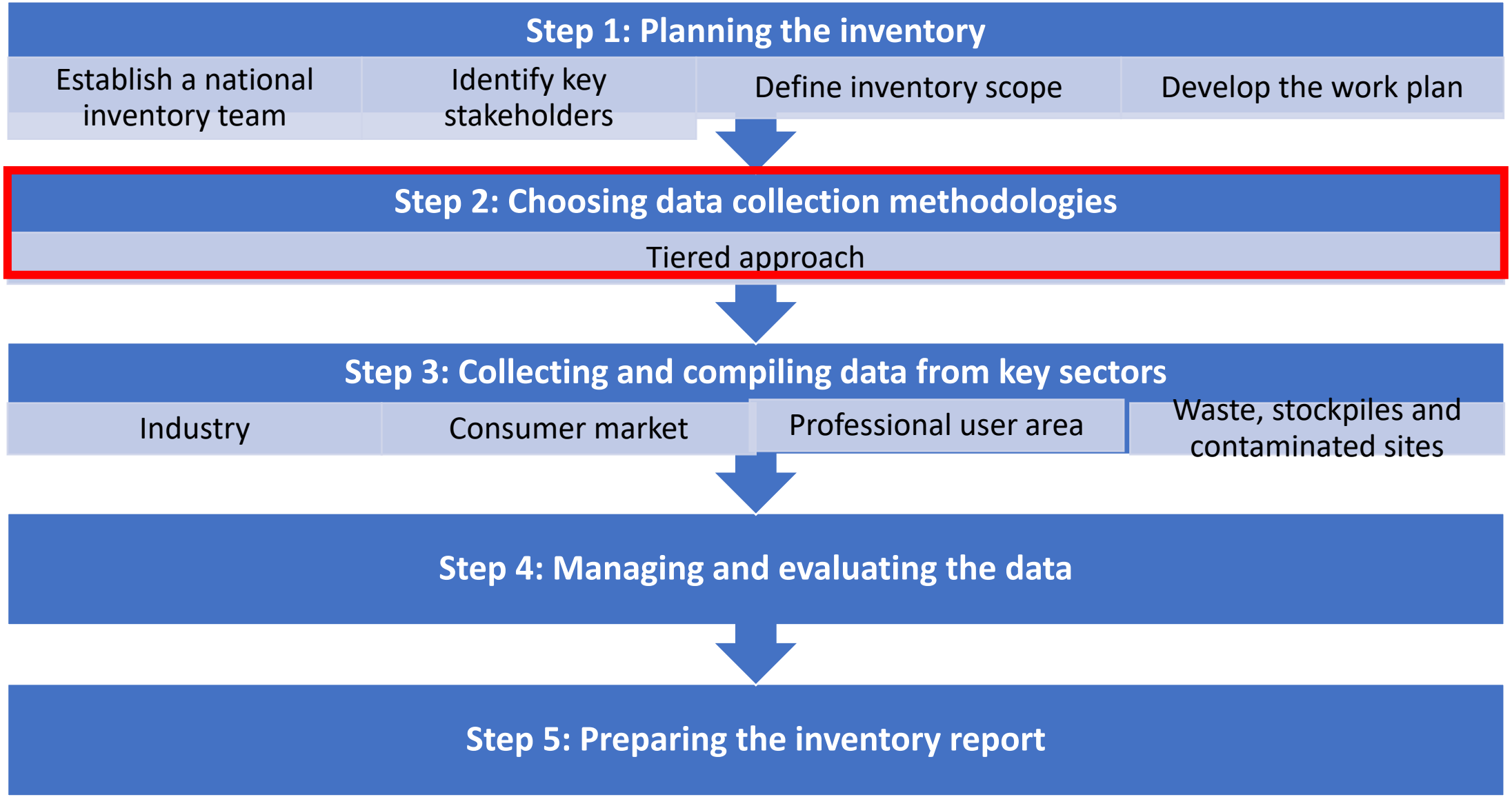
3. Objectives and scope:

- Setting objectives of the inventory and deciding on scope, considering the national circumstances
- Use outcomes of initial assessment for scope setting
- Consider availability/need of resources and capacity

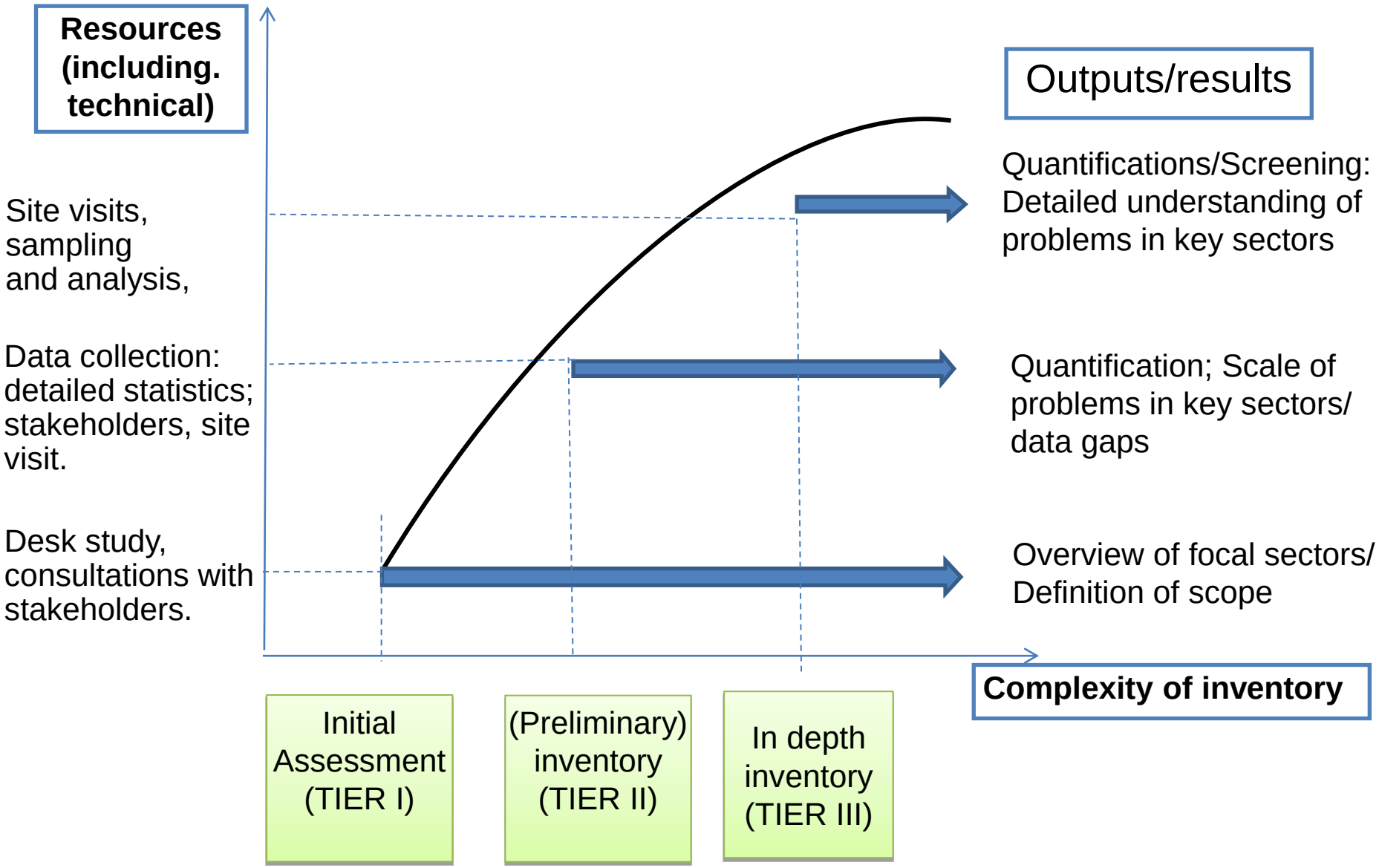
4. Development of workplans:

- Identification of the sectors and inventory strategy;
- Methodologies to be used (in inventory guidance);
- Activities needed and assignments;
- Setting time frame and milestones.
- Allocation of resources for planned activities

Steps for developing industrial POP inventories



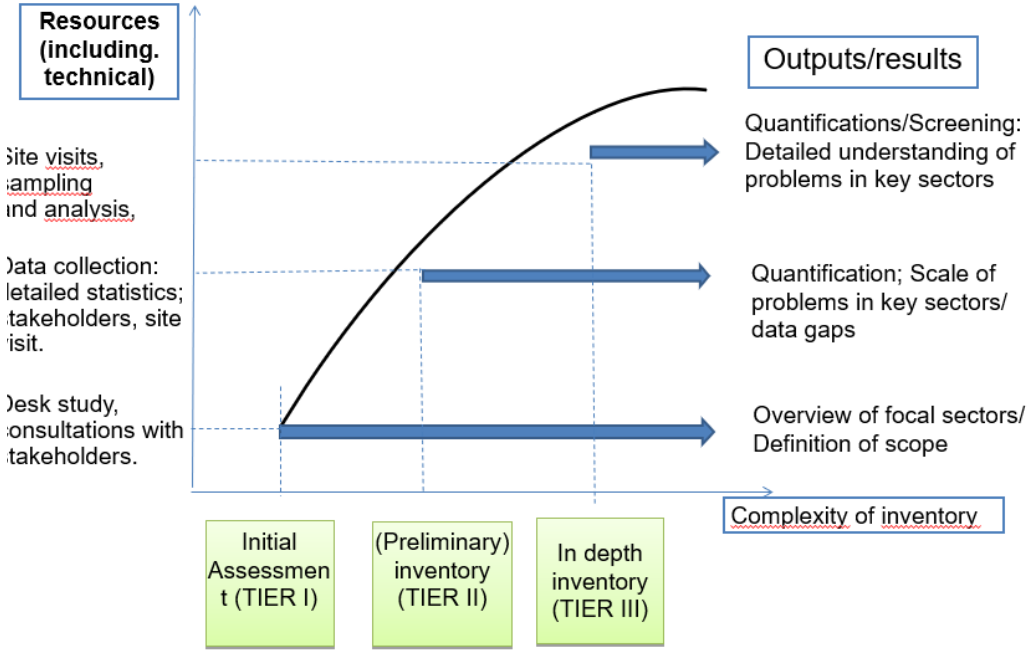
Step 2 – Choosing methodology for data collection



Step 2 – Choosing methodology for data collection: Challenge Tier 3

- A major challenge for low- and middle-income countries is the lack of analytical capacity.
- But many POP data are available – see e.g. SC Guidance on POP in products & recycling.
- POPs data are generated by the Global Monitoring Plan (next phase is currently in planning), by South-North cooperations (see e.g. Nigeria-Sweden/Germany) or by South-South cooperations (e.g. China Belt Road POP monitoring project).
- Regional approach for organizing POP monitoring (some laboratories in the regions available)

- Also Material and Substance flow analysis (MFA/SFA) is considered a Tier 3 inventory approach.
- UNEP developed inventory case studies including MFA/SFA with Nigeria & Vienna University using the open access MFA Tool STAN (https://www.stan2web.net/). https://www.greenpolicyplatform.org/case-studies/inventory-pops-electrical-and-electronic-equipment-eee-and-related-waste-weee-nigeria https://www.greenpolicyplatform.org/case-studies/inventory-pops-transport-sector-nigeria



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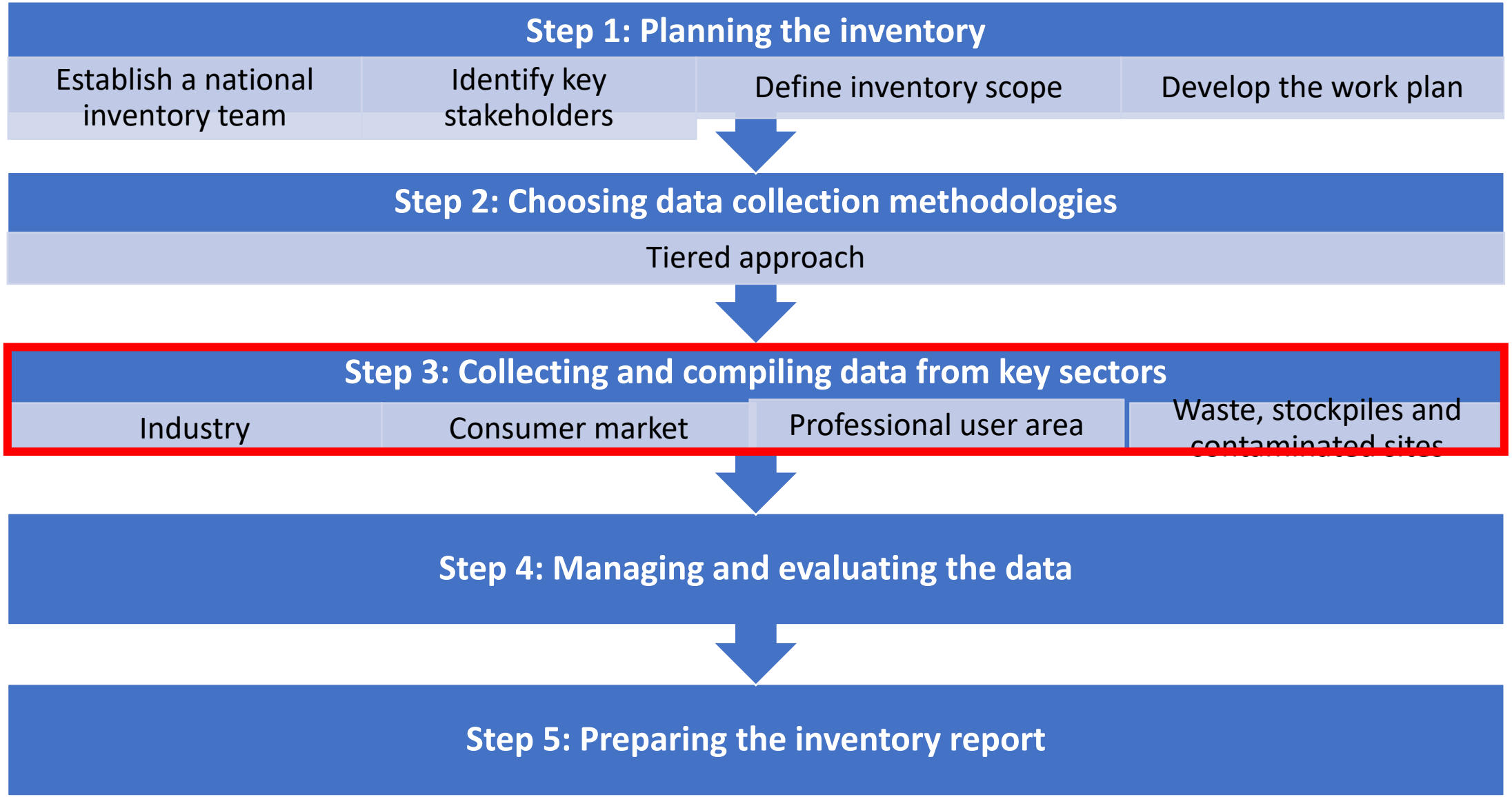
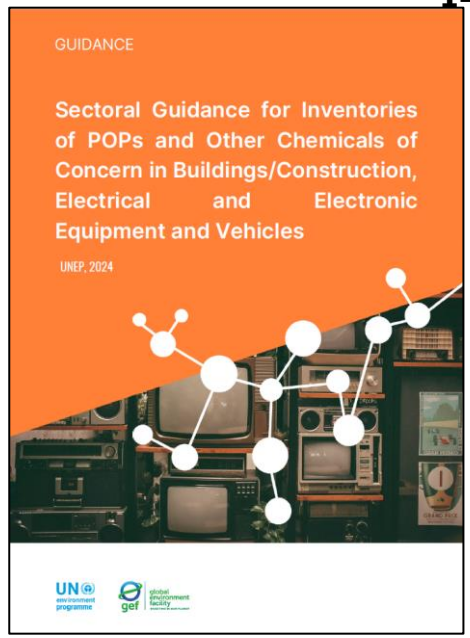


Step 3: Collecting and compiling data from sectors



Collecting data for PBDE, HBCD, DP and UV-328 inventory:

- EEE and WEEE
- **Transport** Sector
- **Construction** Insulation & other polymers
- Textile upholstery

These POPs can to a large extent be covered by the Sectoral approach!

Recorded webinar: https://www.greenpolicyplatform.org/webinar/sectoral-approach-inventories-pops-and-other-chemicals-concern-construction-electronics-and

Collecting the data for POP-PFAS inventory:

- Production (PFOA)
- Import/export articles and chemicals
- Fire-fighting foams
- Industrial use e.g. plating, oil, aviation fl.
- Carpets Textiles furniture

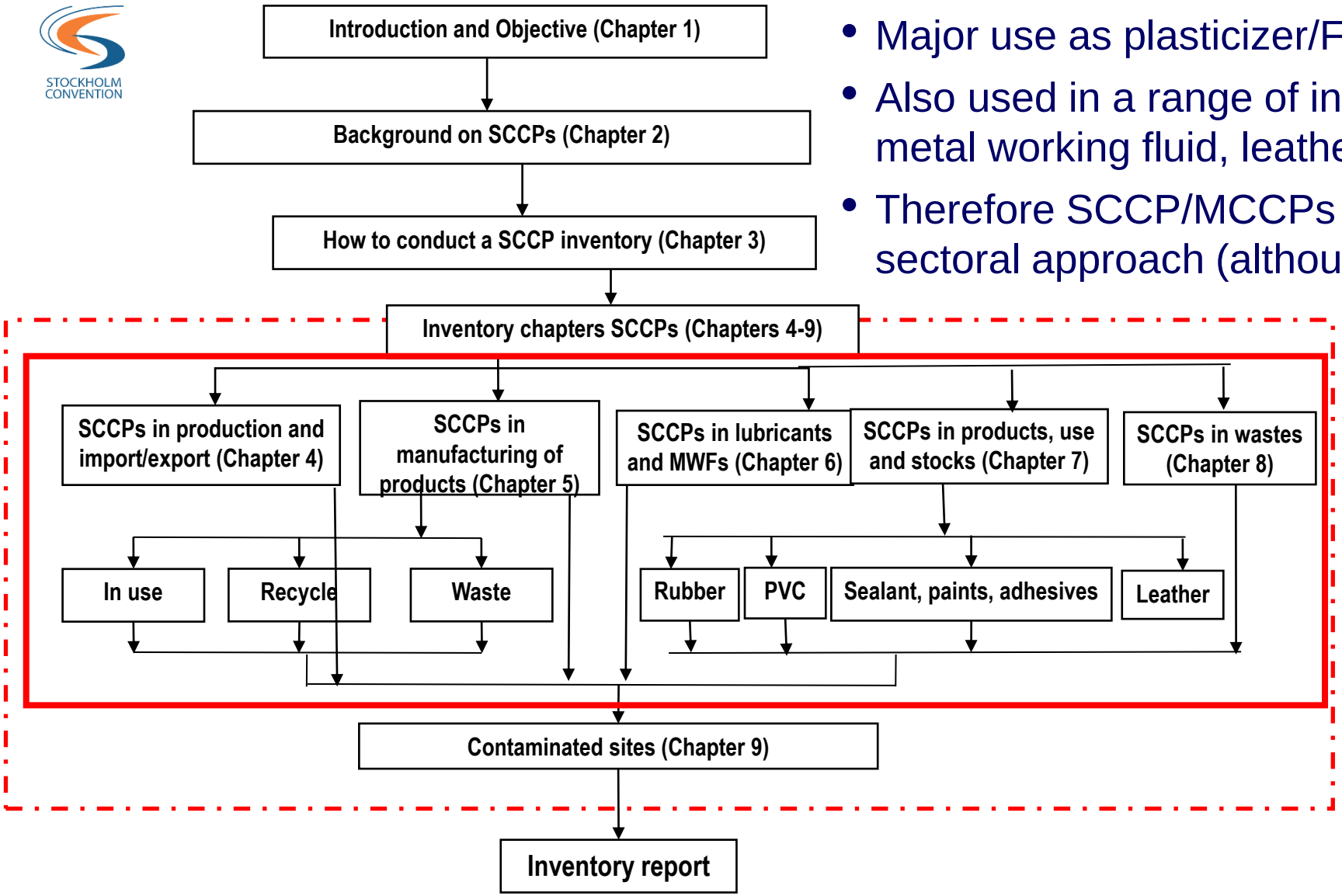
Examples of focal sectors

- Waste
- Stockpiles
- **Contaminated sites**

Not covered by the Sectoral approach!!

Content of SCCP inventory guidance (can cover MCCPs)

- SCCP & MCCPs are still produced in large amount.
- Major use as plasticizer/FR (e.g. PVC, PUR, and rubber)
- Also used in a range of industrial processes as lubricant, metal working fluid, leather fat liquoring,
- Therefore SCCP/MCCPs cannot be covered by the sectoral approach (although present in the 3 Sectors)



Step 3: Collecting data for POP-PFAS and SCCP/MCCPs

Industrial sector

- initial assessment stage/questionnaire surveys

Consumer market

- more-in depth analyses/questionnaire surveys and verifying presence of PFOS in articles by analysis

Professional use areas

- initial assessment stage/questionnaire surveys

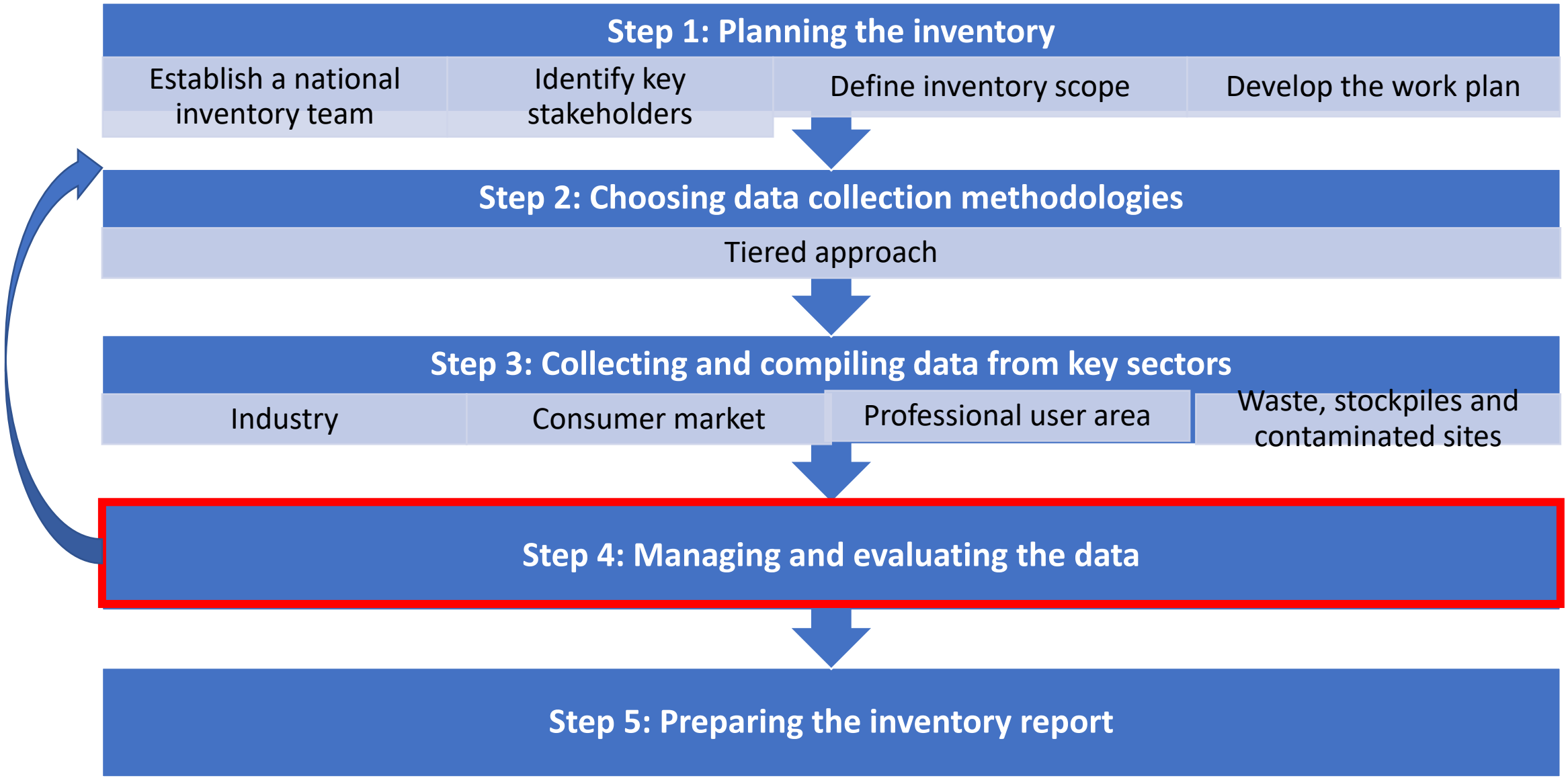
Waste management

- focus on stockpiles and prioritize larger waste segments/questionnaire surveys

Contaminated sites

- focus on identification/questionnaire surveys

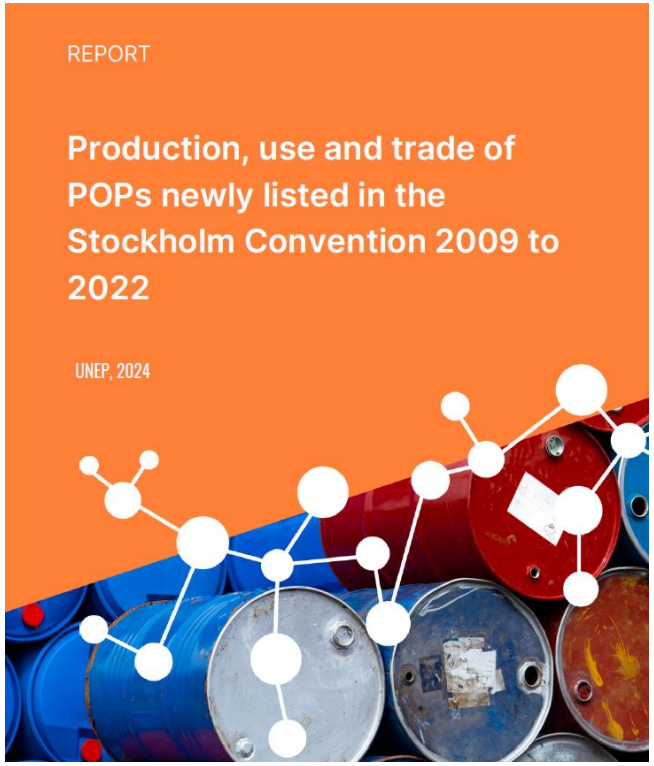
Steps for developing industrial POP inventories



Step 4: Evaluation and validation of inventories

- The compiled data can be evaluated and validated by presenting it to national stakeholders and experts for getting feedback.
- Assessment of inventories by external reviewing of the data.
- Plausibility considerations: For most of the newly listed POPs total historic production and/or current production amount is known (see recent report on production, trade and use). The developed inventories can be compared against these data for a plausibility evaluation.

https://www.greenpolicyplatform.org/research/production-use-and-trade-pops-newly-listed-stockholm-convention-2009-2022 and related Webinar



- Measured data from own monitoring effort or information from other monitoring studies can be used for validation purpose (see guidance on “Monitoring of POPs in products and recycling”).
- Comparison with inventories of other countries.
- Material and substance flow analysis (MFA/SFA) can help to validate inventories developed for the newly listed POPs along their life cycle.

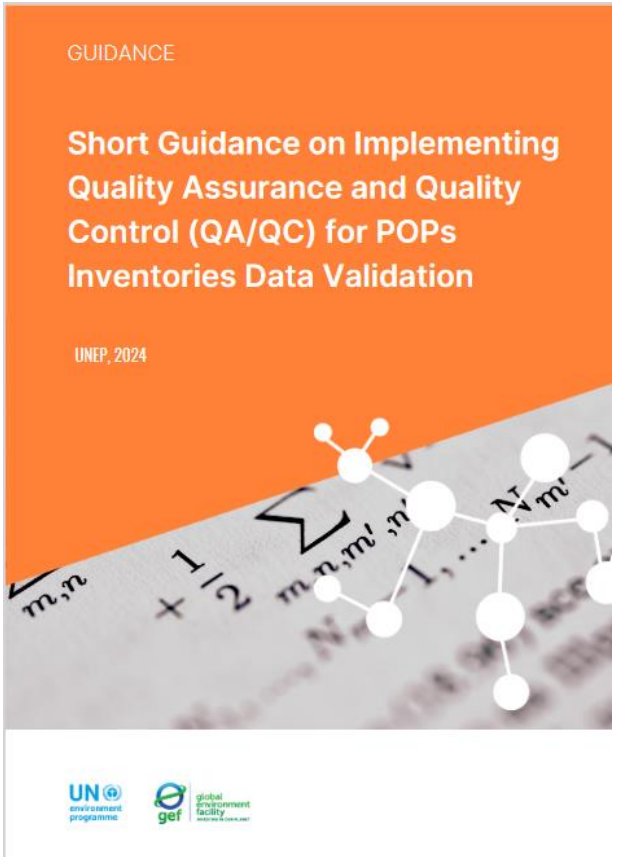
https://www.greenpolicyplatform.org/case-studies/inventory-pops-electrical-and-electronic-equipment-eee-and-related-waste-weee-nigeria
https://www.greenpolicyplatform.org/case-studies/inventory-pops-transport-sector-nigeria

Step 4: Mechanism for evaluation of the inventory

- Identify
  - gaps and limitations and measures needed to complete the inventory.
  - if the obligations under the SC are fulfilled and the necessary actions needed to fulfill them.
  - the need of notification to the registers of acceptable purposes and specific exemptions under the Convention.

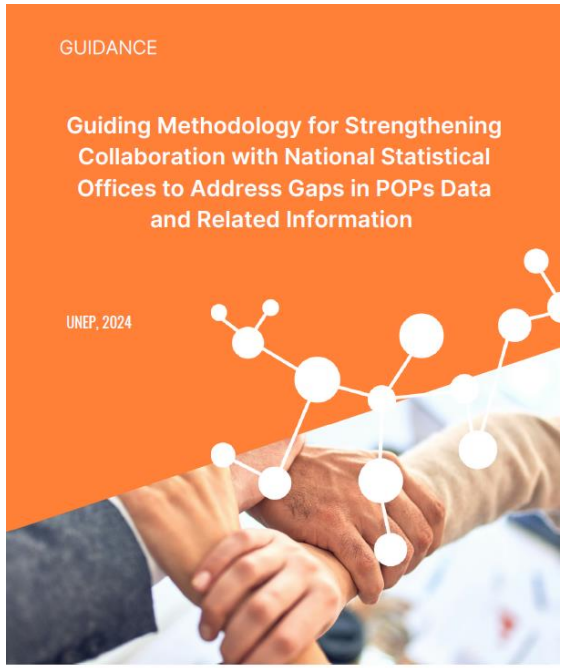
- A guidance on QA/QC for the inventory data has been published and will be introduced in a webinar (likely in November).
- The evaluation will be the **basis for updating the NIP** & development of Action Plan.
- Gaps, limitations and necessary actions will be valuable information in **the NIP**, and can be necessary for applying **for funds.**

https://www.greenpolicyplatform.org/guidance/short-guidance-implementing-quality-assurance-and-quality-control-qaqc-pops-inventories-0



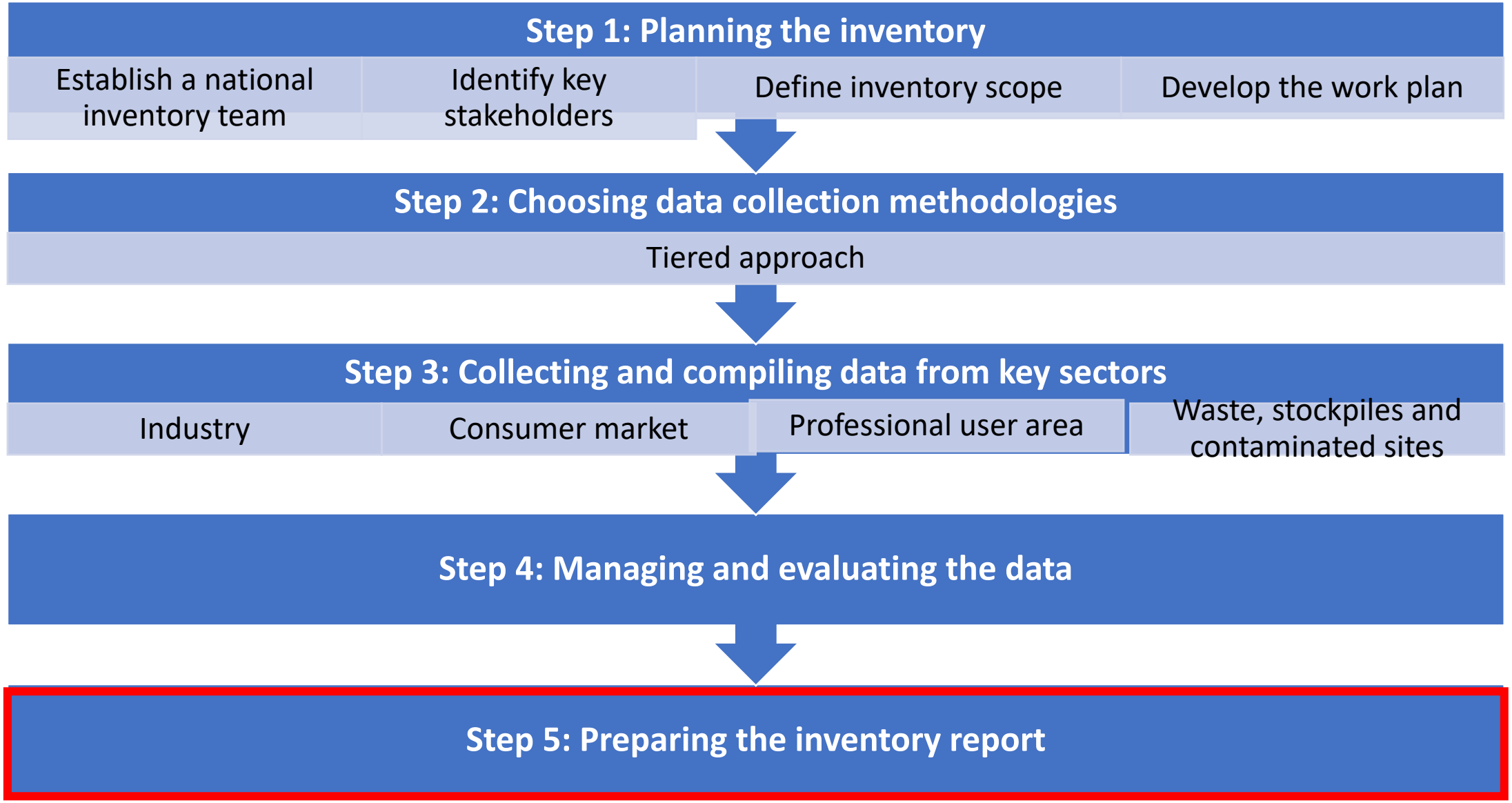
Data Management - Database organization

- What data management and databases are useful for the compilation of new POPs inventories and information?
- POPs should **not** be addressed on their own but should be integrated within a countries chemicals management and waste management schemes.
- Information on POPs should be integrated into/generated from existing databases/information.
- It is recommended that the National Statistical Office (NSO) manages relevant data (see "*Guiding Methodology for Strengthening the Collaboration with National Statistical Offices to Address Gaps Related to POPs Data*")
- Following database considered:
  - POPs as chemicals: Possibly included in a Chemicals Database or impulse to develop a Chemicals Database (see UNITAR).
  - Certain industrial/unintentional POPs link to Pollutant Release Transfer Register (PRTR)?
  - POPs in waste: Waste Catalogue and Waste Database.
  - POPs contaminated sites: Database of contaminated sites



https://www.greenpolicyplatform.org/guidance/guiding-methodology-strengthening-collaboration-national-statistical-offices-address

Steps for developing industrial POP inventories



Step 5: Inventory report and reporting to COP

- **An inventory report is developed as a final step** for each POPs inventory sector. **This inventory report is aimed at supporting the development and formulation of the NIP**.
- The **inventory report should also serve as the basis for the NIP (Article 7) and Article 15 reporting to COP** (The reporting format is available on the BRS Secretariat website and now also in an electronic NIP template). At the start of inventory development the reporting format should be studied that the required information is considered and gathered, as appropriate.
- **Furthermore the inventory reports can be the base for the development of NIP projects**, **developing effective strategies and action plans for managing POPs** in order to meet the obligations under the Stockholm Convention.

Thank you for your attention ! Questions?

More Information https://www.pops.int/Implementation/NationalImplementationPlans/Guidance/tabid/7730/Default.aspx

Basel Convention: www.basel.int

Rotterdam Convention: www.pic.int

Stockholm Convention: http://chm.pops.int/

Montreal Protocol/Vienna Convention: http://ozone.unep.org

FAO: www.fao.org **WHO** www.who.int/ **GFC** https://www.chemicalsframework.org/

Alternatives https://www.subsportplus.eu/subsportplus/EN/Home/Home_node.html

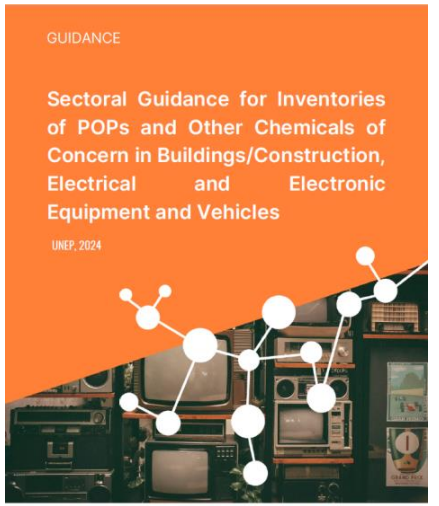
OECD/IOMC: http://www.oecd.org/chemicalsafety/

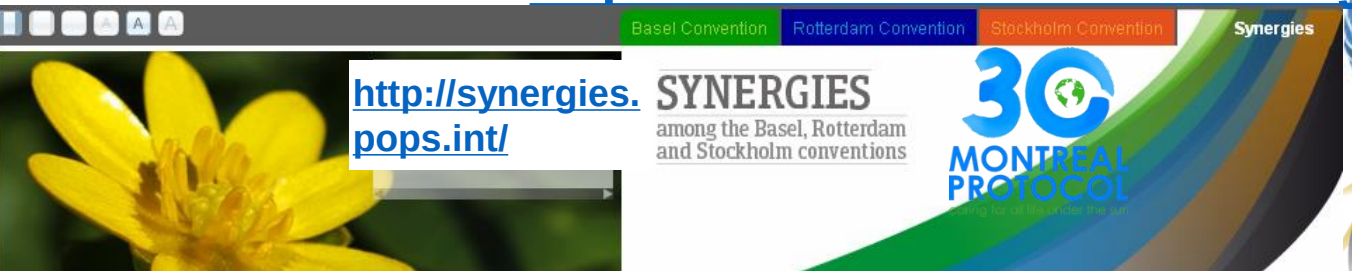
Science: www.ipcp.ch; http://greensciencepolicy.org/; www.unep.org/oewg-spp-chemicals-waste-pollution

Industry: http://www.suschem.org/; https://icca-chem.org/; https://cefic.org/

NGO: www.ipen.org; www.ciel.org/; www.ban.org; www.chemsec.org; www.wecf.org;

Better-world-links: http://www.betterworldlinks.org/





United Nations Framework Convention on Climate Change

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https://www.greenpolicyplatform.org/case-studies/case-study-inventory-pops-building-and-construction-sector-country

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Global NIP Update Webinar -“Introduction to PFAS and SCCP/MCCP and related Inventories”,
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Introduction to and Establishing Inventories for PFOS, PFOA, PFHxS and Related Compounds

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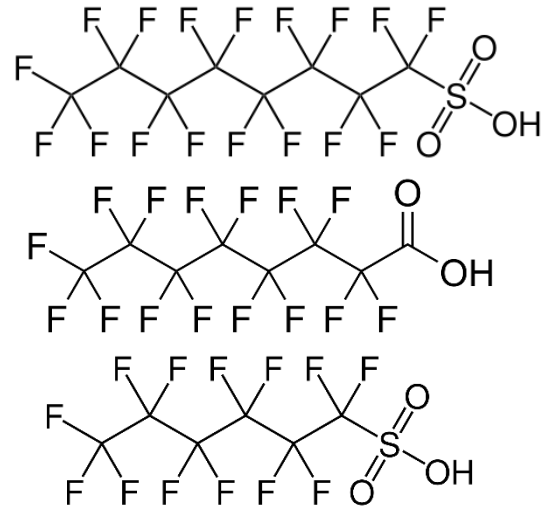
α-/β-HCH, Lindane, Methoxychlor	+			A
Pentachlorophenol (PCP)	+	+		A
Commercial PentaBDE (tetra/penta)		+		A
Commercial OctaBDE (hexa/hepta)		+		A
DecaBDE		+		A
Hexabromobiphenyl (HBB)		+		A
Hexabromocyclododecane (HBCD)		+		A
Perfluorooctane sulfonic acid (PFOS), its salts and PFOSF	+	+		B
PFOA and related compounds		+		A
PFHxS and related compounds		+		A
Short Chain Chlorinated Paraffins		+		A
Dechlorane Plus		+		A
UV-328		+		A
Hexachlorobutadiene (HCBD)		+	+	A/C
Pentachlorobenzene (PeCBz)		+	+	A/C
Polychlorinated Naphtalene (PCN)		+	+	A/C

Meanwhile **three groups of PFAS** have been listed in the Stockholm Convention

- PFOS, its salt and PFOSF
- PFOA and related compounds
- PFHxS and related compounds

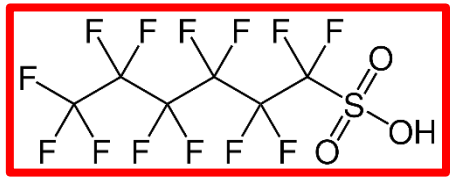


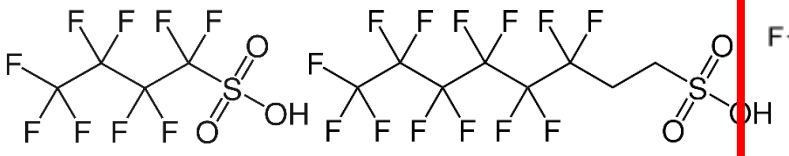
Long-chain perfluorocarboxylic acids (C_9-C_{21} PFCAs) were evaluated in POPRC for their POP properties and will be considered for **listing at COP12 in 05/2025**.

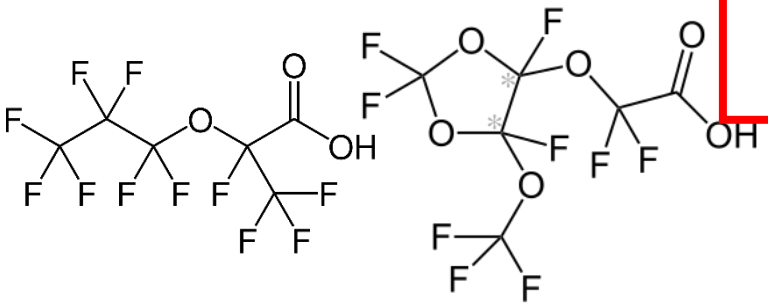
POP Review Committee: Chlorpyríos. Proposed for listing at COP12 in 2025: MCCPs and LC-PFAA

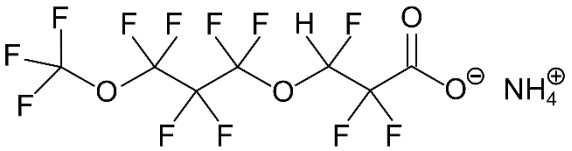
POP-PFASs are a small part of the large PFAS family to be controlled

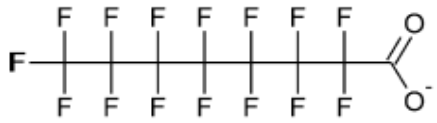
Industry moved to short-chain PFAS & PFAS ether



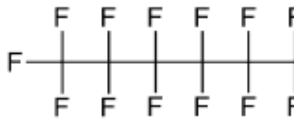




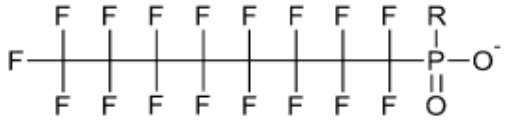




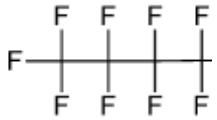
Perfluorocarboxylic acids
(ex. PFOA)



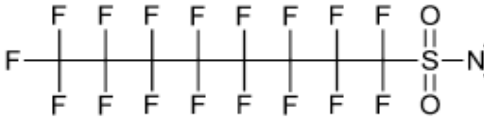
Perfluorosulf
(ex. PFOS)



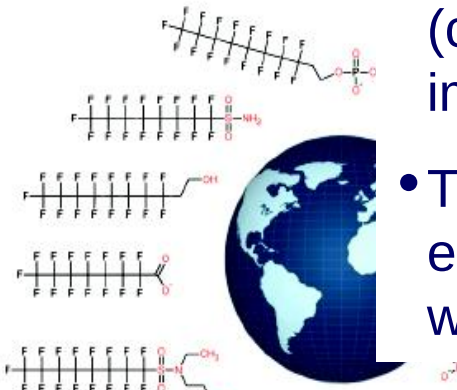
Perfluorophosphonic/phosphinic acids
(ex. If R=OH then PFOPA
If R=C8 perfluoroalkane then 8:8 PFPi)

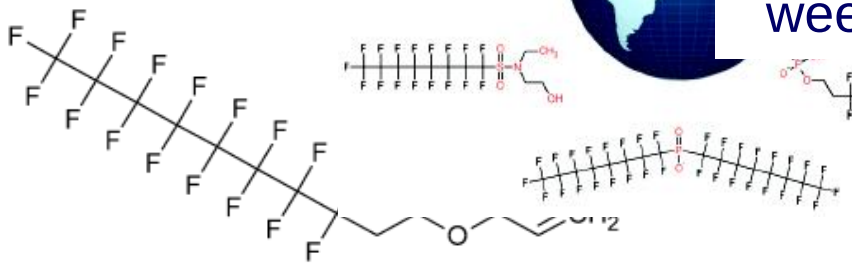


Perfluor
(ex. FOS



Perfluorosulfonamidoethanol
(ex. N-EtFOSE)

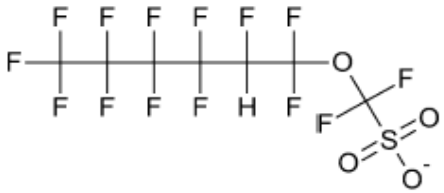




Today more than 10,000 PFASs are in ECHA restriction proposal

https://echa.europa.eu/de/-/echa-publishes-pfas-restriction-proposal

- PFASs are highly persistent „forever chemicals“ (perfluorinated PFAS do not degrade in soil or ground water).
- Many of them are mobile and can contaminated ground/drinking water.
- POP-PFASs bioaccumulate in humans and bind to proteins.
- They have a wide range of toxicities (cancer, developmental delay/sperm, immunotox & endocrine disruption.
- The esposure to POP-PFASs exceed frequently the tolerable weekly intake set e.g. by EFSA.



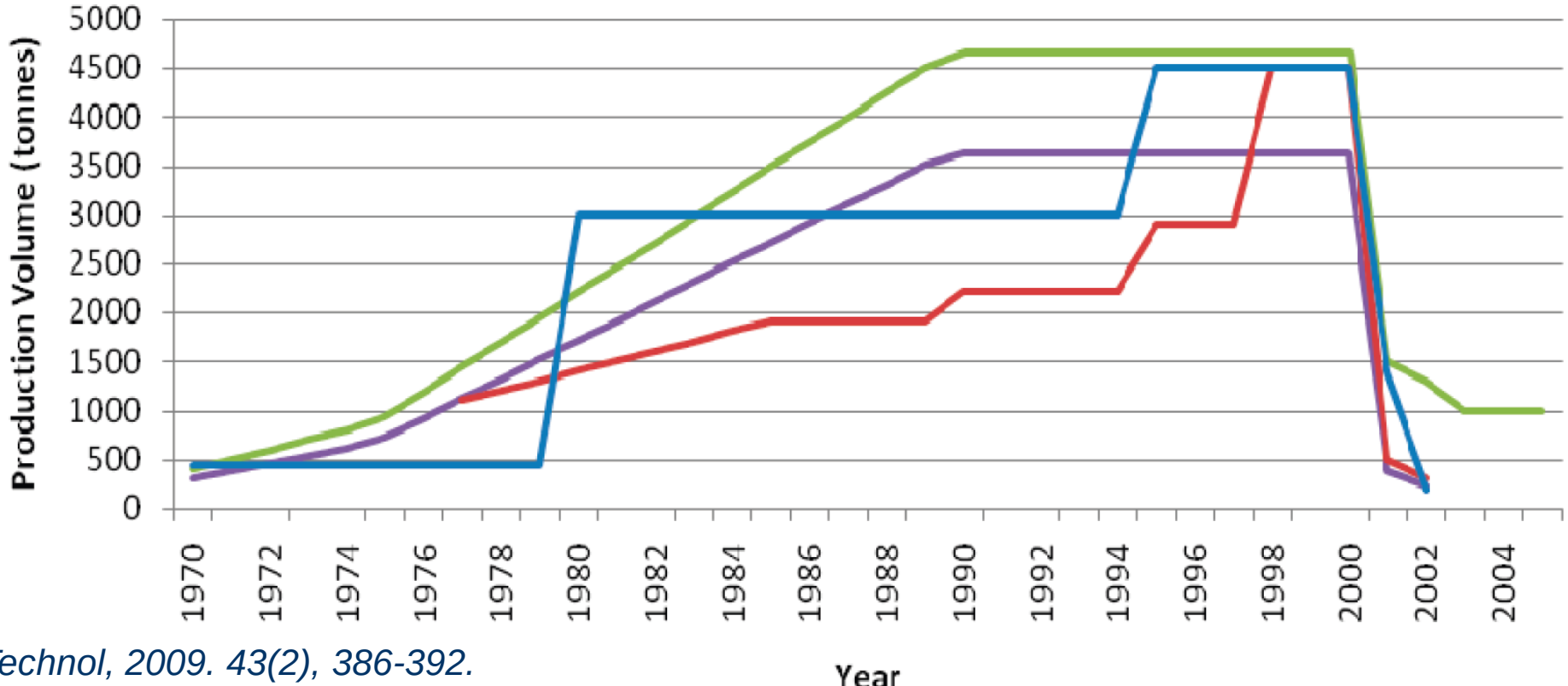
Polyfluorinated ether sulfonates
(ex. Perfluoro [hexyl ethyl ether sulfonate

OECD list with >4700 https://www.oecd.org/chemicalsafety/risk-management/global-database-of-per-and-polyfluoroalkyl-substances.xlsx

Lindstrom et al. ES&T dx.doi.org/10.1021/es2011622 (2011)

Total production of PFOS and related production wastes

- Major production and use from 1980 to 2002 (3M phased out production; peak prod. 4500 t/year).
- Total historic PFOS-production 96000 t + 26500 t production waste.
- PFOS was produced in China until 2022/2023 with a capacity of ~100-200 t/year.
- **Therefore, a large share of PFOS already entered end of life (landfills, environment including contaminated sites; only a minor share destroyed). A share is still today in stocks.**
- Also for PFOA, PFHxS and related compounds also the major production was before 2017.

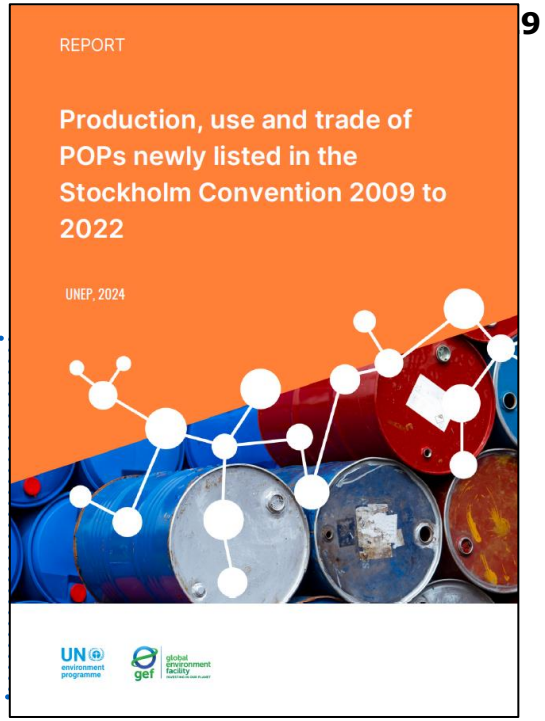


Paul et al, *Environ Sci Technol, 2009. 43(2), 386-392.*

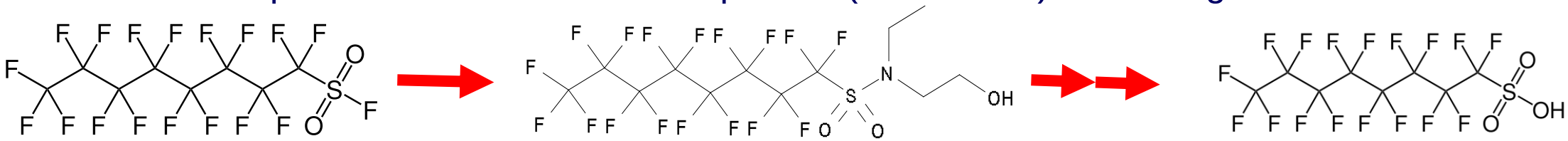
Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF)

- Proposal: 2005, Sweden; Risk profile: UNEP/POPS/POPRC.2/17/Add.5
- Risk management evaluation: UNEP/POPS/POPRC.4/15/Add.6

- **Production: Total past production ~96,000 tonnes**; **production stopped end of 2022 also in China)**.
- For more details on production, use and trade of POPs including POPs-PFAS see related Guidance & Webinar https://www.greenpolicyplatform.org/webinar/navigating-production-use-and-trade-new-pops-2009-2022-key-international-databases-and



PFOSF used to produce PFOS-related compounds (OECD:165) which degrade over time to PFOS (precursors)



N-Ethylperfluorooctane sulfonamidoethanol; **EtFOSE used in side-chain fluorinated polymers**

→**Listed 2009 in Annex B (Restriction) (Decision SC-4/17)**

→Production: **Allowed for exemptions**

→**Use: A range of wide range of Specific exemptions and Acceptable purposes (Decision SC-4/17 and update Decision SC-7/1 & SC-9/1 and Decision SC-9/4).**

PFOS use - Acceptable Purposes SC (Annex B)

(SC: Currently no alternative is available in some countries)

- Insect baits with sulfluramid (CAS No: 4151-50-2) as an active ingredient for control of leaf-cutting ants from Atta spp. and Acromyrmex spp. for agricultural use only

Following acceptable purposes have been removed:

- ~~Photo imaging~~
- ~~Metal plating in closed loop systems~~
- ~~Fire fighting foam (e.g. oil, air port, military)~~
- ~~Photo resist and anti-reflective coatings for semi-conductors~~
- ~~Etching agent for semi-conductors and ceramic filters~~
- ~~Aviation hydraulic fluids (Rec?)~~
- ~~Certain medical devices (e.g. ETFE layers radio-opaque ETFE, in vitro diagnostic medical devices, CCD color filters)~~

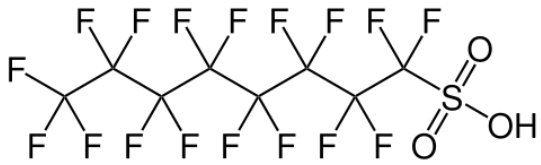
Decision SC-4/17, Decision SC-9/1 and Decision SC-9/4

PFOS use - Specific Exemptions SC

(Alternatives need to be phased-in within 5 years)

- **Hard-metal plating** only in closed-loop systems
- **Firefighting foam** for liquid fuel vapour suppression and liquid fuel fires (Class B fires) in installed systems (mobile & fixed systems).

Still large PFOS stocks/in use in firefighting!



Following exemptions have been removed:

- ~~Coating~~
  - ~~**Carpets, (Recy.?)**~~
  - ~~Paper and packaging (Recy.?)~~
  - ~~Textiles and upholstery, (Recy.?)~~
  - ~~Leather and apparel, (Recy.?)~~
- ~~Chemically driven oil production,~~
- ~~Insecticides red fire ants & termites,~~
- ~~Photo masks semiconductor & LCD ,~~
- ~~Electric/electronic parts for some color printers/co machines,~~

Decisions SC-4/17, Decision SC-7/1, SC-9/1 and SC-9/4

Perfluorooctanoic acid (PFOA), its salts & PFOA-related compounds

- **Proposal: 2015; Risk profile: UNEP/POPS/POPRC.12/3**
- **Risk management evaluation: UNEP/POPS/POPRC.13/3**

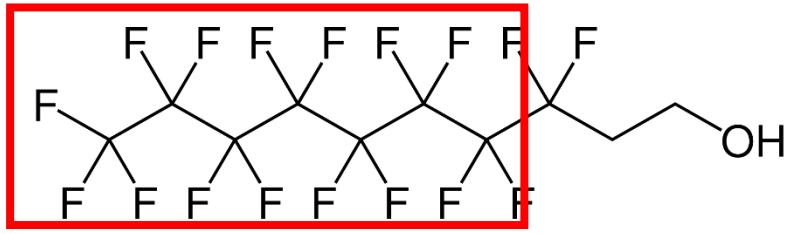
- **Production: 9500 t of PFOA/APFO (1951-2020) and 171,000 t of PFAIs (1961-2015).**
- PFOA and PFOA-related **compounds are still produced.**

PFOA, its salts and PFOA-related compounds" means the following:

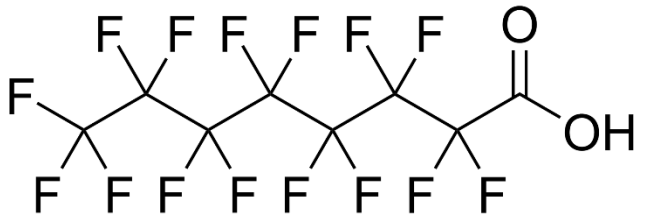
(i) Perfluorooctanoic acid (PFOA; CAS No: 335 67 1), including any of its branched isomers; **(ii)** Its salts;

(iii) Any substances that degrade to PFOA, including any substances (including salts and polymers) having a **linear or branched perfluoroheptyl group with the moiety (C_7F_{15})** as one of the structural elements;

POPRC compiled an indicative list of >300 PFOA related compounds (UNEP/POPS/POPRC.20/INF/12)



8:2 fluorotelomer alcohol (8:2-FTOH)



PFOA (and other PFAS)

(< 21% with variation) (Just et al. J. Agric. Food Chem. 2022, 70, 8920−8930)

→**Listed 2019 in Annex A (Elimination) (Decision SC-9/12)**

→Production: **Allowed for specific exemptions**

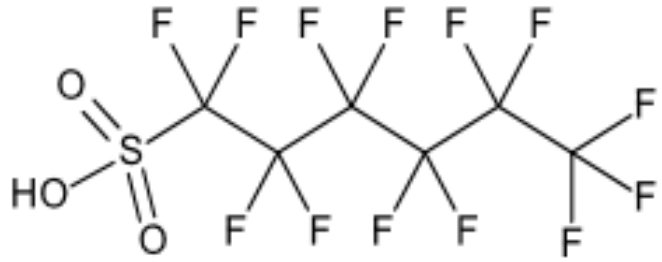
→Use: **A range of specific exemptions registered**

PFOA use - Specific Exemptions SC (Annex A)

Several exemptions (Alternatives needs phase-in 5 year until 12/2025)

- **Firefighting foam** (only existing stock);
- **Textiles for oil-and water-repellency** for the protection of workers from dangerous liquids that comprise risks to their health and safety;
- Photolithography or etch processes in semiconductor manufacturing;
- Photographic coatings applied to films;
- **Invasive/implantable medical devices;**
- **Manufacturing fluorinated polymers;**
- **Manufacturing plastic accessories for car interior parts; and**
- **Manufacturing electrical wires**

Perfluorohexane sulfonic acid (PFHxS), its salts and PFHxS-related compounds



- **Proposal: 2017, Norway**
- **Risk profile: UNEP/POPS/POPRC.14/6/Add.1**
- **Risk management evaluation: UNEP/POPS/POPRC.15/7/Add.1**

Production: Stopped 2022. Former production was much lower compared to PFOS (~10%)

Use: Was in the same uses as PFOS (Firefighting foam, plating, textile, carpet).

PFHxS, its salts and PFHxS-related compounds" means the following:

(i) Perfluorohexane sulfonic acid (CAS No. 355-46-4, PFHxS), including branched isomers;; **(ii)** Its salts;

(iii) Any substance that contains the chemical moiety $C_6F_{13}SO_2$- as one of its structural elements and that potentially degrades to PFHxS;

POPRC compiled a indicative list of PFHxS related compounds (UNEP/POPS/POPRC.20/INF/13)

→Listed in 2022: **Annex A (Elimination) (Decision SC-10/13)**

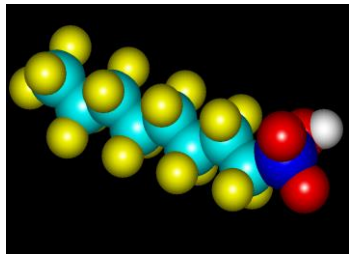
→Production: Total ban **- No exemption**

→Use: Total ban **- No exemption**

STOCKHOLM CONVENTION

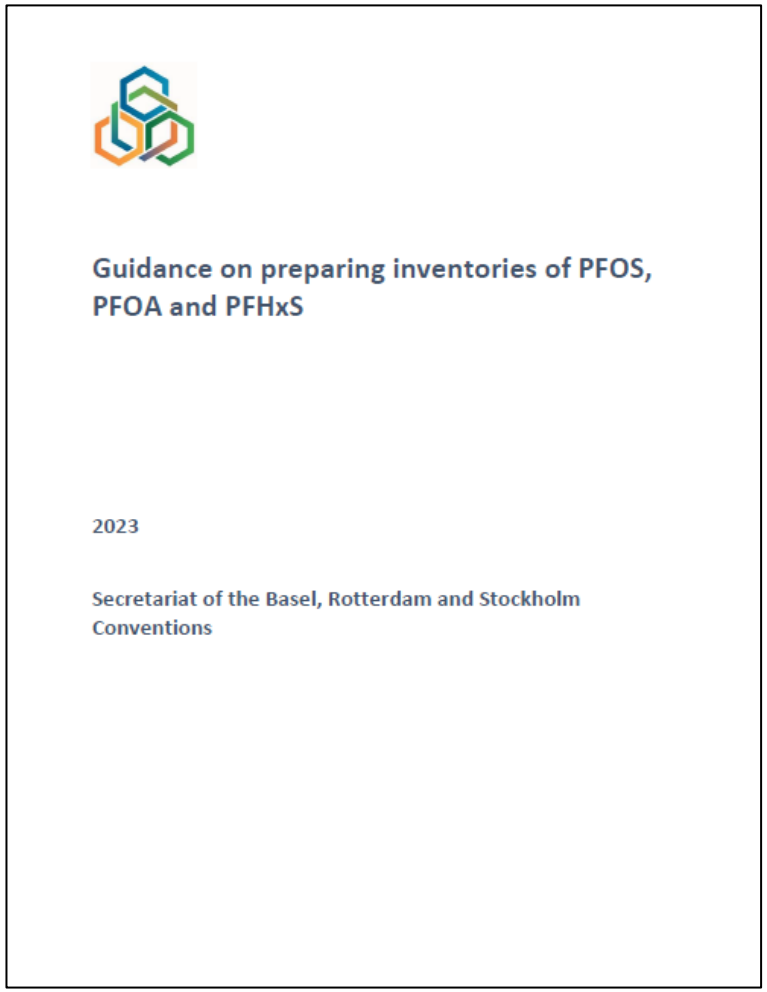
Objective of the Inventory of PFOS, PFOA and PFHxS

- To identify the current production and uses of PFOS and PFOA in the use categories listed as acceptable purposes or specific exemptions in the SC and assessment in not exempted uses.
- **PFHxS has no exemption and its production stopped. But i**t can be present as impurity in PFOS (~4-15%) and possibly in PFBS (?) which is still produced and used (Tier III).
- **The stockpile** of PFOS, PFOA, and PFHxS containing products in use & wastes (e.g. carpets).
- To identify **contaminated sites and their risk**.
- **To identify gaps and if the current status meets the requirements** of the Convention and **where it does not. Financial needs (projects)?**
- To give inputs for developing a **strategy** on PFOS and PFOA phase out and management, developing of **actions plans** and **prioritization** of sectors and actions that need attention.
- To provide a basis for **reporting obligations** under the Stockholm Convention for POP-PFAS.

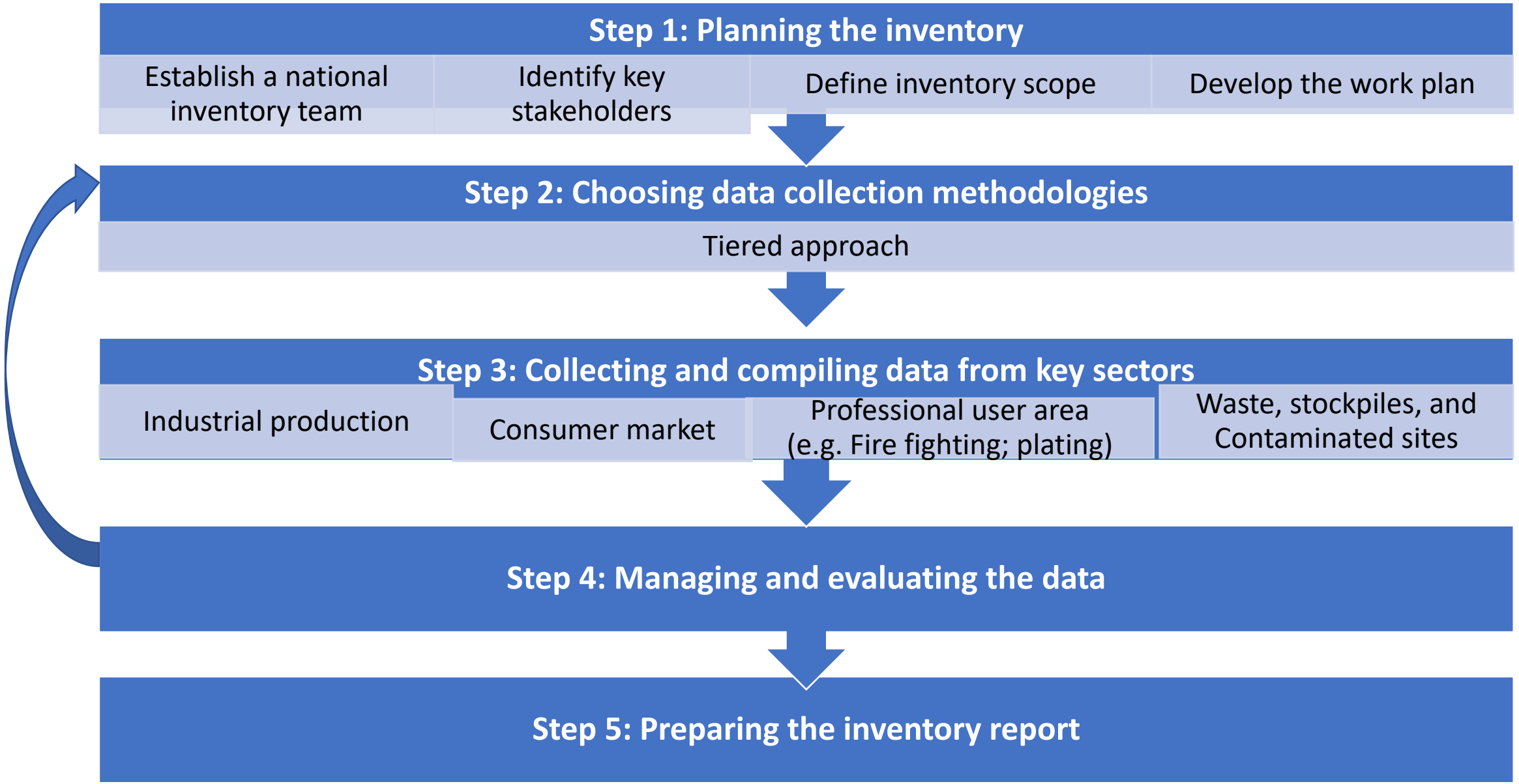


Inventory Guidance for PFOS, PFOA and PFHxS

An updated "*Guidance on preparing inventories of PFOS, PFOA and PFHxS".* has been published by the BRS Secretariat/UNEP in 2023.



Steps for developing industrial POP inventories



Step 1: Planning of the Inventory

1. National inventory team:

- Multi-stakeholder inventory team with necessary competences and **access to relevant inventory information for the different PFAS inventory sectors**.
- This team would comprise **government ministries (chemicals and waste management), customs, private sectors, firefighters**, NGOs (industry associations; CSO), research (working on PFAS related topics; and water and waste management and contaminated sites).

2. Identification of key stakeholders

- For the different sectors **key stakeholders need to be identified** (Web search; National registers) **which have access to the necessary information in the different sectors**.
- Depending on the needs and availability, **stakeholders could become inventory team members or just support with data/information** (approach of industrial countries by a consultancy).

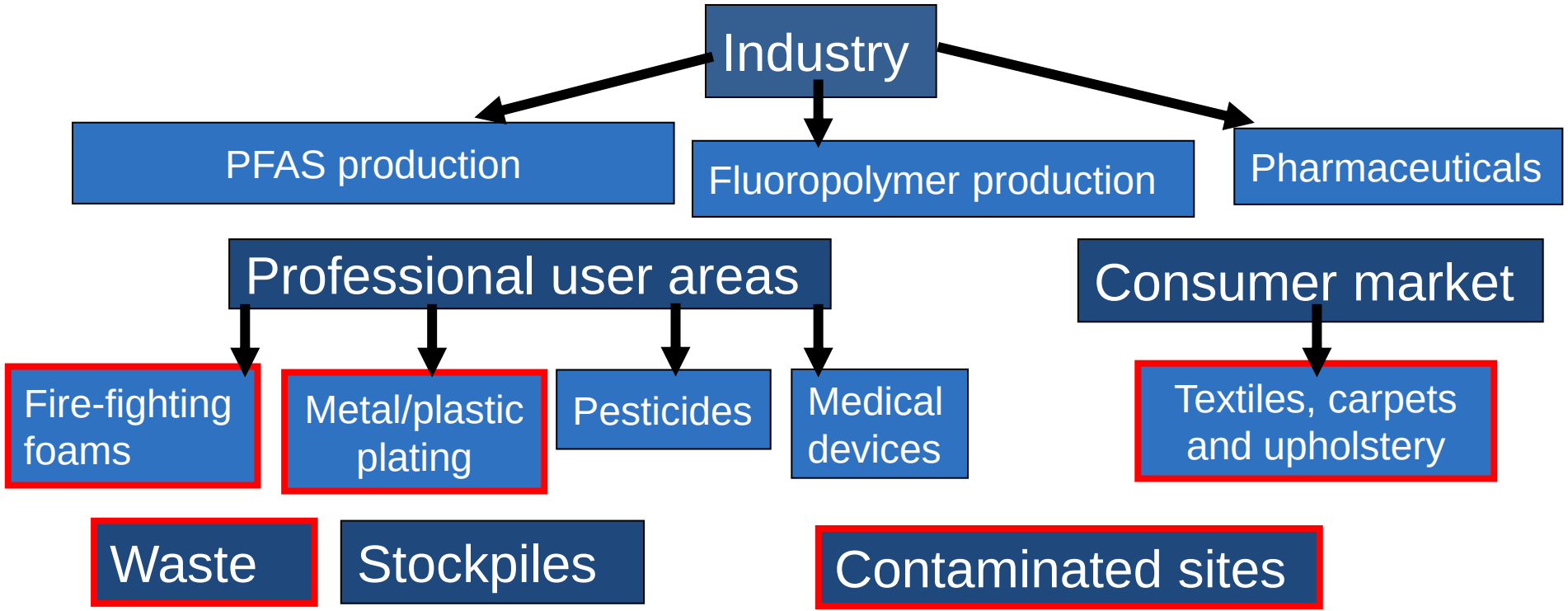
Step 1: Planning of the Inventory

3. Objectives and scope :

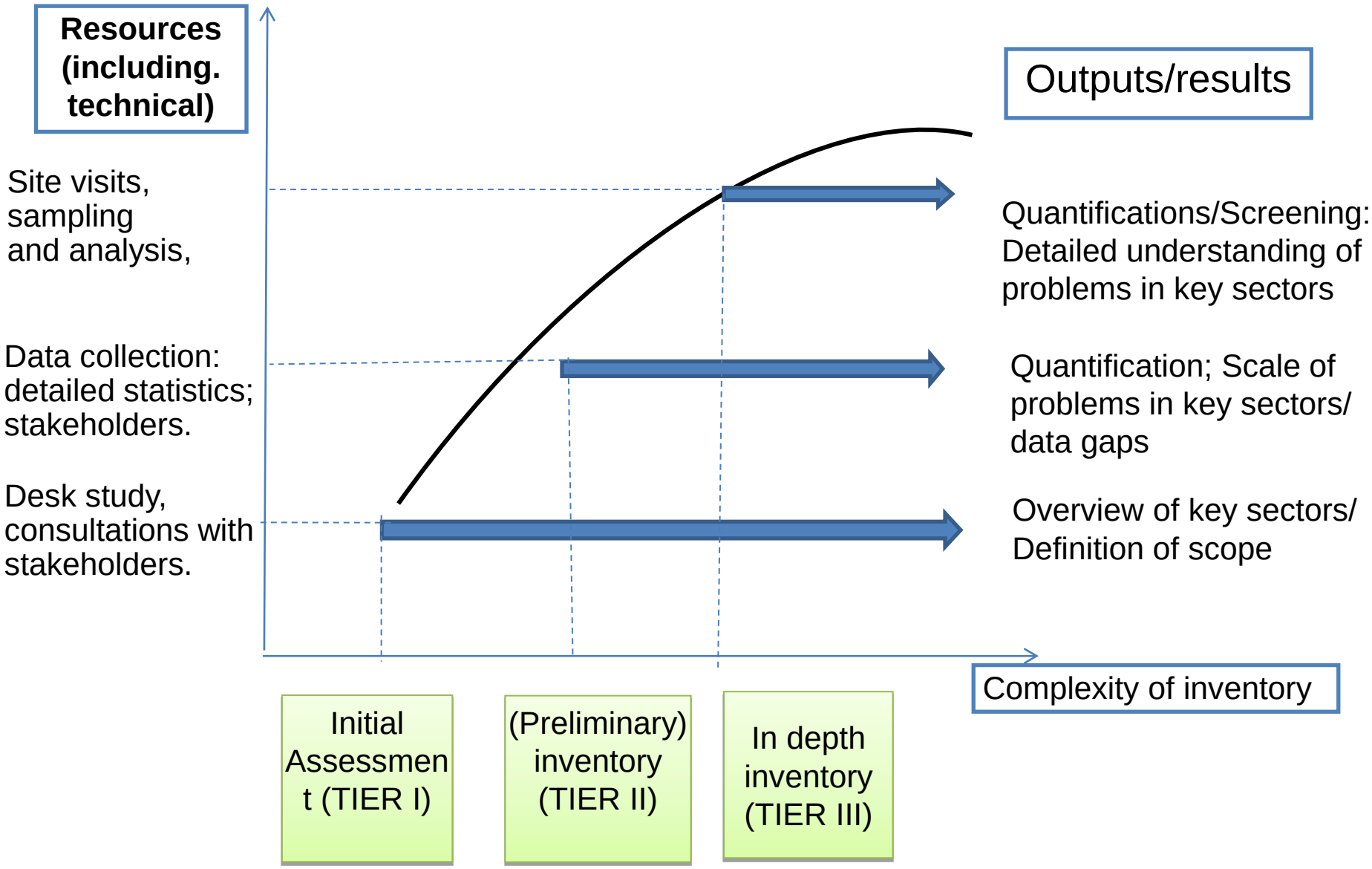
- Objectives and important elements of the inventory
- Outcomes of initial assessment inform on scope
- Needed/available resources and capacity

4. Workplan:

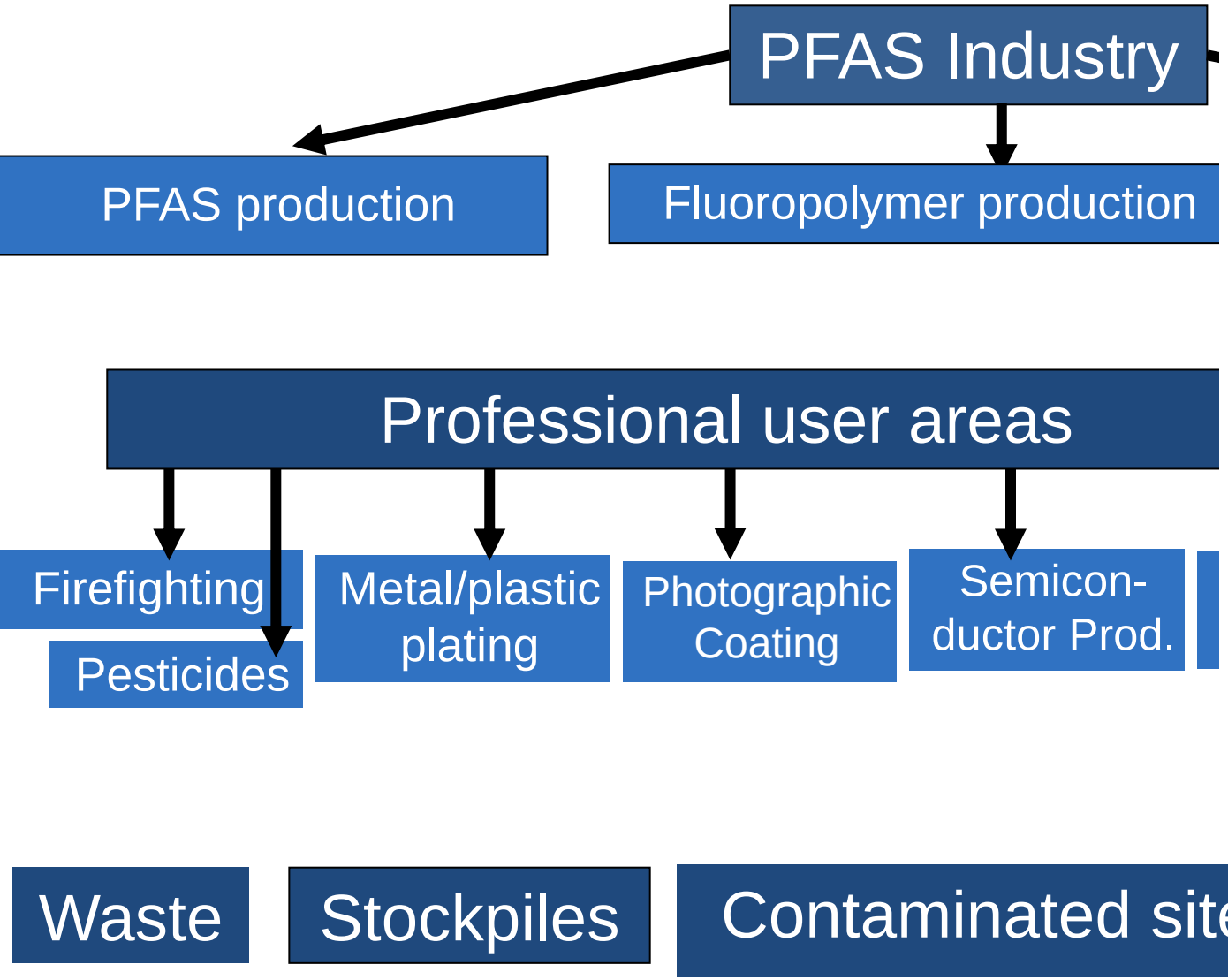
- For the selected key sectors for POP-PFAS, work plans would be established



Step 2: Choosing methodology for data collection

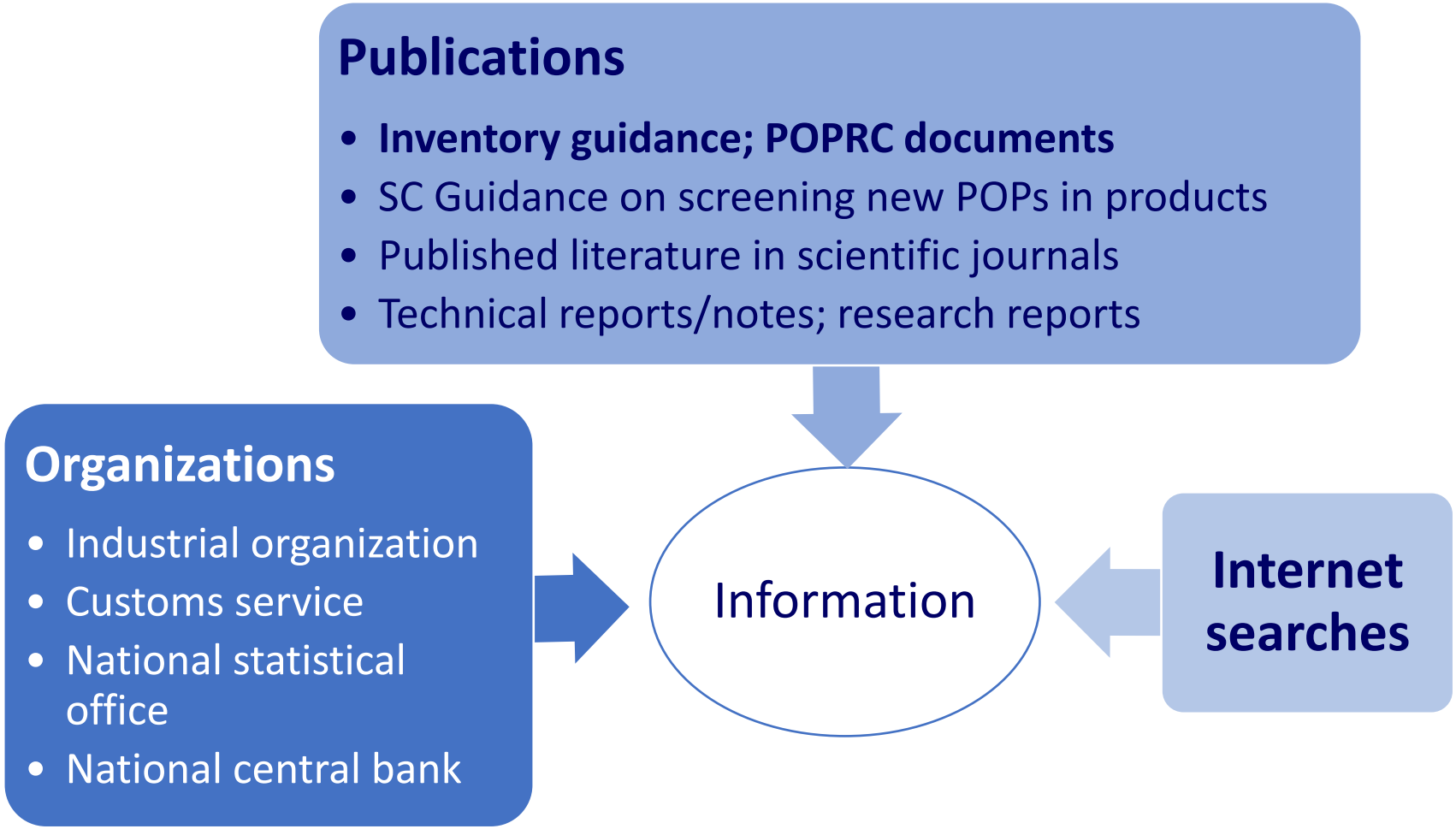


Step 3: Collecting/compiling data from sectors using or presence of PFOS, PFOA, PFHxS and related compounds



- **The following types of data are needed** and should be collected in the inventory:
  - **Quantities** of PFOS/PFOA (and PFHxS) and related compounds used **in industrial processes, professional uses** and **use in consumer products**
  - **Releases of POP-PFASs from industrial and other point sources e.g. firefighting foams or from plating plants.**
  - **Quantities of PFOS/PFOA/PFHxS in waste and stockpiles and presence situation of contaminated sites.**
- **Methodology approach can also use estimations and qualitative /indicative surveys where quantitative data are not available (to indicate in inventory).**

Step 3: Data collection
Desk study of existing information



Step 3: Data Collection: Questionnaire surveys

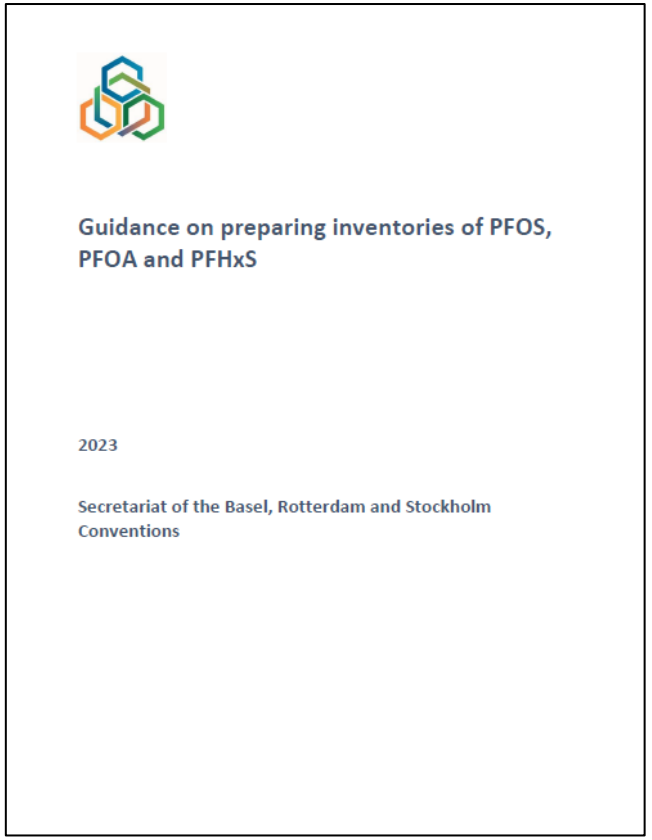
Ten Questionnaires for the major uses have been developed to gather information from key sectors (Annexes of the POP-PFAS inventory guidance).

Questionnaire (modification)

- Preliminary contact
- Consultation meetings with stakeholders

Outreach mechanisms

- Postal distribution
- **Supply chain distribution**
- Via trade unions, NGOs, local governments and community leaders
- Hand delivery in one-on-one interviews



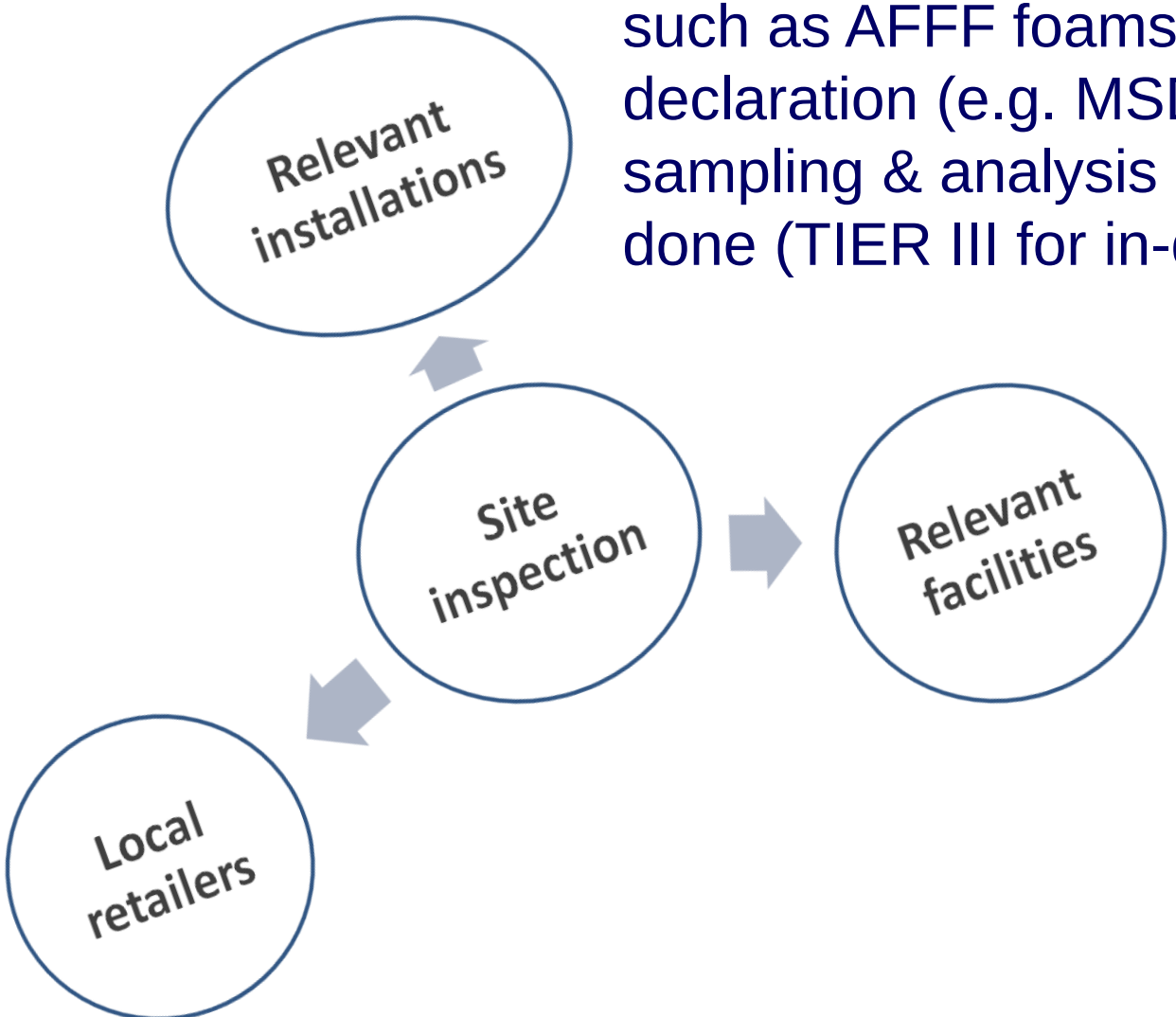
Guidance on preparing inventories of PFOS, PFOA and PFHxS

2023

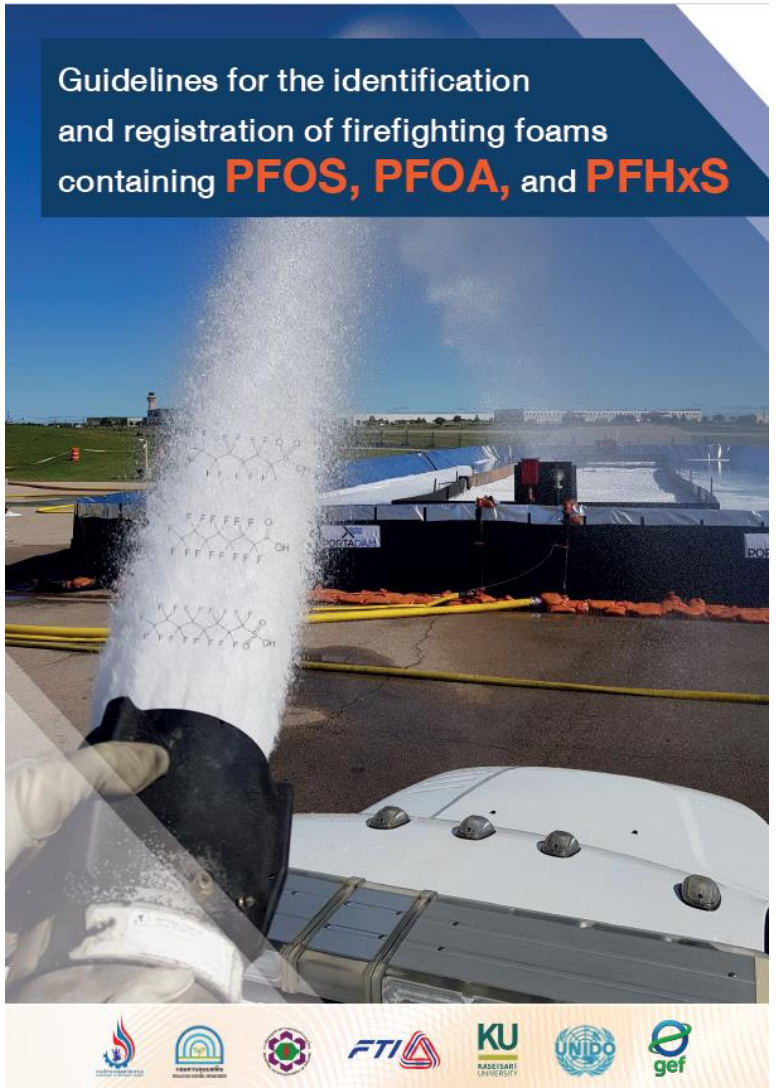
Secretariat of the Basel, Rotterdam and Stockholm Conventions

Step 3: Site inspection, sampling/analysis

In selected cases, site inspections might be needed.



If for specific PFOS/PFOA use areas such as AFFF foams the chemical declaration (e.g. MSDS) is unclear, sampling & analysis might need to be done (TIER III for in-depth inventory)

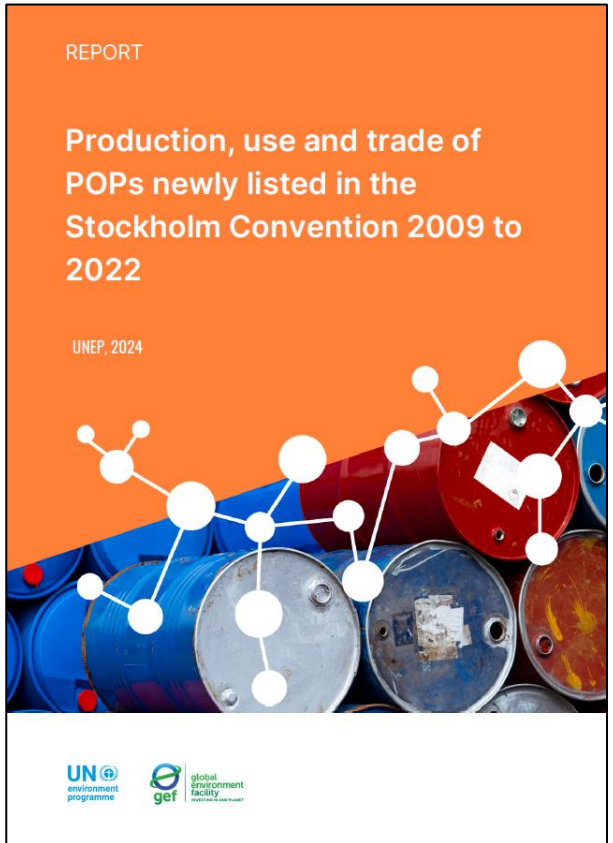


Some practical considerations for key areas of POP-PFAS inventory development

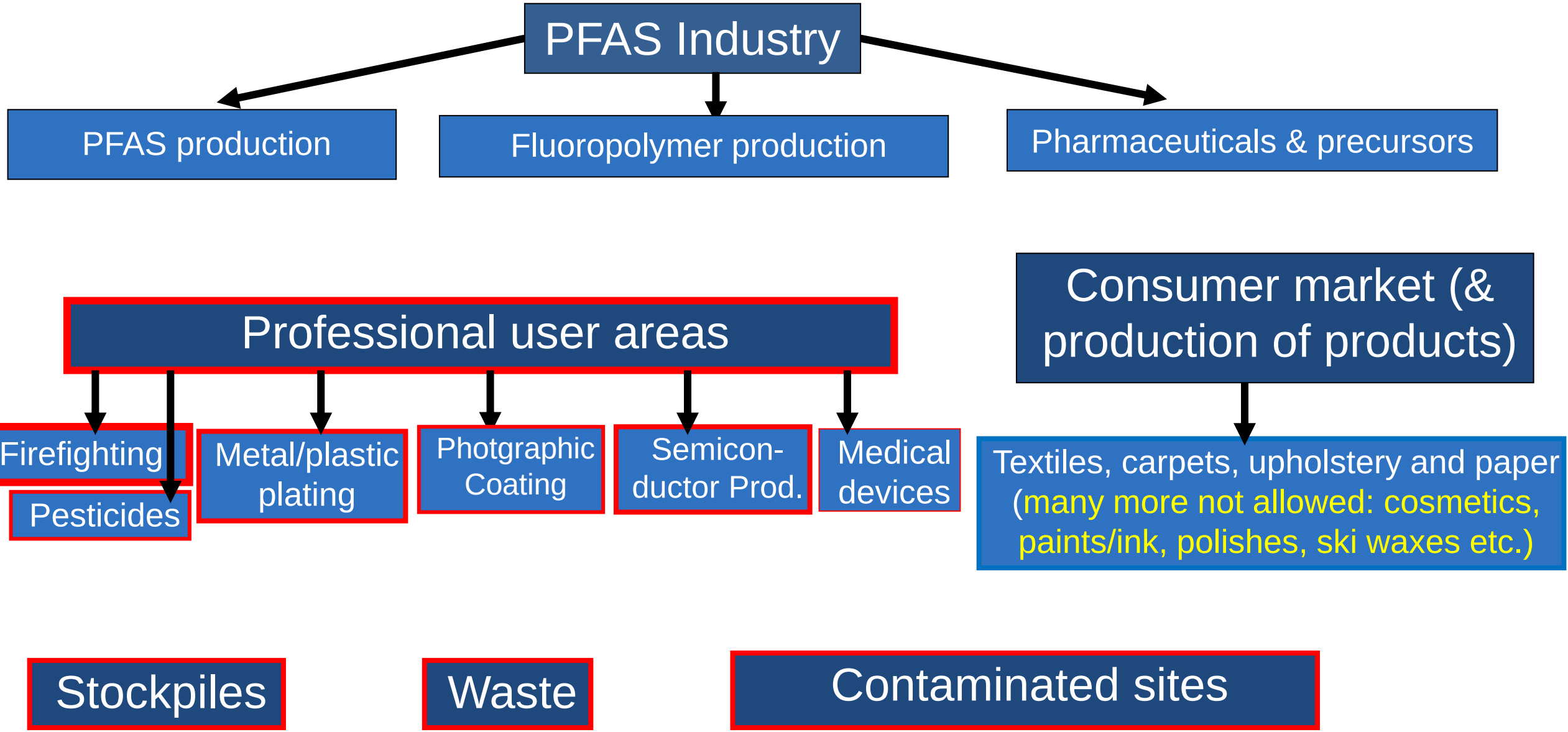
Assessment of Imports and Exports of POP-PFASs

- The **control of the import of POPs is the first line of defense** (Reiner Arndt, Chair POPRC).
- **Information on current and historic imports/exports of POP-PFASs** could be available from **customs services, related industries, and industry associations. Including related uses**!
- PFOS and PFOA and related compounds are listed in Annex III to the Rotterdam Convention and are subjected to the Prior Informed Consent Procedure (PIC) procedure.

- PFOS, some of its salts and related compounds have assigned specific HS codes.
- **HS codes are used in import and export declarations, which can be used to seek necessary information for the inventory**.
- **CAS numbers** and **trade names** should also be used to find the import and export information. CAS numbers are compiled in the POPRC documents on related compounds (UNEP/POPS/POPRC.20/INF/12 &13).
- For more details on trade of POPs including POPs-PFAS see related Guidance & Webinar https://www.greenpolicyplatform.org/webinar/navigating-production-use-and-trade-new-pops-2009-2022-key-international-databases-and



Major use areas of POP-PFASs



Example of step by step guidance for key areas: PFOS/PFOA/PFHxS inventory for firefighting foams

Inventory of firefighting foams

Aqueous film forming foams (AFFF) are used for Class B fires – flammable liquids, like oil, petrol, other non-water-soluble hydrocarbons and flammable water-soluble liquids like alcohols, acetone, etc. **They are at facilities where larger quantities of flammable liquids are stored (e.g., airports, oil production, refineries, oil storages). They are present in fixed installations, at firefighting services and in a share of fire extinguishers.**

Step 1: Preliminary survey

Purpose: To identify the relevant sectors that can be professional users of firefighting foams containing POP-PFASs

Tools: Preliminary **contact with listed stakeholders by phone, visit** and e-mail. **Custom services and firefighting foam distributors can be a valuable source.**

Step 2: Stakeholder meeting

Purpose: **Better understanding of the intention of the inventory among stakeholders** and **getting feedback to make the survey as adequate and practical as possible and targeting the right areas.**

Example of step by step guidance for key areas: Inventory of firefighting foams

Inventory of firefighting foams

Step 3: Data collection

Purpose:

To get more **in depth information on stockpiled firefighting foams**, the **consumption of firefighting foams in fire drills or accidental fires** and **waste management of firefighting foam which has expired**.

Information on location of firefighting drills and locations of (former) fires where AFFF foams were used in the past 40 years (presumed POP-PFAS contaminated sites).

Tools:

Contact the stakeholders identified in Step 1 and 2. **Questionnaire** in the inventory guidance can be used for the purpose

Example of step by step guidance for key areas: Inventory of firefighting foams – check AFFF foams for POPs

For some foams the PFAS used are known. But might change over time. Check MSDS.

PFAS reported to be present in certain AFFF foams (ECHA 2020)

PFSAs with ≥C6	
PFHxS (C6)	Angus Fire, 2000; Niagara 1-3 Ansul AFF Ansulite 3M Lightwater Angus Fire Forexpan
PFOS (C8)	Angus Fire, 2000; Niagara 1-3 Angus Fire, 2007, Hi Combat A™ Dr. Sthamer STHMES-AFFF 3% Ansul Ansulite ® AFFF
PFCAs with ≥C8	
PFOA (C8)	Ansul AFFF Ansulite® Angus Fire, N/a Angus Fire, 2000; Niagara 1-3 Sthamex AFFF-P 3% Towalex 3x3

Example of step by step guidance for key areas: Inventory of firefighting foams

Inventory of firefighting foams

Step 3: Further investigations

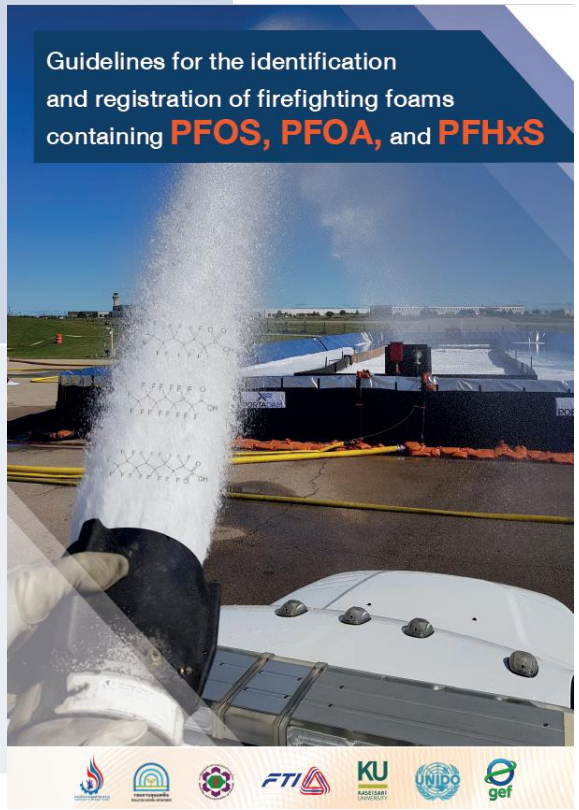
Purpose: **Identify national supply chain** and brands of firefighting foam containing POP-PFASs and alternative foams **(fluorinated and fluorine-free)** from information gathered in previous steps and investigations upstream and downstream to compare results.
In depths information on PFAS contaminated sites by (former) use of foams.

Tools: Desk study and stakeholder meetings. Contact can be made with the Firefighting Foam Coalition (FFFC) and professional firefighter organisation(s).
Tier III: Sampling and monitoring of AFFF and other suspected foams

Step 4 : Data management and evaluation

Purpose: **Estimate** the **amount of PFOS/PFOA/PFHxS foams** and **quantity from the percentage of PFOS/PFOA in the different firefighting foams**.

Tools: Concentration provided by the stakeholders or the concentration of POP-PFAS given in the Guidance.



Firefighting foams - Planning of the Inventory

4. Workplan: Example inventory of firefighting foams

Responsible:

National inventory team (NIT)

Identified Experts/Consultants

Identified Experts/ Consultants together NIT

Stage 1: Planning
- Preliminary survey
- Identification of scope
- Workplan

1 month

Stage 2
Initial assessment in targeted areas
Stakeholders identified
Firefighting foam project established
(STAKEHOLDER MEETING)

2 months

Stage 3
- Preliminary survey
- Data collection and compilation of questionnaires
- More in-depth analysis

5 months

Data management and reporting

6 months

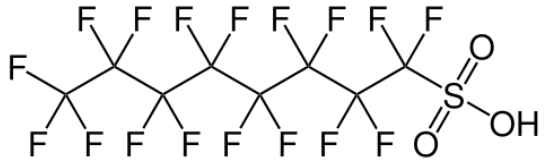
Similar approach for other inventory areas; might be simpler/less complex

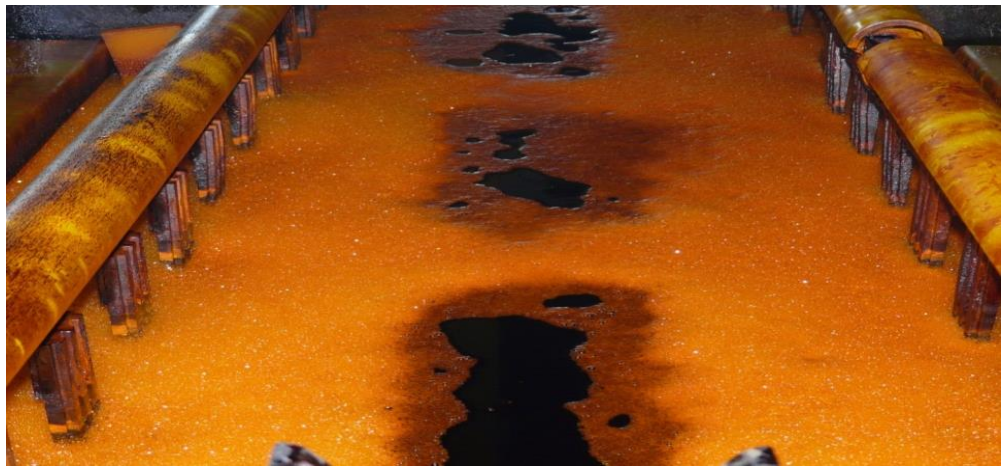
Inventory of PFOS use in electroplating

- PFOS-related chemicals have been used as surfactants, wetting agents, and mist suppressants in hard & decorative chromium plating.
- Still exempted for hard chromium plating in closed-loop.
- Estimations for **industrial sectors using PFOS** (based on data from questionnaire surveys from use and related management in metal and plastic plating industries).

$T = L \cdot C$

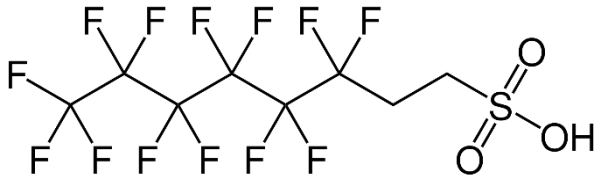
T= Total quantity of PFOS used in the industrial process per year
L= PFOS concentration or % of PFOS in the plating formula
C= Yearly consumption of the plating formula



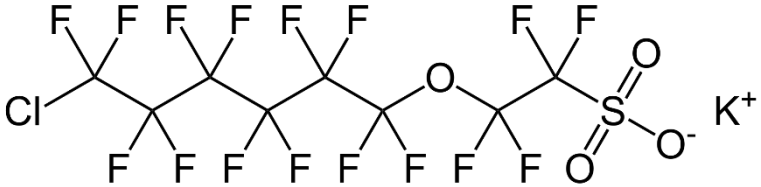


Also the alternatives used should be assessed and noted

Regrettable substitute!



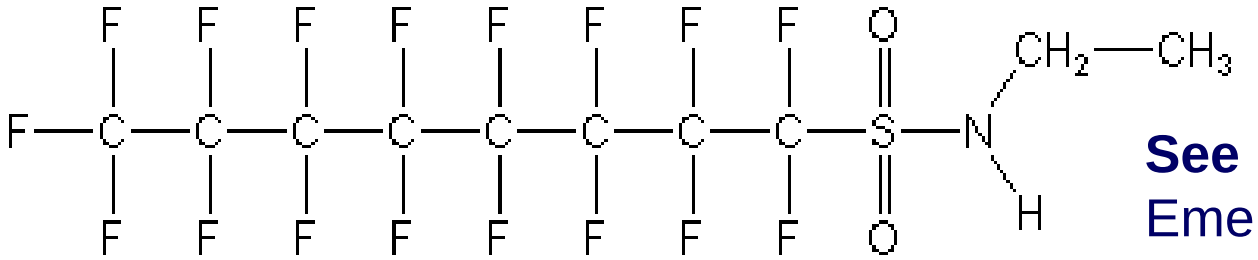
6:2FTS



F53

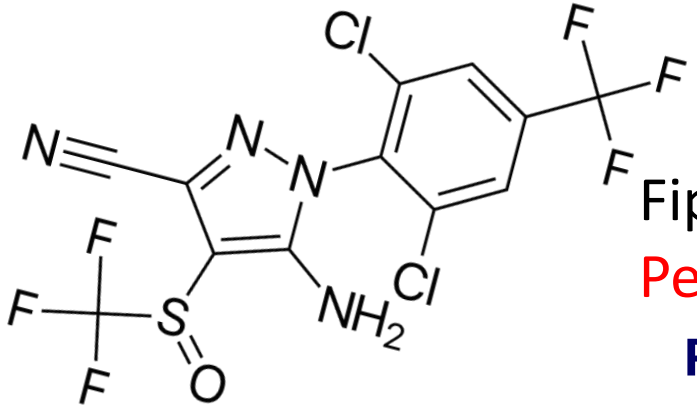
Inventory of pesticide/insecticide use (Sulfluramide)

- The use of the PFOS precursor N-Ethyl perfluorooctane sulfonamide (known as sulfluramid; CAS No: 4151-50-2) for leaf cutting ants is an acceptable purpose and is used in Brazil (and other South American countries). It is marketed e.g. as Mirex-S (see NIP Suriname).
- According to information to POPRC from China, sulfluramid was used against cockroaches, white & fire ants in China. This use is not exempted and stopped.



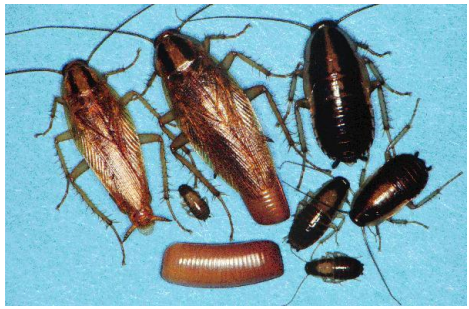
See PFOS inventory of Suriname: Pinas et al. (2020)
Emerging Contaminants 6, 421-431
https://doi.org/10.1016/j.emcon.2020.10.002

- What alternatives are used in your country to control cockroaches, termites and ants?



Fipronil (a Highly Hazardous Pesticide (HHP) in the PAN list!)

Regrettable substitute!



PFOA contaminated fluorinated pesticide containers

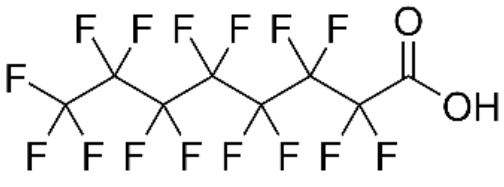
- USEPA testing showed PFOA contamination from **fluorinated high-density polyethylene (HDPE) pesticide containers** and similar plastics (i.e., fluorinated polyolefins). PFOA in these containers resulted in PFOA contamination of the pesticide (measured@ 250 ng/g).
- **By this unintentional produced PFOA and other PFASs are spread to agricultural areas with risk of transfer to food crops, vegetables and fruits.**
- 03/2022 **USEPA provided information** to manufacturers, processors, distributors, users, and those that dispose of fluorinated high-density polyethylene (HDPE) containers and similar plastics (i.e., fluorinated polyolefins) about the potential of formation and migration of PFOA (and other PFAS) from these materials and containers.
- 12/2023, EPA issued orders to Inhance Technologies LLC directing it **not to unintentionally produce PFAS chemicals in the production of its fluorinated HDPE plastic containers**.
- 02/2024, EPA released a new method to detect 32 PFAS from the HDPE containers at 2 ppt.
- Assessment of the use of fluorinated HDPE container in the country. PFAS monitoring.
- PFOA and other PFAS were used as “inert” surfactants (enhancers used in pesticide formulas but not constituting active ingredients) in pesticide products. **This use is also not exempted.**

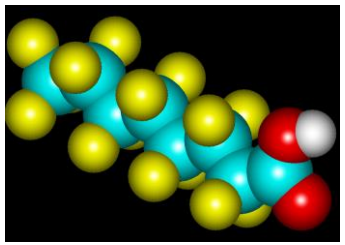
USEPA (2024) https://www.epa.gov/pesticides/pfas-packaging
Whitehead et al. (2023). ES&T Letters. 10(4), 350-355; **Vitale et al. (2022). Environmental Advances. 9,100309**.

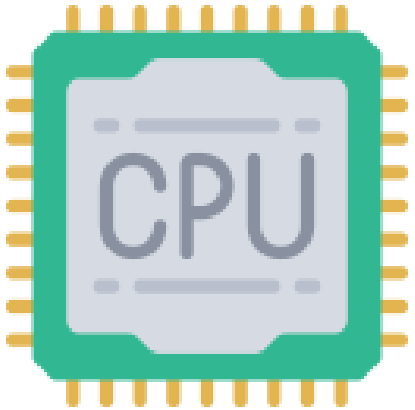
Use of PFOA in electronic and semiconductor production

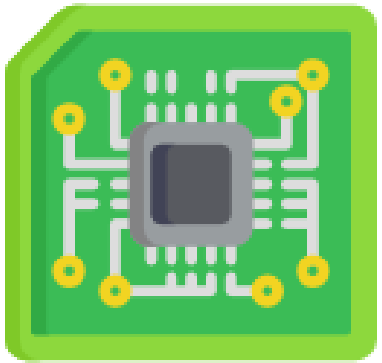
- PFOA and related compounds can be found in the semiconductor industry. **They are contained in equipment used to manufacture semiconductors and are used in the photolithography and etching processes during the semiconductor production.**
- Overall use in this industry is considered moderate (50 kg/year) with **release of less than 4 kg/year**.

- **Assessment of companies producing semiconductors on current use of PFOA and past use of PFOA, PFOS and related compounds and related alternatives**.
- PFOA emission control measures are documented in the OECD Emissions Scenario Document No. 9, Photoresist Uses in Semiconductor Manufacturing (OECD 2010; SIA 2016).





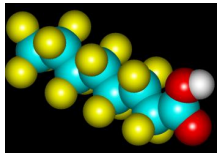


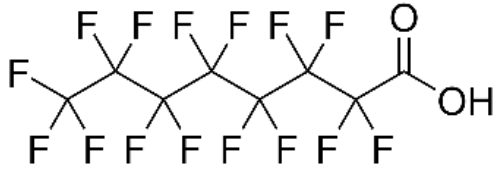


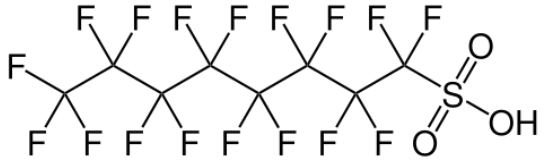
UNEP (2022) Draft guidance on alternatives to PFOA, its salts and PFOA-related compounds. UNEP/POPS/COP.10/INF/25

Use of PFOS and PFOA in medical devices

- PFOS and related compounds have been used in vitro diagnostic medical devices, such as video endoscopes, and CCD color filters.
- Around 70% of the **video endoscopes** used worldwide contain a CCD43 color filter that contains **~150 ng of PFOS**. **All 200,000 endoscopes** with **PFOS-containing filters contained ~0.03 g of PFOS**. Stop of exemption for new medical devices. **Not a relevant amount!**
- **Implantable medical devices**, manufactured **with PTFE can contain PFOA (EU: PFOA-related compound unintentional trace 1 mg/kg**), in synthetic vascular grafts, endovascular and interventional devices, surgical meshes for hernia repair, to sutures for use in vascular, cardiac, and general surgery procedures.
- **Therefore the exemption for medical devices is for PTFE containing PFOA residues**.
- The amounts of PFOA and PFOA-related compounds in the final products are estimated to be low (ECHA 2015). In implantable devices, one manufacturer previously estimated that the **total amount of PFOA present in all devices put on the EU market 2018–2025 would amount to 20 g. This was extrapolated to 100 g total worldwide by the industry (UNEP 2022). This is rather a part of PTFE/fluoropolymer management.**

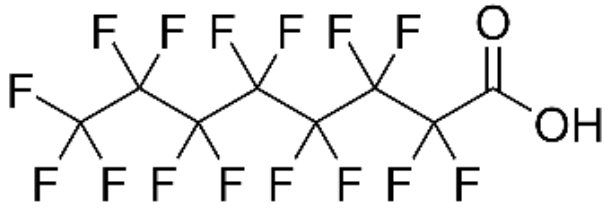




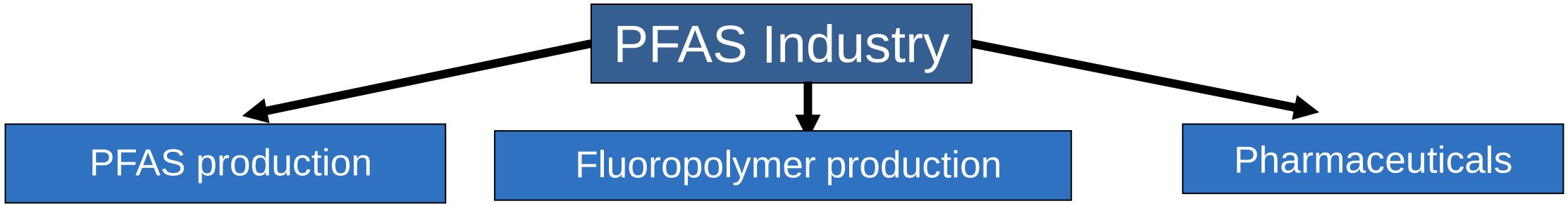


Use of PFOA in photographic coatings applied to films

- PFOA salts and related compounds play an essential role in manufacturing and performance of certain imaging products because they provide surfactant, friction control, and dirt repellent qualities.
- These substances also provide important critical antistatic property and therefore safety features by controlling the build-up and discharge of static electricity.
- Moreover, **PFOA-related compounds** are considered **necessary for the application of coating layers during manufacture of some remaining conventional photographic film products (i.e., products in which the image formation is based on silver halide technology)**.
- **Assessment if these technologies are still used in the country.**
- Although **replacements did not exist for these remaining few applications**, **reduction in use of these substances is anticipated as the transition continues towards digital imaging.**



Major use areas of POP-PFAS



Professional user areas

- Fire-fighting foams
- Metal/plastic plating
- Pesticides
- Semicon-ductor Prod.
- Medical devices

Consumer market (& production of products)

- Textiles, carpets, upholstery and (many more not allowed: e.g. paper, leather cosmetics, paints, polishes, wax)

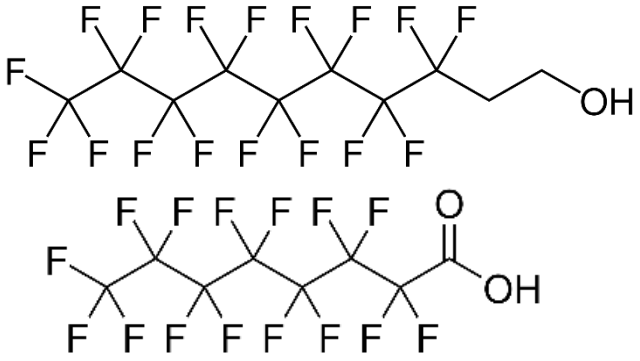
Stockpiles

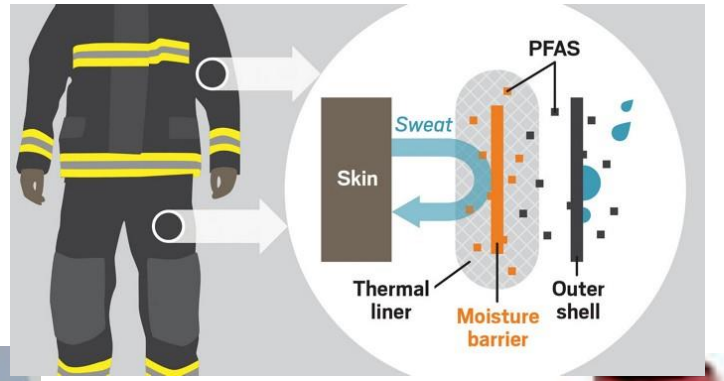
Waste

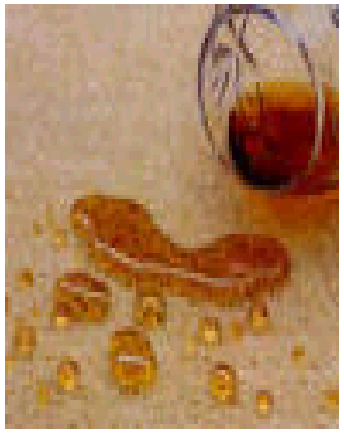
Contaminated sites

Use of PFOA and formerly PFOS in textiles, apparel and carpets

- PFOA-related chemicals are still used as formulars/mixtures for the oil-, water- & chemical-repellent finishing of textiles, apparel, carpets, upholstery, and leather.
- The PFOA-precursor 8:2 FTOH has been the dominant residue in studied textiles (Robel et al., 2017).
- Textiles/furniture/car seats/carpets was a main use of PFOS until 2002 with minor use until ~2012.
- **Assessment** of the **products** on the **consumer market and productions** if present in the country.



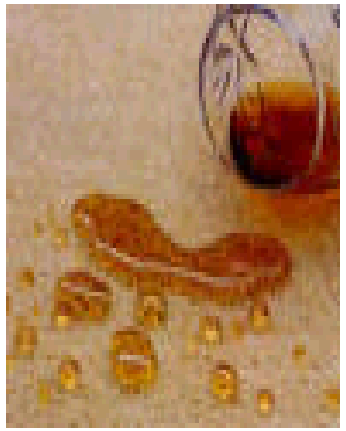




Use of PFOA in textiles, carpets, leather & impregnation

- PFOA-related compounds (frequently 8:2 FTOH) are still used as formulars/mixtures for the oil-, water- & chemical-repellent finishing of textiles, apparel, carpet upholstery, and leather.

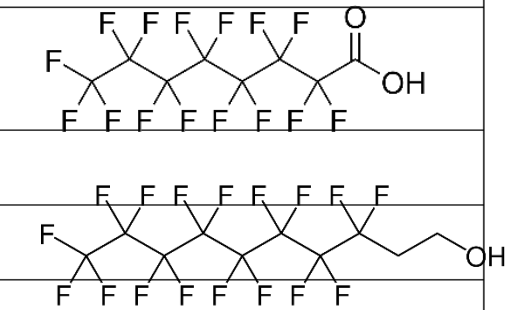
Leather			
Leather	PFOA-related	PFOA	Maximal of 13 samples was 12.4 µg/m² (Kotthoff e al., 2015)
Carpet			
Pretreated/ Teflon® treated carpet	PFOA-related	PFOA	PFOA: 3.5 – 226 µg/g (Liu et al., 2014)
		8:2 TFOH	22 – 368 µg/m² (Dorte Herzke et al., 2012)
Impregnation spray (waterproof agent)			
Impregnation spray	PFOA-related	PFOA	median = 15.9 µg/kg (Kotthoff et al., 2015)
		8:2 FTOH	median = 146200 µg/kg (Kotthoff et al., 2015)



Use/assessment of PFOA in textiles: Worker protection clothing

- Surface treated textiles: **automotive and aviation industry, sports & outdoor clothing, home textiles and upholstery, carpets, sun protection / building industry, lifting and carrying belts**, as well as in the **professional sector**, e.g. **medical, firefighter, military.** PFOA-related compounds, such as **side-chain fluorinated polymers**, e.g. **copolymers of fluoroalkyl (meth)acrylate**.

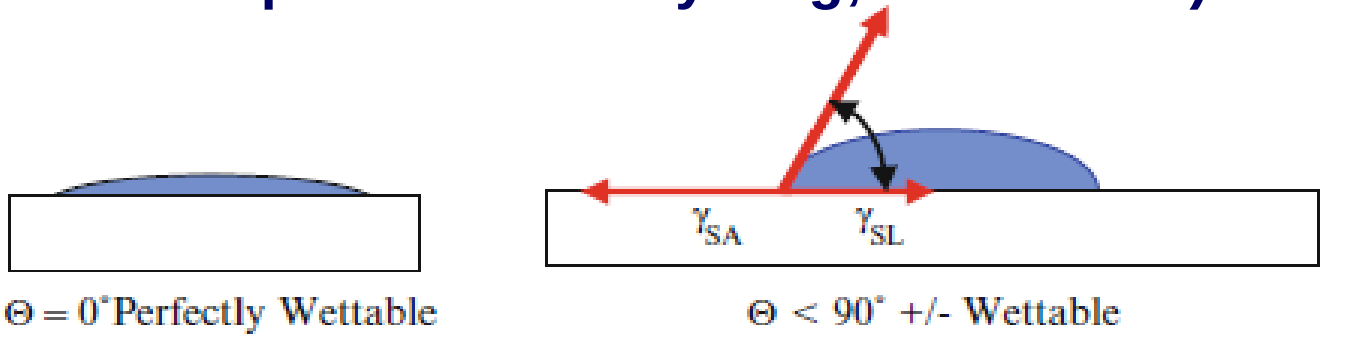
Workers protection clothing (Zangl et al., 2012)			
protection clothing	PFOA-related	PFOA	<0.042 – 36.5 µg/m²
High visibility warning clothing	PFOA-related	PFOA	0.093 – 12 µg/m²
Cold protection clothing	PFOA-related	PFOA	< 0.081 - 5.85 µg/m²
Rain protection clothing	PFOA-related	PFOA	<0.04 – 1.25 µg/m²
Fleece products	PFOA-related	PFOA	< 0.053 – 21.3 µg/m²
Pilot clothing	PFOA-related	PFOA	0.056 – 5.77 µg/m²
Flame retardant clothing	PFOA-related	PFOA	< 0.048 – 1 µg/m²
Surgical clothing	PFOA-related	PFOA	< 0.04 - 0.246 µg/m²
Outdoor clothing	PFOA-related	PFOA	median concentration: 6 µg/m² (max 41 µg/m²)
		8:2 TFOH	Median concentration: 44.2 µg/m² (max = 379.9 µg/m²)



UNEP (2022) Draft guidance on alternatives to PFOA, its salts and PFOA-related compounds. UNEP/POPS/COP.10/INF/25

Assessment of relevant stocks/wastes: Inventory of PFOS/PFOA in synthetic carpet and PFOA in textiles

- Synthetic carpet (tufted carpets) was **a major use area of PFOS until 2002 (3M product) and possibly until 2012 (China)**. **Also PFOA/PFHxS related compounds were used. Mainly the nylon fibres** were treated with a PFOS polymer.
- **Carpets service life** is **estimated to 10 to 19 years for EU** (Bipro 2011) and **could be longer in LMICs**. **Carpets can have long shelf- life of >10 years (Pinas et al. 2020 for Suriname**).
- Synthetic carpets are considered a large **POP-PFAS stock** (was largest PFOS stock Germany).
- **Assessment can be done by drop test for screening the water/oil repellency which can inform if PFASs are included. For determining which PFAS, an instrumental analysis is needed (see UNEP guidance on monitoring POPs in products & recycling; UNEP 2021).**



See PFOS inventory of Suriname Pinas et al. (2020) Emerging Contaminants 6, 421-431 https://doi.org/10.1016/j.emcon.2020.10.002

Assessment of important stocks/wastes: Inventory of PFOS in synthetic carpets

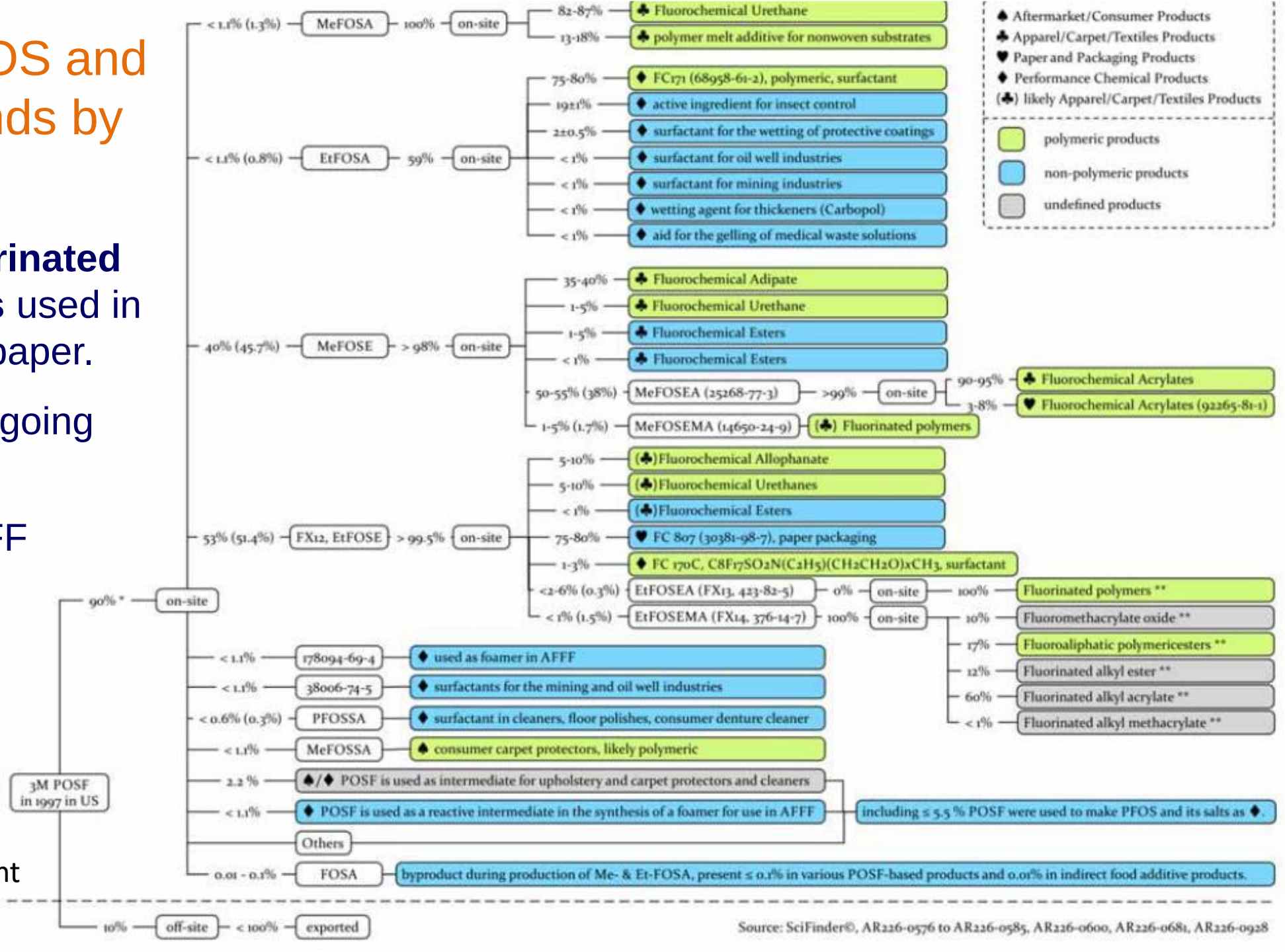
Estimation of the quantity of PFOS in synthetic carpets manufactured and sold on the market per year and the related stock.

Category of article or preparation	**Year of phase-out**	**Process-** *Steps, if applicable*	**Import (kg per year)**	**Manufacture (kg per year)**	**Export (kg per year)**	**PFOS content** *Approximate values* **(mg PFOS/kg article or preparation)**	**PFOS quantity [tonnes per year]**
Synthetic carpets	**2003**		6,876,257	0	10,081	500 - 5000	Low: 3.4 High: 34

After developing the inventory of carpets in use (stock) and estimating the service life for a country, a rough estimation of PFOS carpets in end-of-life/waste flow might be established.

Production of PFOS and related compounds by 3M in 1997

- **Major use were fluorinated side-chain polymers** used in carpets, textiles and paper.
- More than 50% were going into these uses.
- <1.1 was used in AFFF firefighing foams.



Wang et al. (2014) Environment International, 70, 62-75.

Use of PFOS and PFOA in paper impregnation

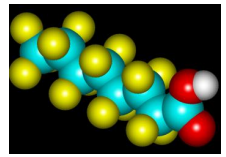
- PFAS have been applied to paper to impart grease, oil & water resistance since the early 1960s. They were used in the paper, food packaging and commercial packaging as a part of a polymer.
- Long-chain PFASs (mixture C8, C10 and C12) were previously used in food packaging. Due to regulations these have been replaced by short-chain PFAS which are mainly based upon C6 technology (OECD, 2020).
- **PFOS had an exemption until 2012**, **but today no exemption for PFOS and PFOA.**
- **Uses in food contact applications** (Begley et al., 2005; OECD, 2020; UNEP, 2011)):

  (a) Disposable plates;

  (b) Food containers take out boxes, pizza boxes, wraps, Popcorn bags;

  (c) Baking paper;

  (d) Biscuits and sweets packaging..



- **Use in non food** (a) Folding cartons; (b) Containers; (c) Carbonless forms and masking papers; (d) Tablecloths; (e) Wallpaper.

PFAS in food contact materials in EU (05/2021)

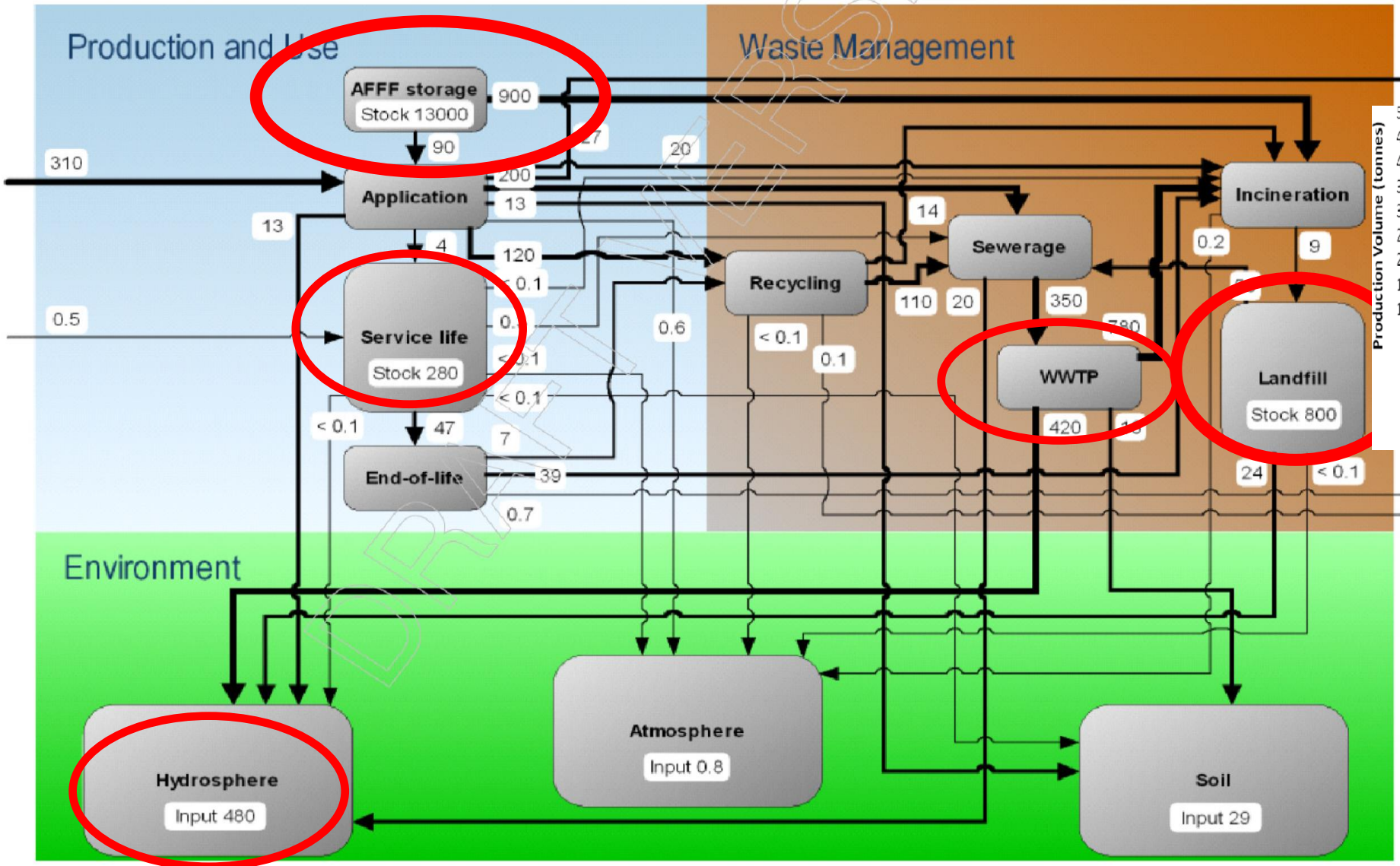
- Study of PFASs in fast food packaging and disposable tableware in 6 EU countries (organised by 9 IPEN NGOs).
- 32 out of 42 fast food packages tested in laboratory contained PFASs (KFC, McDonald's; Dunkin Donut, Subway).
- In recent years mostly short-chain PFASs used (C6-chemistry)
- McDonald's fries packaging: In the Czech Republic contained PFAS but in Denmark without PFAS (since 06/2020 there is a PFAS ban in food contact materials in Denmark!).
- McDonald's announced phase out by 2025.
  https://saferchemicals.org/2021/01/13/mcdonalds-announces-global-ban-of-toxic-chemicals-in-food-packaging/

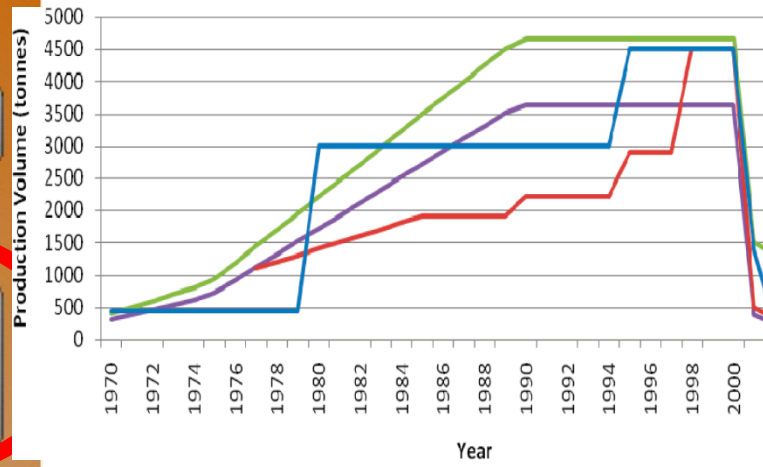
Impact on paper recycling: PFOS has been phased out in paper more than 12 years ago but **PFOA & related compounds** has been used more recently and **might be present in paper waste and recycling (in recent study mainly C6 PFAS** Mofokeng et al. (2024) Langber et al. 2024).

https://www.env-health.org/wp-content/uploads/2021/05/FINAL_pfas_fcm_study_web.pdf

Inventory and Substance Flow of POP-PFAS (Case PFOS Switzerland)

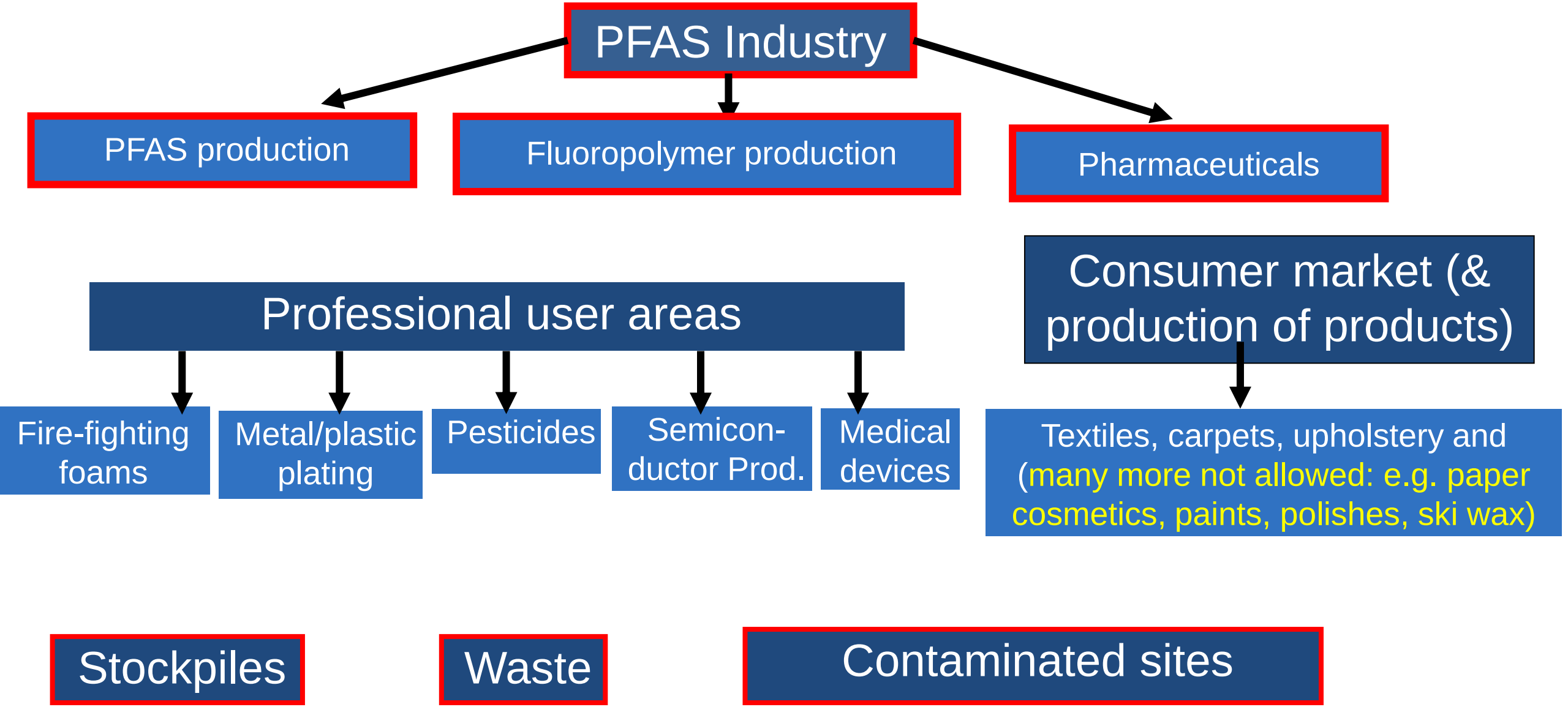
Understanding the flow of POP-PFASs in the country, where chemicals and products are/end up, and the fate of POP-PFAS and considerations of related risks.





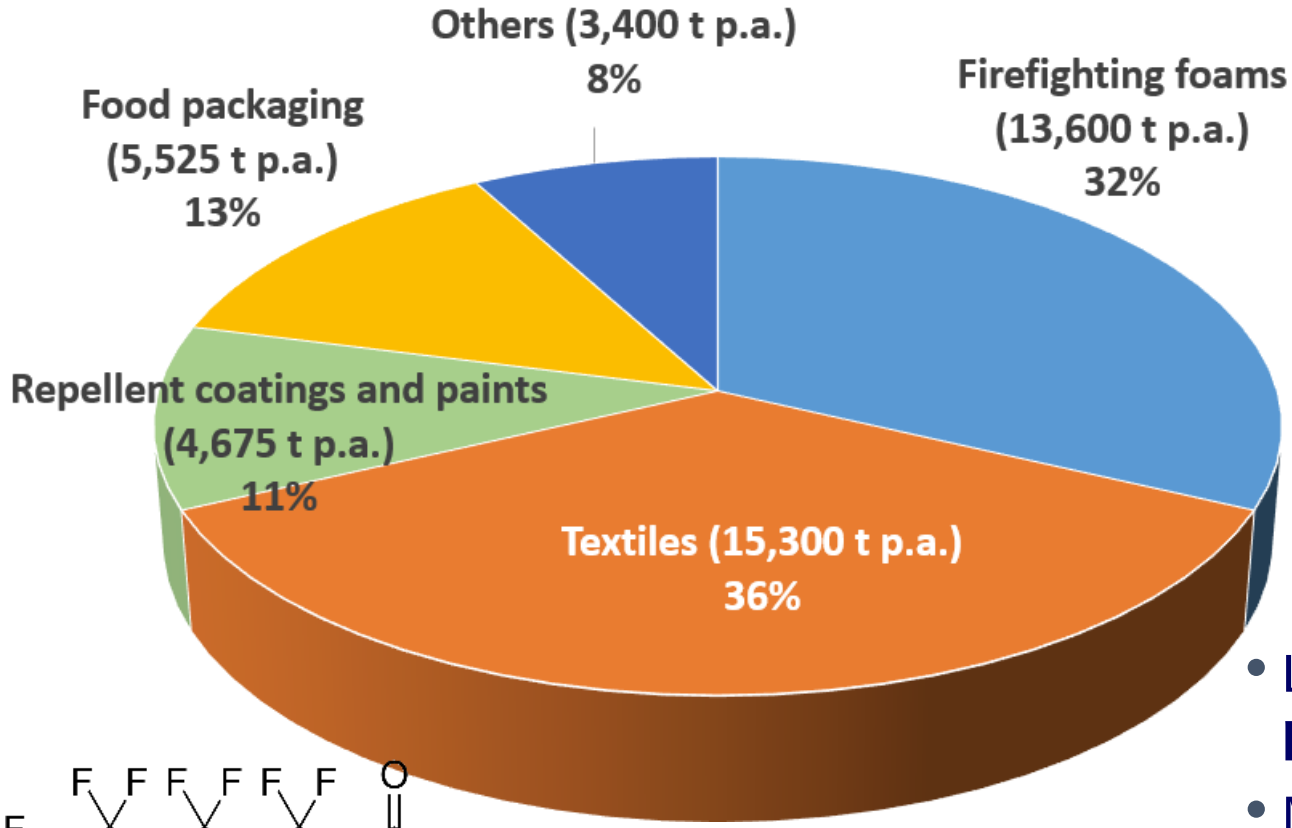
Morf and Buser (2009)
Report for Swiss BUWAL

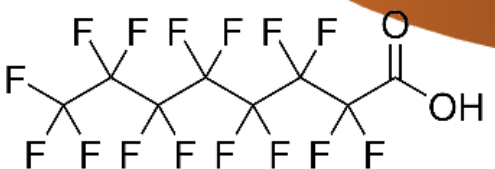
Major use areas of POP-PFAS

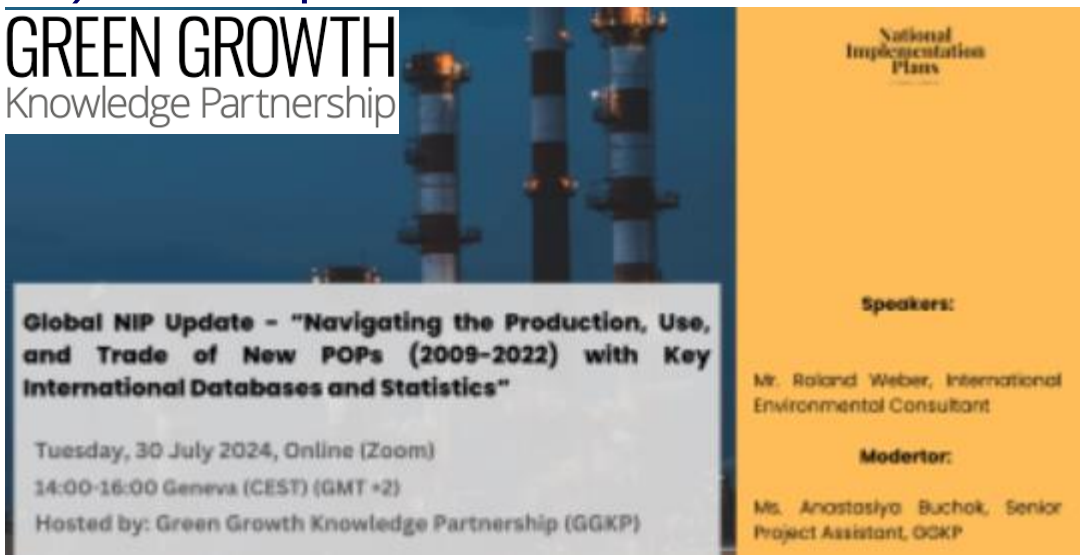


Production of PFOS, PFOA, PFHxS and related compounds

- Production and trade of PFOS, PFOA and PFHxS has been introduced in GGKP Webinar 30 July.
- **PFHxS production has stopped (in Italy in 2018 and in China in 2022)**.
- Currently there is **also no production known for PFOS** (also last production likely 2022).
- PFOA and PFOA related compounds (e.g. fluorotelomers) are still produced at unknown volume. **Assessment of production sites.**







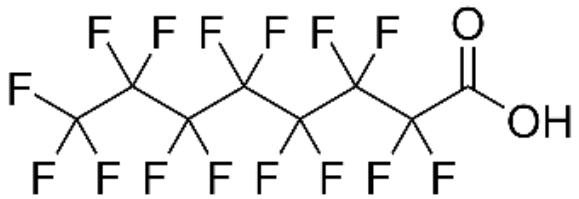
https://www.greenpolicyplatform.org/webinar/navigating-product use-and-trade-new-pops-2009-2022-key-international-databases-a

- Large production of fluorotelomers – **share PFOA precursor is unknown** (e.g. 8:2-FTOH; 10:2-FTOH)
- Major F-telomer use: textiles (36%), firefighting foam (32%), food packaging (13%), repellant coatings.

Use of PFOA in pharmaceutical applications

- Parties to the Convention agreed on a specific exemption for use of **perfluorooctyl iodide** (PFOI) to produce pharmaceuticals. **The exemption for PFOI will expire no later than 2036.**
- The PFOA-related compounds, **PFOI** is a precursor in the manufacture of perfluorooctyl bromide (PFOB). PFOB is a processing aid in the manufacture of “microporous” particles for pharmaceutical applications.
- **PFOB is not listed as a PFOA-related compound, only PFOI shall be calculated in the inventory of PFOA and related compounds**. Except for the manufactory process, the PFOI contamination in PFOB shall also be considered.

- **The production of PFOI takes place at one single site in Japan and is then transported to another site in Japan for use as intermediate in the production of PFOB. Therefore this production does likely not have a relevance for almost all other countries.**



Use of PFOA in fluoropolymer production

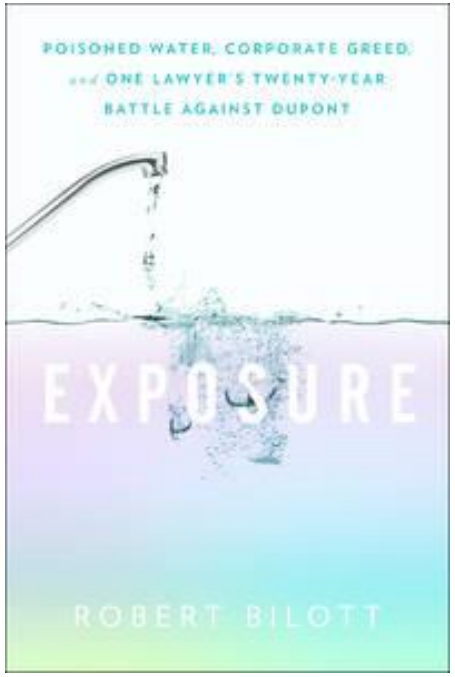
- **The fluoropolymer production was the predominant global user of PFOA as processing aid**. In 2000 85% of the global use of PFOA was in fluoropolymer manufacturing (Prevedouros et al., 2006).
- Fluoropolymer production in **industrial countries** has largely **substituted PFOA** reducing the share. **Other countries might continue the use** (asked for exemption).
- **Assessment of PFOA & other PFAS use in fluoropolymer production (only in few countries).**
- **Get information on what PFAS is currently used, amount of PFAS used per year and former PFOA use and sludge disposal history.**

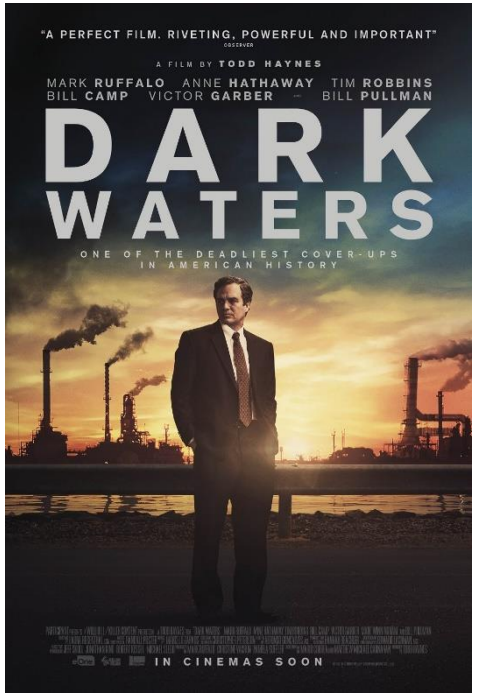
PFOA substances	Specific exemptions
PFOA and its salts: • **Ammonium salt of PFOA** • **Potassium salt of PFOA** • **Silver salt of PFOA** • **Sodium salt of PFOA** **PFOA, perfluorooctanoic acid**	Manufacture of polytetrafluoroethylene (PTFE, Teflon) and polyvinylidene fluoride (PVDF) for the production of: High-performance, corrosion-resistant gas filter membranes, water filter membranes and membranes for medical textiles Industrial waste heat exchanger equipment Industrial sealants capable of preventing leakage of VOC and PM2.5 particulates
	Manufacture of polyfluoroethylene propylene (FEP) for the production of high-voltage electrical wire and cables for power transmission
	Manufacture of fluoroelastomers for the production of O-rings, v-belts and plastic accessories for car interiors

PFOA contaminated cities from fluoropolymer production

- The production of fluoropolymers has resulted and was/is resulting in large releases of PFOA and other PFAS to environment and human exposure.
- Parkersburg/USA where DuPont manufactured Teflon since 1951 is the best investigated PFOA contaminated city with further contamination of the Ohio related valley. In 2004, DuPont settled Bilott's class-action suit, with 80,000 plaintiffs for $343 million. 2017 DuPont and Chemours settled 3,500 cases for 670 million US$. Science documentation of PFAS pollutions
  https://pfasproject.com/parkersburg-west-virginia/
- Hollywood film "Dark Waters" & the documentary Film "The Devil We Know"
  https://www.youtube.com/watch?v=NJFbsWX4MJM

- **Similar contaminated sites from fluoropolymer production e.g. in China, Germany and the Netherlands.** (Gebbink & van Leeuwen (2020) Environ Int. 137, 105583; Liu et al. (2021) Environ Sci Eur 33, 6)
- **The related scientific health assessment ("C8 Panel")** linked PFOA exposure to 6 diseases: ulcerative colitis, pregnancy-induced hypertension, thyroid disease, testicular cancer, and kidney cancer. (Lerner, 2015).
  https://theintercept.com/2015/08/11/dupont-chemistry-deception/





Major use and inventory areas of POP-PFASs

Industry

PFAS production

Fluoropolymer production

Pharmaceuticals

Professional user areas

Fire-fighting foams

Metal/plastic plating

Pesticides

Semicon-ductor Prod.

Medical devices

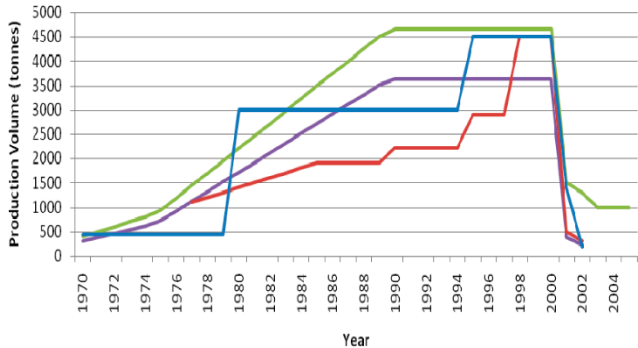
Consumer market (& production of products)

Textiles, carpets, upholstery and (many more not allowed: e.g. paper cosmetics, paints, polishes, ski wax)

Waste

Stockpiles

Contaminated sites



the Forever Pollution Project

Mapping PFAS pollution across Europe

Stéphane Horel

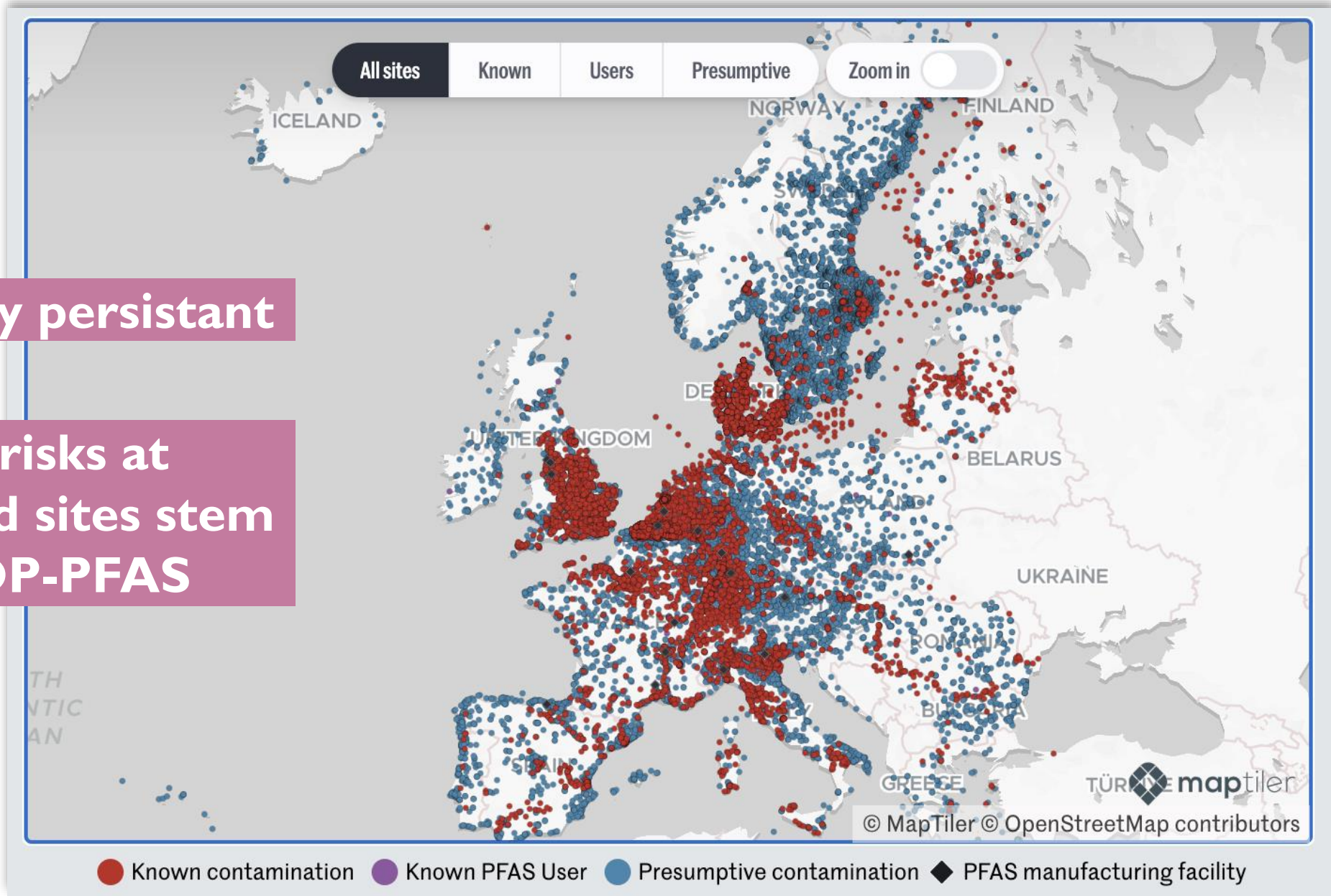
Le Monde

17 September 2024

the map / an inventory of PFAS Forever Pollution in Europe

PFAS are extremely persistant

Please note: major risks at PFAS contaminated sites stem frequently from POP-PFAS



a cross-border investigation

Le Monde — France
Süddeutsche Zeitung, NDR, WDR — Germany
RADAR, le Scienze — Italy
The Investigative Desk, nrc — The Netherlands
Knack — Belgium
Deník Referendum, DR — Czechia
POLITIKEN — Denmark
yle — Finland
REPORTERS UNITED — Greece
Latvijas Radio — Latvia
DATADISTA — Spain
SRF — Switzerland
WATERSHED, The Guardian — United Kingdom

12 countries, 16 media
February-July 2023

Work grants
journalismfund.eu
IJ4EU

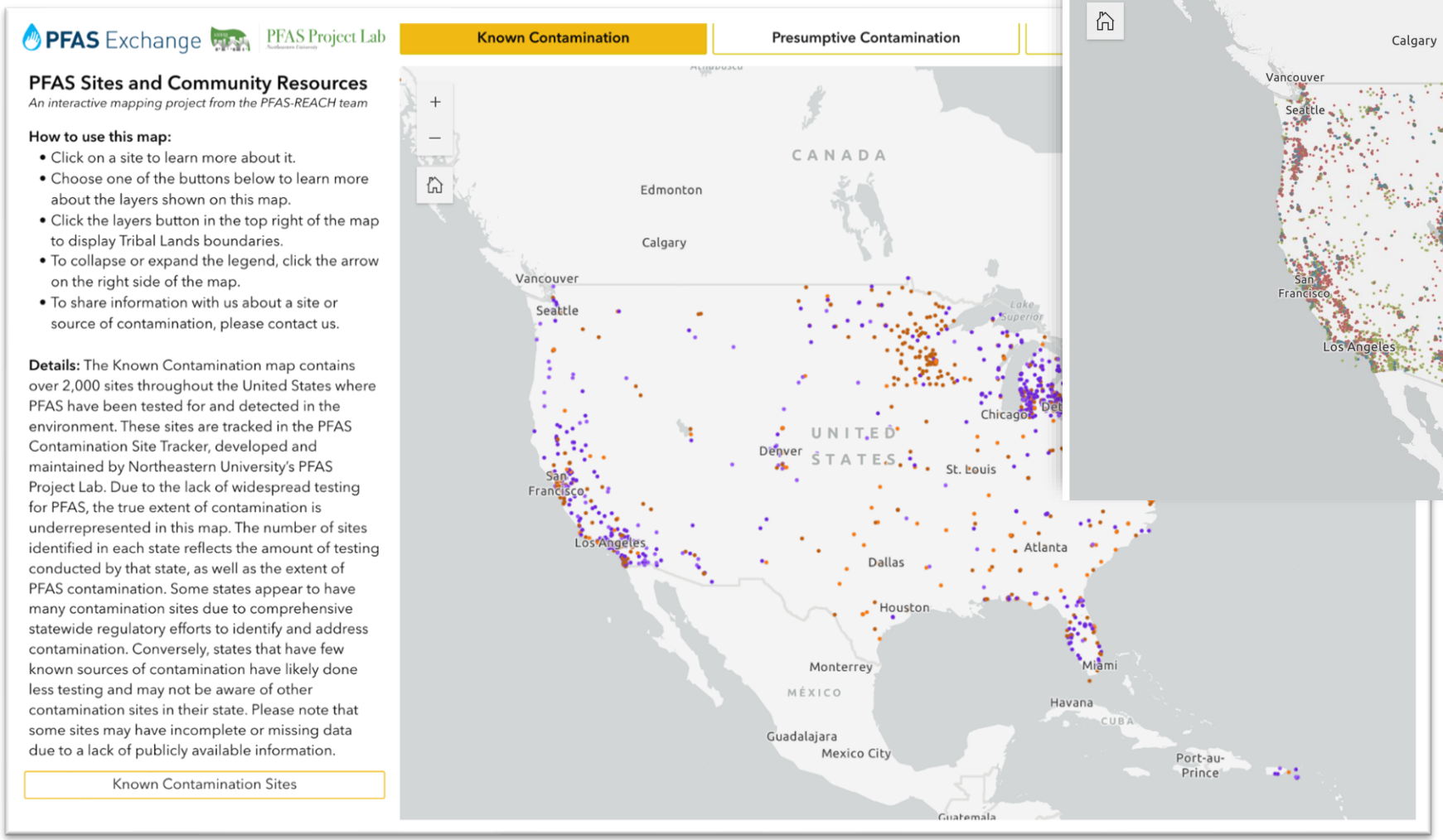
Coordination
Arena for journalism in Europe

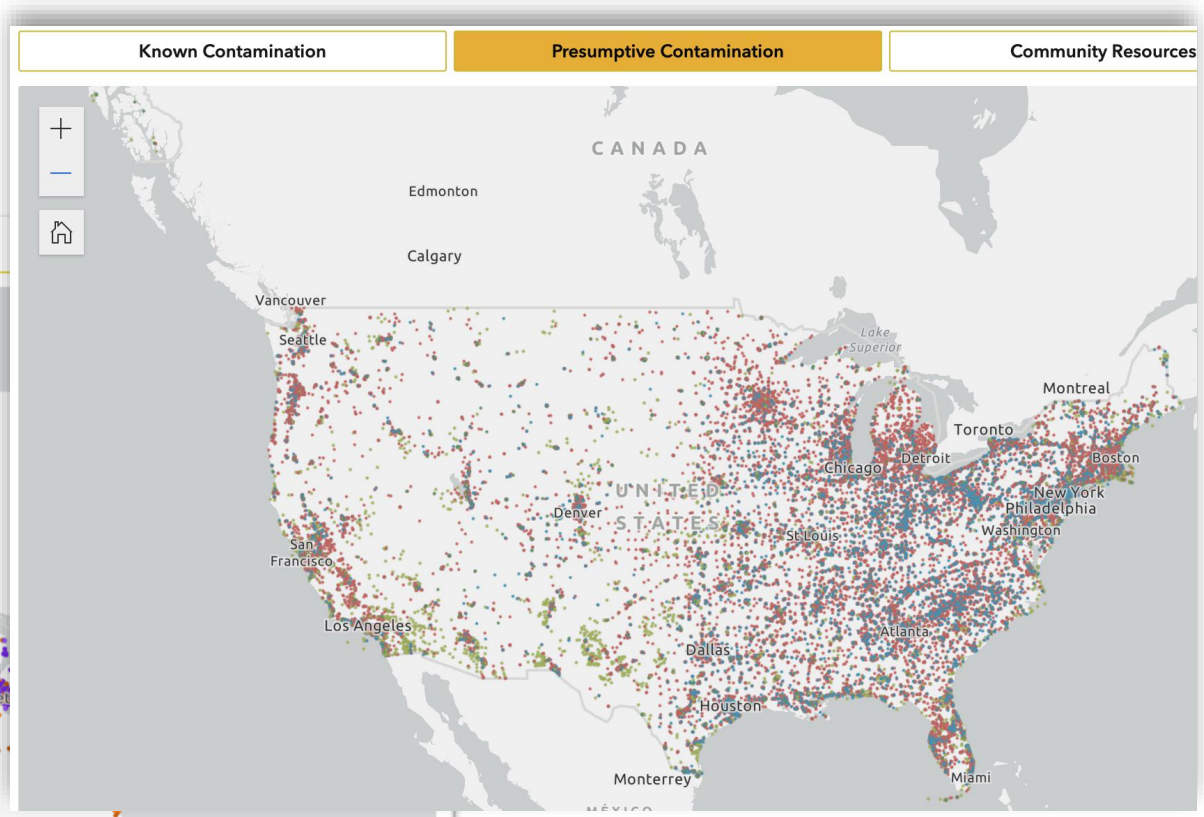
Map design
Le Monde

Mapping partner
maptiler

how it started

Adapting the map/inventory of contamination in the U.S.





7 “expert-reviewers”

Sociologists

Alissa Cordner (Whitman College, Walla Walla, USA)
Phil Brown (Northeastern University, Boston, USA)

Environmental scientists

Ian Cousins (Stockholm University, Sweden)
Martin Scheringer (ETH Zürich, Switzerland)
Kimberly K. Garrett (Northeastern University, Boston, USA)
Derrick Salvatore (Massachusetts Department of Environmental Protection, USA)

Environmental lawyer

Gretta Goldenman (Global PFAS Science Panel, Bruxelles)





how it started (April 2022)

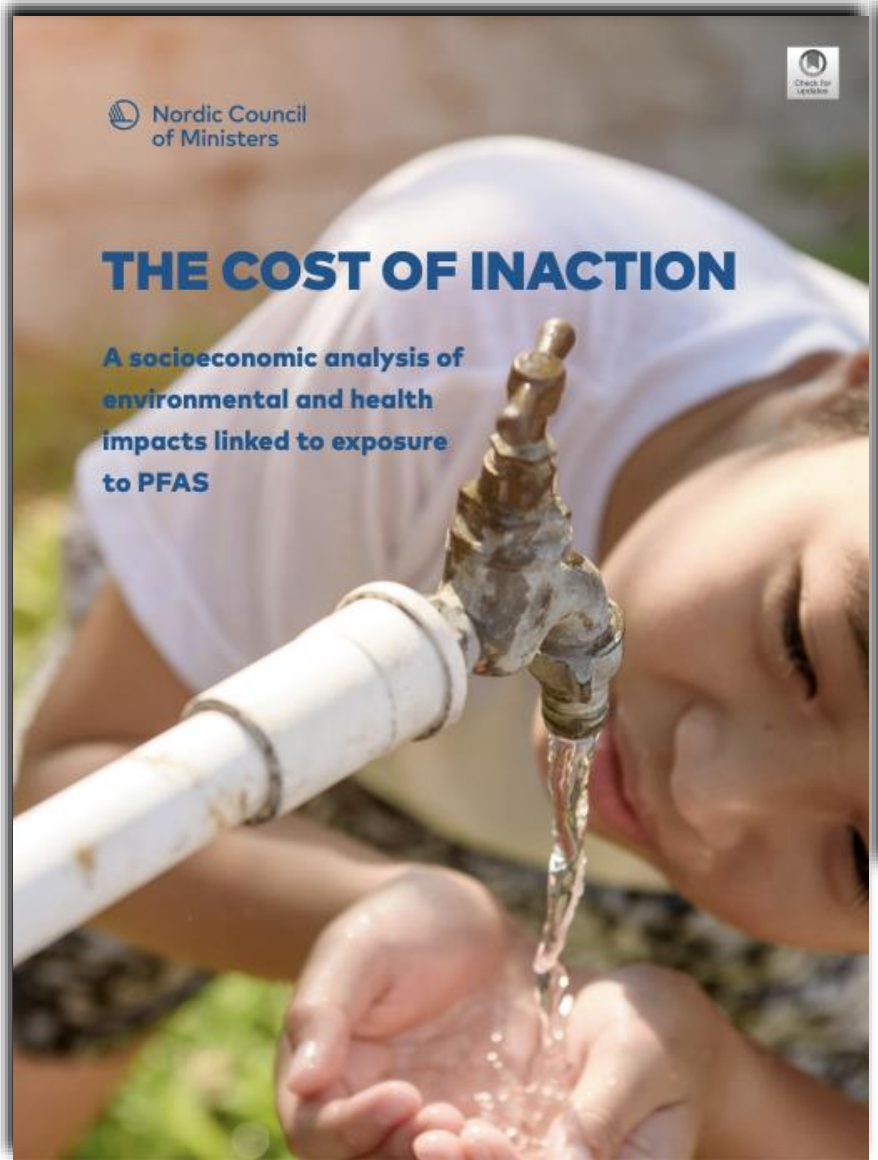


Table 10: List of manufacturers of fluorochemicals and/or fluoropolymers

Country	Company and site of plant	What is being produced
Belgium	3M (Zwijndorf)	Fluorochemicals
France	Arkema (Pierre-Bénite)	Fluoropolymers (PVDF)
	Solvay Solexis (Tavaux)	Fluoropolymers (PVDF)
	Daikin Chemical France S.A.S.[1]	Fluorochemicals
Germany	Dyneon (Gendorf)	Fluorochemicals, fluoropolymers (PTFE, FEP, PFA, THV)
	BASF (Ludwigshafen)	n.a.
Italy	Solvay Solexis (Spinetta-Argeno	Fluoropolymers) – PTFE, MFA
	Heroflon S.p.A. (Collebeato)	Fluoropolymers (PTFE compounds and micropowders)
	Miteni (Trissino) [2]	Fluorinated intermediates; performance fluorinated products
Netherlands	Chemours (Dordrecht)	Fluoropolymers (PTFE, FEP)
	Daikin Chemical Netherlands (Oss) – Pre-compounding of fluoroelastomers	Fluorochemicals
United Kingdom	AGC (Blackpool)	Fluoropolymers – PTFE, PFA

"Based on this list, it is further assumed that the number of PFAS production sites in Europe is between 12 and 20 plants".

Investigative methods: OSINT, FOI, extreme persistence

- ECHA list of registrants
- Corporate material (annual reports, websites...)
- Trade associations member companies
- List provided by Ian Cousins (Stockholm University)
- Google maps
- Consultant intelligence reports
- Scientific papers
- Right to reply emails to companies
- Freedom of information requests

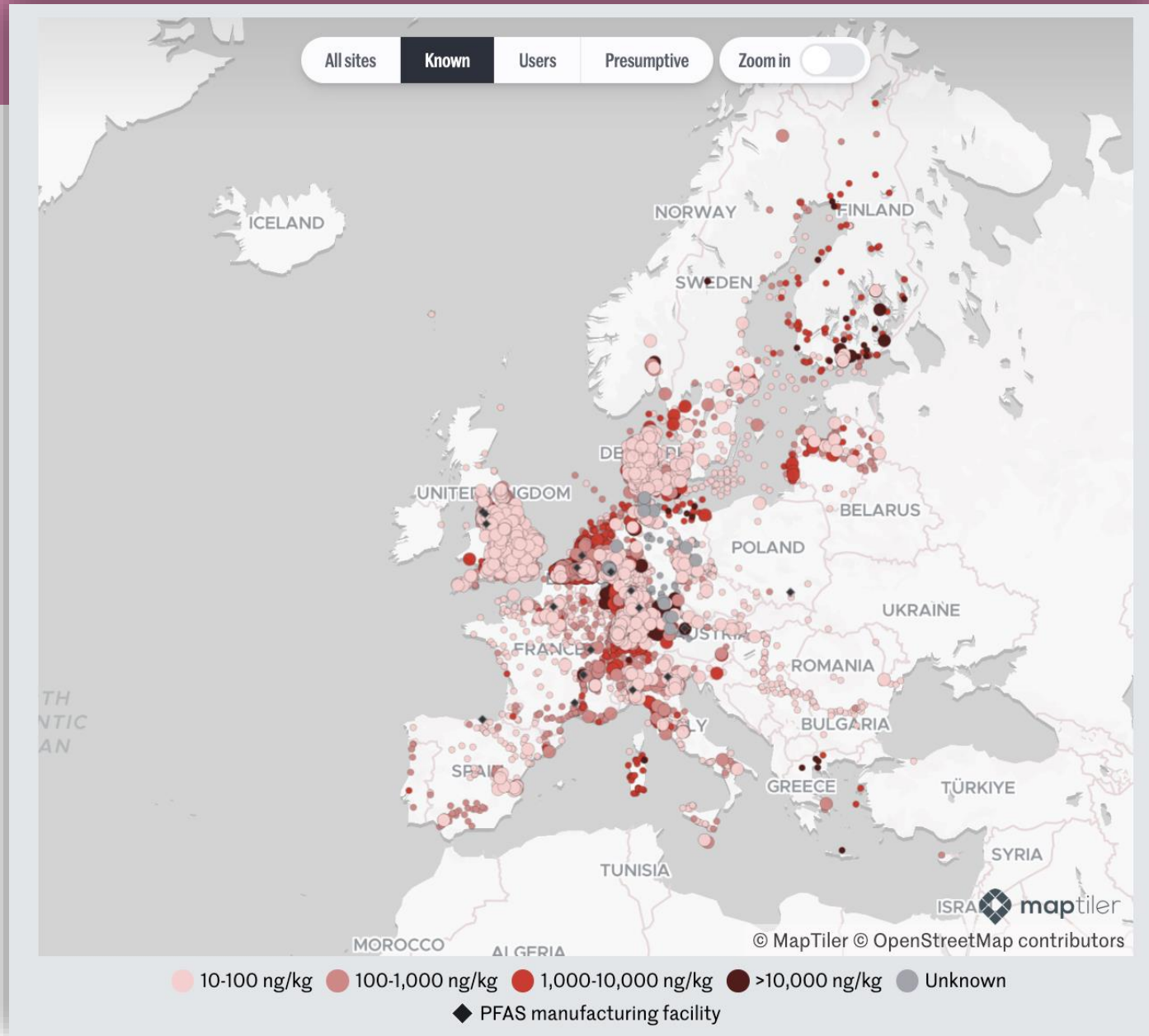
20 PFAS manufacturing facilities

Company	Town	Country
Dyneon / 3M	Gendorf	🇩🇪
Solvay	Bad Wimpfen	🇩🇪
Archroma	Gendorf	🇩🇪
Gore	Gendorf	🇩🇪
Daikin refrigerants	Frankfurt am Main	🇩🇪
Lanxess	Leverkusen	🇩🇪
Arkema	Pierre-Bénite	🇫🇷
Daikin	Pierre-Bénite	🇫🇷
Solvay	Tavaux	🇫🇷
Solvay	Salindres	🇫🇷
Chemours	Villers Saint-Paul	🇫🇷
AGC	Thornton-Cleveleys	🇬🇧
F2	Preston	🇬🇧
Mexichem/Koura	Runcorn	🇬🇧
Miteni	Trissino	🇮🇹
Solvay	Spinetta-Marengo	🇮🇹
3M	Zwijndrecht	🇧🇪
Chemours	Dordrecht	🇳🇱
Grupa Azoty	Tarnów	🇵🇱
Arkema	Zaramillo	🇪🇸

22,934 known contamination sites
2,300 hotspot clusters

EU limit value
= 100 ng/l (20 PFAS)
= 500 ng/l (sum PFAS)

Hotspot according to experts
= 100 ng/l



Presumptive contamination sites

ENVIRONMENTAL Science & Technology LETTERS

pubs.acs.org/journal/estlcu

Presumptive Contamination: A New Approach to PFAS Contamination Based on Likely Sources

Derrick Salvatore, Kira Mok, Kimberly K. Garrett, Grace Poudrier, Phil Brown, Linda S. Bi
Gretta Goldenman, Mark F. Miller, Sharyle Patton, Maddy Poehlein, Julia Varshavsky,
and Alissa Cordner*

Cite This: *Environ. Sci. Technol. Lett.* 2022, 9, 983–990

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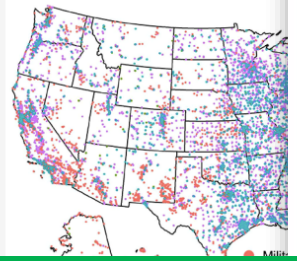
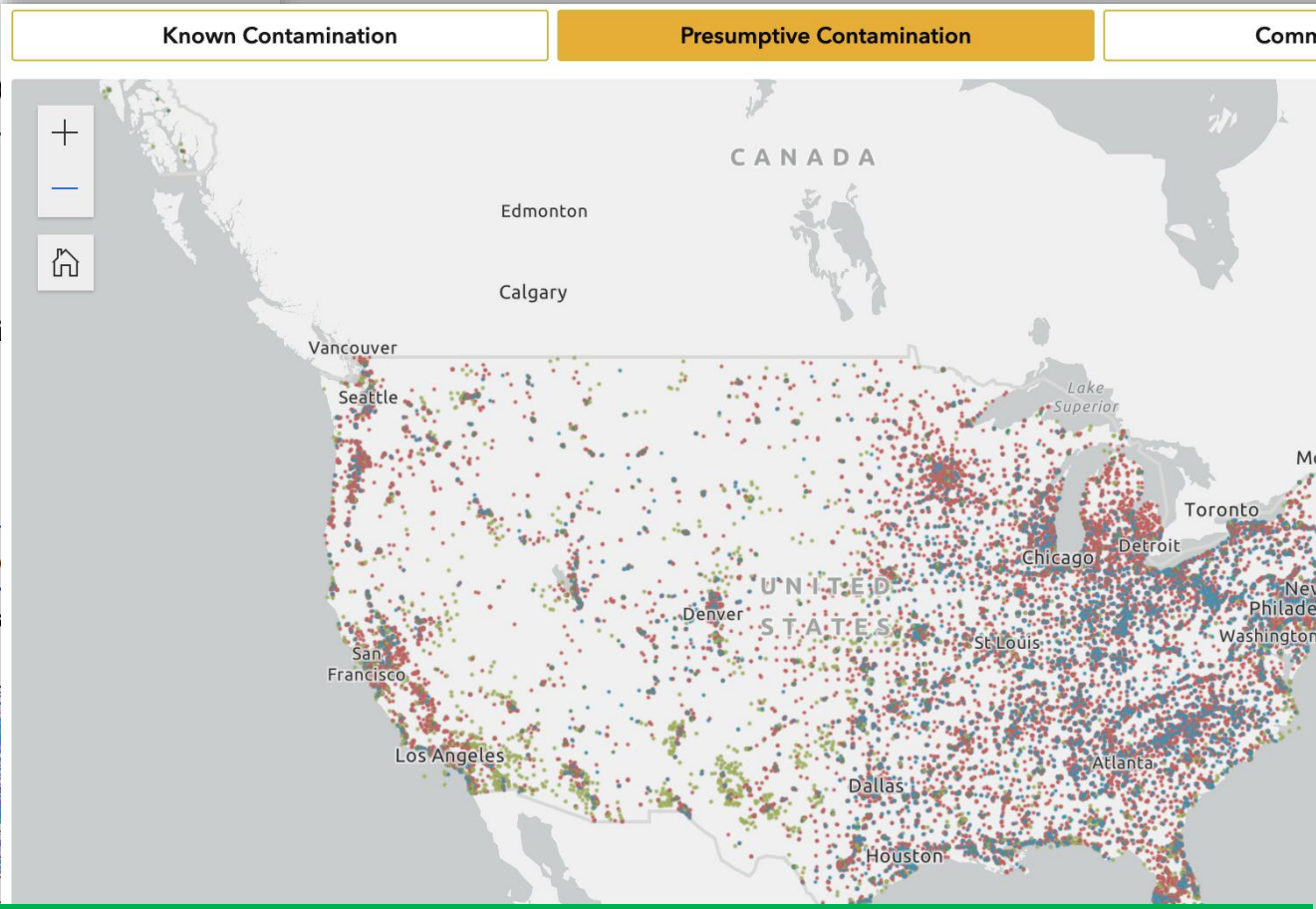
ABSTRACT: While research and regulatory attention to per- and polyfluoroalkyl substances (PFAS) has increased exponentially in recent years, data are uneven and incomplete about the scale, scope, and severity of PFAS releases and resulting contamination in the United States. This paper argues that in the absence of high-quality testing data, *PFAS contamination can be presumed* around three types of facilities: (1) fluorinated aqueous film-forming foam (AFFF) discharge sites, (2) certain industrial facilities, and (3) sites related to PFAS-containing waste. While data are incomplete on all three types of presumptive PFAS contamination sites, we integrate available geocoded, nationwide data sets into a single map of presumptive contamination sites in the United States, identifying 57,412 sites of presumptive PFAS

Presumptive Contamination S





Sites without sampling results, but presumed to be contaminated based on scientific studies and expert advice.

Presumptive contamination sites

1– Fluorinated aqueous film-forming foam (AFFF) discharge sites

2– Sites related to PFAS-containing waste

3- Industrial sites

Presumptive contamination sites

1– Fluorinated aqueous film-forming foam (AFFF) discharge sites

642 Military sites
978 Airports
1096 Firefighting training sites (Flanders, Sweden, Norway)
Firefighting incidents (10,774 in Sweden, 279 in Flanders)

2– Sites related to PFAS-containing waste

2,620 Wastewater treatment plants treating >3,700m3/day
2,167 Waste management sites (landfills for non-hazardous and hazardous waste and incinerators)

Presumptive contamination sites / industrial sites

NAICS code US	Title	Sources	Quantity	NACE code EU	Activity
313320	Fabric Coating Mills	bcdefghik	380	C13.96	Manufacture of other technical and industrial textiles
325510	Paint and Coating Manufacturing	abcdefhik	2100	C20.3	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
322220	Paper Bag and Coated and Treated Paper Manufacturing	bcdefghi	0	C17.1	Manufacture of pulp, paper and paperboard
313210	Broadwoven Fabric Mills	bcdefhk	484	C13.2.0	Weaving of textiles
322121	Paper (except Newsprint) Mills	bcdefhk	610	C17.1	Manufacture of pulp
	Idem			C17.2	Manufacture of paper and paperboard
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	bcdefhi	5642	C25.6.1	Treatment and coating of metals
324110	Petroleum Refineries	abcdehk	594	C19.2.0	Manufacture of refined petroleum products
325612	Polish and Other Sanitation Good Manufacturing	abdefhk	673	C20.4.1	Manufacture of soap and detergents, cleaning and polishing preparations
334413	Semiconductor and Related Device Manufacturing	bcdefi	1552	C26.1.1	Manufacture of electronic components
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing	bdefhi	597	C22	Manufacture of rubber and plastic products
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers	bcefgi	3587	C25.6.1	Treatment and coating of metals
333318	Other Commercial and Service Industry Machinery Manufacturing	bdefgh	0	C26.7.0	Manufacture of optical instruments and photographic equipment
	Idem			C28.2.3	Manufacture of office machinery and equipment (except computers and peripheral equipme
334419	Other Electronic Component Manufacturing	bcdefg	1663	C26.1.1	Manufacture of electronic components
	Idem			C26.1.2	Manufacture of loaded electronic board
562212	Solid Waste Landfill	cdefjk	4765	E38.2.1	Treatment and disposal of non-hazardous waste
325199	All Other Basic Organic Chemical Manufacturing	abdefi	1847	C20.1.4	Manufacture of other organic basic chemicals
323111	Commercial Printing (except Screen and Books)	bcdhk	4226	C18.1.2	Other printing
	Idem			C18.1.3	Pre-press and pre-media services
313110	Fiber, Yarn, and Thread Mills	bcefh	0	C13.1.0	Preparation and spinning of textile fibres
314110	Carpet and Rug Mills	bdhik	189	C13.9.3	Manufacture of carpets and rugs
316110	Leather and Hide Tanning and Finishing	bdefg	276	C15.1.1	Tanning and dressing of leather; dressing and dyeing of fur
325211	Plastics Material and Resin Manufacturing	bdgik	2141	C20.1.6	Manufacture of plastics in primary forms
	Idem			C22	Manufacture of rubber and plastic products
	Idem			C22.29	Manufacture of other plastic products
324191	Petroleum Lubricating Oil and Grease Manufacturing	abcdh	919	C19.2.0	Manufacture of refined petroleum products
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	aefgk	2598	C20.5.9	Manufacture of other chemical products n.e.c.
562211	Hazardous Waste Treatment and Disposal	acefj	1357	E38.2.2	Treatment and disposal of hazardous waste
562213	Solid Waste Combustors and Incinerators	acefj	407	E38.2.1	Treatment and disposal of non-hazardous waste
313310	Textile and Fabric Finishing Mills	bcdh	0	C13.3.0	Finishing of textiles
322219	Other Paperboard Container Manufacturing	bcdh	0	C17.2.1	Manufacture of corrugated paper and paperboard and of containers of paper and paperboa
323120	Support Activities for Printing	bcdh	0	C18.1.2	Other printing

Presumptive contamination sites

3- 2,911 industrial sites

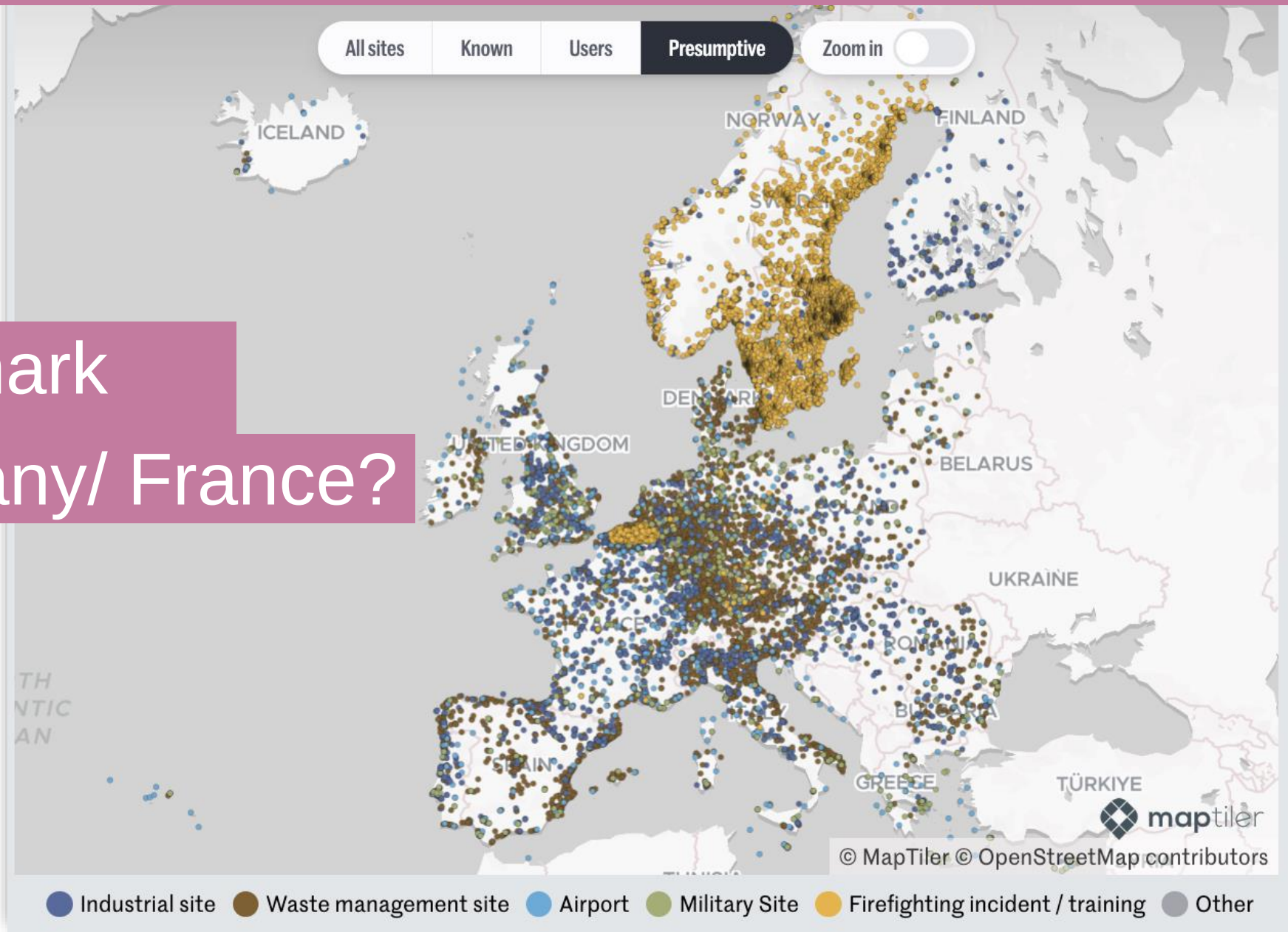
!! largely underestimated !!

Industrial activity	Sites
Manufacture of pulp, paper and paperboard	1,120
Treatment and coating of metals	680
Manufacture of articles of paper and paperboard	302
Manufacture of plastics in primary forms	221
Manufacture of refined petroleum products	213
Manufacture of other fabricated metal products n.e.c.	132
Finishing of textiles	126
Manufacture of other organic basic chemicals	45
nan	45
Manufacture of rubber and plastic products	16
Tanning and dressing of leather; dressing and dyeing of fur	11
Treatment and disposal of hazardous waste	1

21,429 presumptive contamination sites

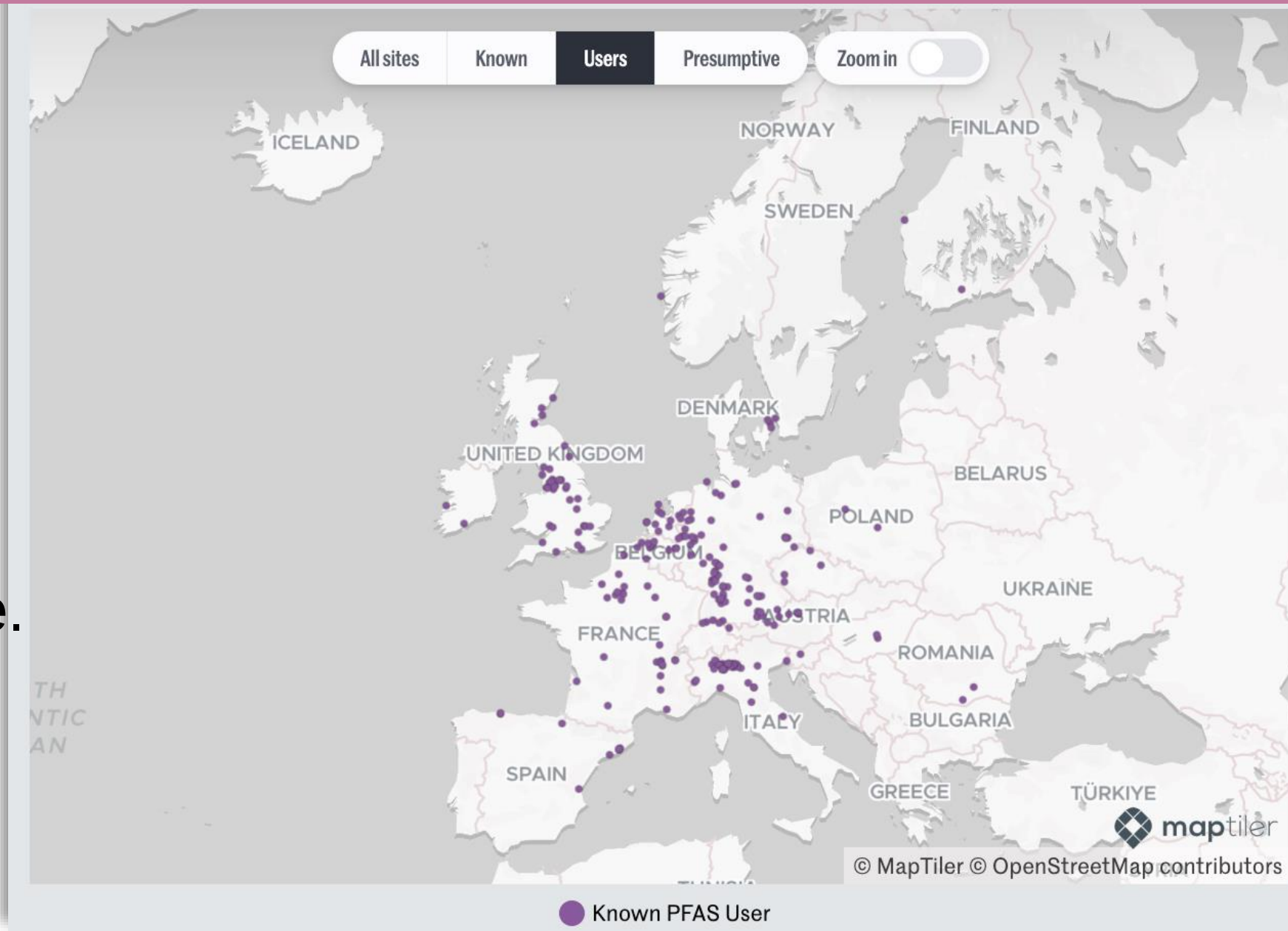
+ 15,000 in Denmark

100,000 in Germany/ France?



231 PFAS known users

Sites where there is evidence of PFAS use. (New category)



methodology > published in a scientific journal (ES&T)

map > transmission to cnrs

Environmental Science & Technology

pubs.acs.org/est

Article

PFAS Contamination in Europe: Generating Knowledge and Mapping Known and Likely Contamination with "Expert-Reviewed" Journalism

Alissa Cordner, Phil Brown, Ian T. Cousins, Martin Scheringer, Luc Martinon, Gary Dagorn, Raphaëlle Aubert, Leana Hosea, Rachel Salvidge, Catharina Felke, Nadja Tausche, Daniel Drepper, Gianluca Liva, Ana Tudela, Antonio Delgado, Derrick Salvatore, Sarah Pilz, and Stéphane Horel*

Cite This: https://doi.org/10.1021/acs.est.3c09746

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ABSTRACT: While the extent of environmental contamination by per- and polyfluoroalkyl substances (PFAS) has mobilized considerable efforts around the globe in recent years, publicly available data on PFAS in Europe were very limited. In an unprecedented experiment of "expert-reviewed journalism" involving 29 journalists and seven scientific advisers, a cross-border collaborative project, the "Forever Pollution Project" (FPP), drew on both scientific methods and investigative journalism techniques such as open-source intelligence (OSINT) and freedom of information (FOI) requests to map contamination across Europe, making public data that previously had existed as "unseen science". The FPP identified 22,934 known contamination sites, including 20 PFAS manufacturing facilities, and 21,426 "presumptive contamination sites", including 13,
with fluorinated aqueous film-forming foam (AFFF) discharge, 2911 industrial facilities, and 47
waste. Additionally, the FPP identified 231 "known PFAS users", a new category for sites with
PFAS use and considered likely to be contamination sources. However, the true extent of
significantly underestimated due to a lack of comprehensive geolocation, sampling, and publicly
knowledge production and dissemination offers lessons for researchers, policymakers, and journalists about cross-field collaborations.

https://pdh.cnrs.fr

PDH PFAS Data Hub

Map Data About

Welcome to PFAS Data Hub

We currently have 332,675 rows in the database:

- 13,112 of category "Presumptive",
- 231 of category "Known PFAS user",
- 319,332 of category "Known", including 303,494 with precise location (some other points only have the city but no coordinates, these are not shown on the map)

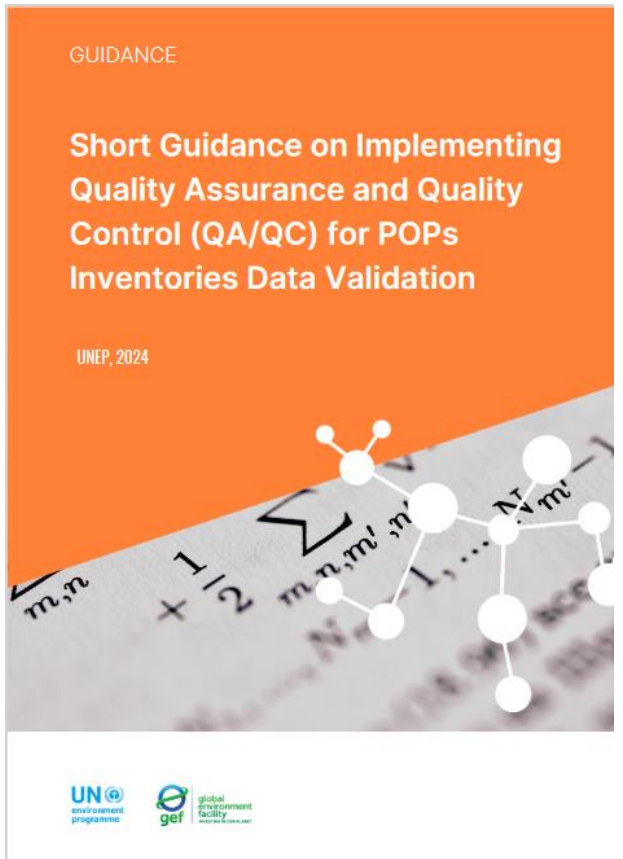
This data is coming from 103 different datasets (see here), including 14 scientific articles and 77 datasets coming from authorities.

http://foreverpollution.eu horel@lemonde.fr
Signal +33 686 92 77 18

Step 4 – Evaluation and data management

- A mechanism for data evaluation is needed, to identify
  - Gaps/limitations and measures needed to complete the inventory
  - if the obligations under the SC are fulfilled and the necessary actions needed to fulfill them
  - **the need of notification to the registers of acceptable purposes and specific exemptions** under the Convention

- The evaluation will be the **basis for** development of a PFAS Action Plan and **updating the NIP**.
- A guidance on QA/QC for assessing the inventory data has been published and will be introduced in a webinar (likely in October).



https://www.greenpolicyplatform.org/guidance/short-guidance-implementing-quality-assurance-and-quality-control-qaqc-pops-inventories-0

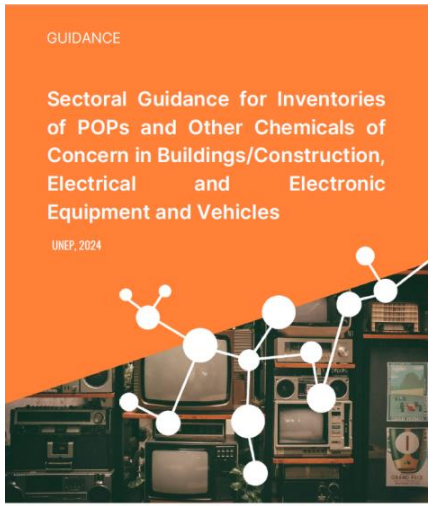
Step 5: Inventory report

Essential elements of an inventory report are:

- Objectives and scope;
- Data methodology used and how the POP-PFAS data were gathered;
- Final results of the inventory in each sector considered a priority for that country;
- Results of the gap-analysis and limitations identified for completion of the inventory;
- Further actions suggested to improve the inventory **and recommendations for action plan.**

Other information (e.g. stakeholder list), depending on the national requirements, could be included in the report.

Thank you for your attention ! Questions?



More Information https://www.pops.int/Implementation/NationalImplementationPlans/Guidance/tabid/7730/Default.aspx

Basel Convention: www.basel.int

Rotterdam Convention: www.pic.int

Stockholm Convention: http://chm.pops.int/

Montreal Protocol/Vienna Convention: http://ozone.unep.org

FAO: www.fao.org **WHO** www.who.int/ **GFC** https://www.chemicalsframework.org/

Alternatives https://www.subsportplus.eu/subsportplus/EN/Home/Home_node.html

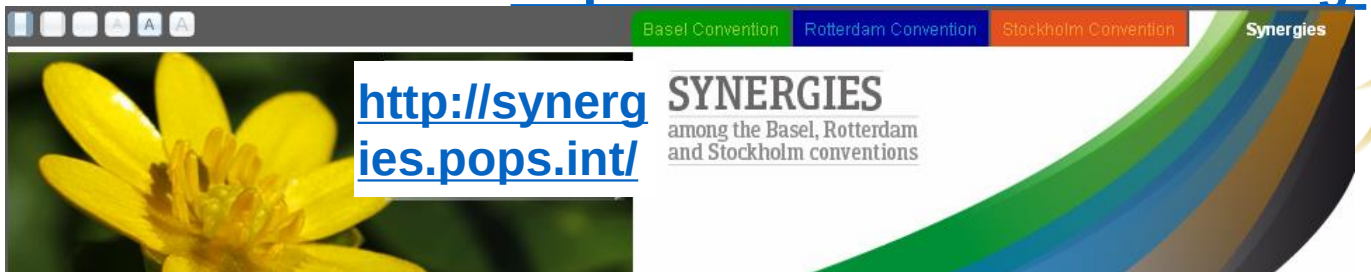
OECD/IOMC: http://www.oecd.org/chemicalsafety/

Science: www.ipcp.ch; http://greensciencepolicy.org/; www.unep.org/oewg-spp-chemicals-waste-pollution

Industry: http://www.suschem.org/; https://icca-chem.org/; https://cefic.org/

NGO: www.ipen.org; www.ciel.org/; www.ban.org; www.chemsec.org; www.wecf.org;

Better-world-links: http://www.betterworldlinks.org/



http://synergies.pops.int/

https://www.greenpolicyplatform.org/case-studies/inventory-pops-transport-sector-nigeria

https://www.greenpolicyplatform.org/case-studies/inventory-pops-electrical-and-electronic-equipment-eee-and-related-waste-weee-nigeria

https://www.greenpolicyplatform.org/case-studies/case-study-inventory-pops-building-and-construction-sector-country

Global NIP Update Webinar -“Introduction to PFAS and SCCP/MCCP and related Inventories”,
17. September 2024, 14:00 -16:15 CEST, GMT 2

STOCKHOLM CONVENTION

Introduction to Short-Chain and Medium-Chain Chlorinated Paraffins (SCCP/MCCPs) and related Inventory Development

Dr. Roland Weber
POPs Environmental Consulting,
73527 Schwäbisch Gmünd, Germany
https://www.researchgate.net/profile/Roland-Weber-2
https://scholar.google.com/citations?user=-Cexto4AAAAJ&hl=en

GREEN GROWTH Knowledge Partnership

UN environment programme

gef

22 POPs were newly listed in the Stockholm Convention 2009-2023

Chemical	Pesticides	Industrial chemicals	Unintentional production	Annex
Chlordecone, Endosulfan, Dicofol	+			A
α-/β-HCH, Lindane, Methoxychlor	+			A
Pentachlorophenol (PCP)	+	+		A
Commercial PentaBDE		+		A
Commercial OctaBDE (hexa/hepta)		+		A
DecaBDE		+		A
Hexabromobiphenyl (HBB)		+		A
Hexabromocyclododecane (HBCD)		+		A
Perfluorooctane sulfonic acid (PFOS), its salts and PFOSF	+	+		B
PFOA and related compounds		+		A
PFHxS and related compounds		+		A
Short Chain Chlorinated Paraffins		+		A
Dechlorane Plus		+		A
UV-328		+		A
Hexachlorobutadiene (HCBD)		+	+	A/C
Pentachlorobenzene (PeCB)		+	+	A/C
Polychlorinated Naphtalene (PCN)		+	+	A/C

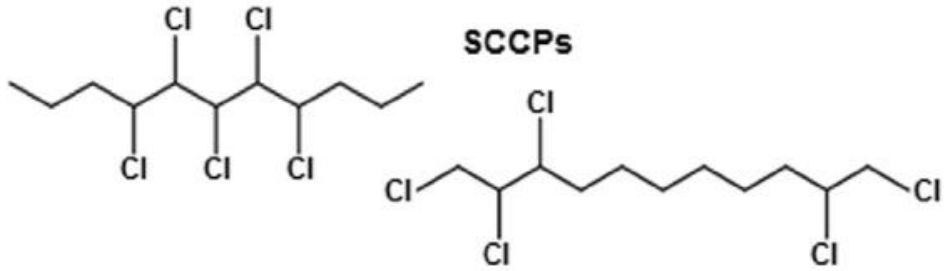
SCCPs were listed 2017 in Annex A and received a wide range of exemption.

MCCPs are suggested for listing at COP12 in May 2025 with a range of exemptions.

POP Review Committee: PBDD/F & PXDD/F; Chlorpyrífos. And **MCCPs** & LC-PFAA are proposed @COP12 2025.

Technical mixtures of chlorinated paraffines – chain length and chlorination degree

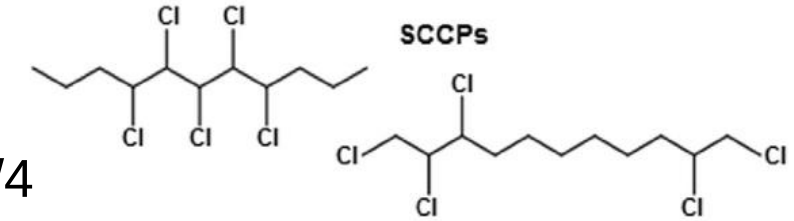
- Chlorinated paraffins (CPs), are complex mixtures of chlorinated alkanes ($C_nH_{2n+2-x}Cl_x$.)
- According to their chain length, CPs are subdivided into short-chain CPs (**SCCPs, C10–C13),** medium-chain CPs (**MCCPs, C14–C17**) and long-chain CPs (LCCPs, C18–C30),
- Chlorinated paraffins are **produced with different chlorination degree** varying from 30% to 70% (w/w). The variation option in chain length and chlorination degree makes them versatile and approx. 200 commercial CP formulations are in use.



- The **Stockholm Convention listed SCCPs with a chlorine content** of **>48% as POPs**.
- **Also CP mixtures** with **≥1% of SCCPs are considered SCCPs/POPs.**
- **MCCPs with chlorine content ≥45% are proposed for listing by POPRC at COP12 in 2025.**

SCCPs in the Stockholm Convention

- Proposal: 2006, EU and its Member States
- Risk profile: UNEP/POPS/POPRC.8/6
- Risk management evaluation: UNEP/POPS/POPRC.12/4



Production: **Frequently produced in mixtures with MCCP; the SCCP** amount was estimated to **400,000 t/year in 900,000 t of CP mixtures (2022). The current production amount is unclear.**

Past and current use: Plasticizers and flame retardants in PVC and other plastics and rubber; metalworking fluid, lubricants; paints; coatings; adhesives and sealants; leather fat liquors; additives in textiles

Alternatives: Available (SCCP alternative Guidance); also conclusion of POPRC assessment.

→Listed in 2017: Annex A (Elimination) (**Decision SC-8/11**)

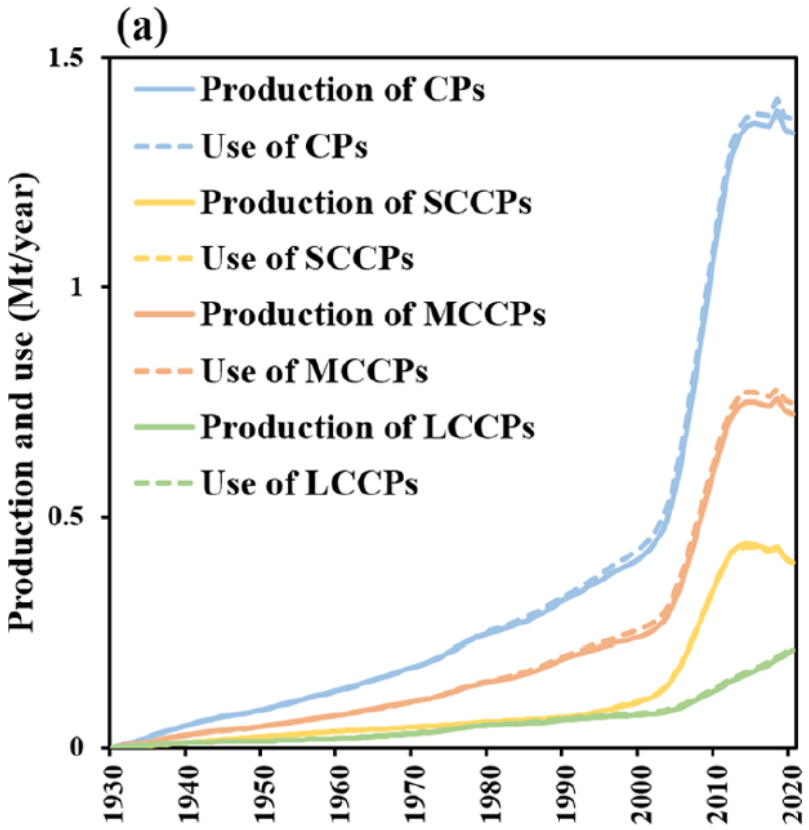
→ Production: **Was allowed for exemptions but expired 12/2023; China has restricted SCCP production in 12/2023. India did not ratify SCCPs yet!**

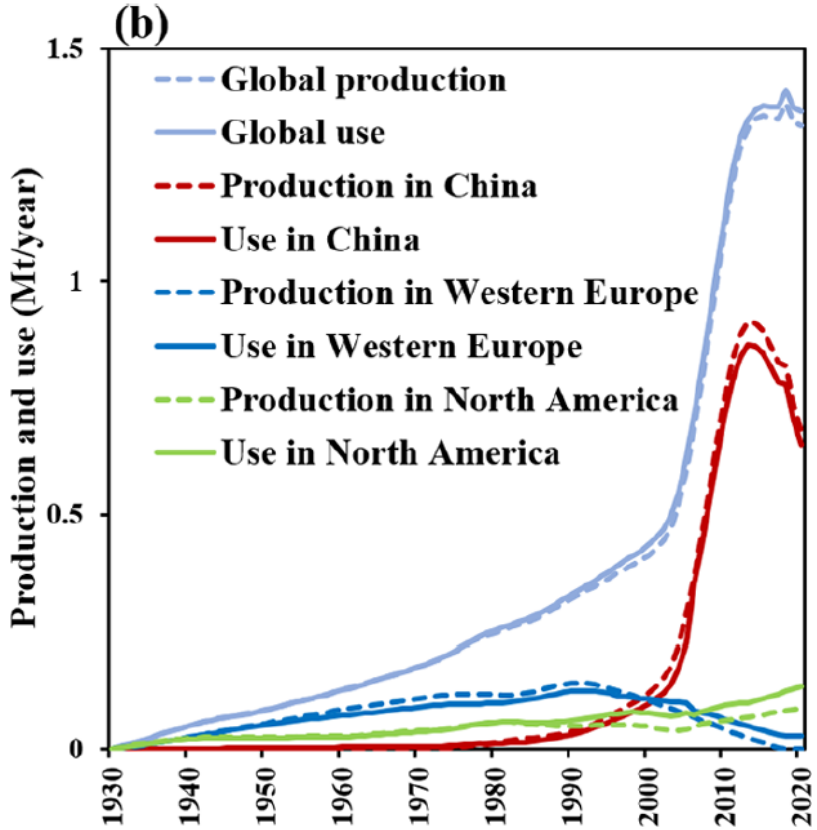
→Use: **A range of exemptions granted but expired 12/2023 (Decision SC11/1)**

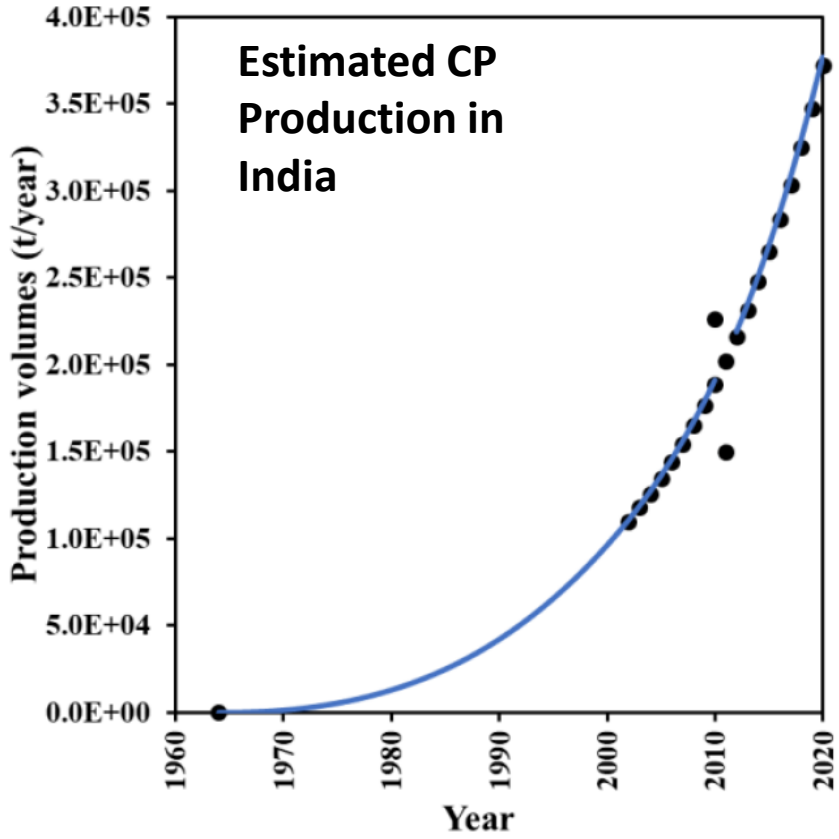
→Use in country: **Vietnam registered for 15,000 t/year; most countries are not aware that they get SCCPs imported in high volumes as CP mixtures & in plastics.**

Estimate of global production & use of SCCPs and other CPs

- Global production of CPs increased drastically over past 20 years and is **since ~2010 above 1 Mt/a**. Current production ~1.4 Mt/y (Chen et al 2022). **Global production capacity is above 2 Mt/a.**
- Total production of **SCCPs** estimated to 400,000 t/a but often in CP-mixtures. Therefore the **total amount of CPs containing SCCPs ≥1% in 2022 was ~900,000 t** (Guida et al. 2022; Xia et al. 2021).
- China & India are the largest **CP producers** with estimated 700,000 t and 375,000 t (Chen et al. 2022). Further productions in Egypt, Russia, Qatar, South Africa, USA. Some restricted SCCPs.



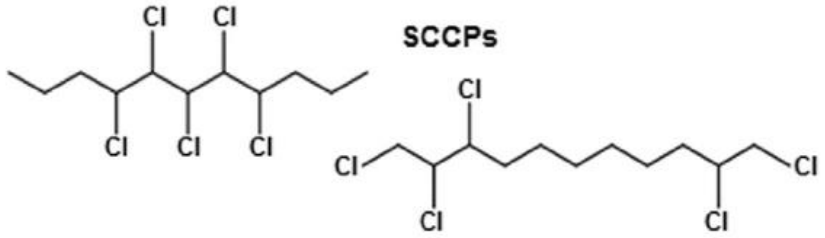




Chen et al. (2022) ES&T https://doi.org/10.1021/acs.est.2c00264

Stockholm Convention had exemption for production & use of SCCPs

- **The listing** in the Stockholm Convention **was with a range of exemptions (basically all major uses):**
  - Secondary plasticizers in **flexible PVC**, except in toys & children's products.
  - Additives in **rubber transmission belts** in the natural and synthetic rubber industry;
  - Leather industry, in particular **fatliquoring in leather**;
  - **Lubricant additives**, in particular for engines of automobiles, electric generators and wind power facilities, and for drilling in oil and gas exploration, petroleum refinery to produce diesel oil;
  - **Metal processing**;
  - **Waterproofing and fire-retardant paints**;
  - Tubes for outdoor decoration bulbs;
  - **Adhesives**.



Decision SC-8/11: Listing of short-chain chlorinated paraffins

Exemption of SCCPs expired 2023 but are likely further produced (e.g. India did not ratify SCCP yet).

⇒ **Hence assessment of current use and assessment of alternatives and substitution is needed.**

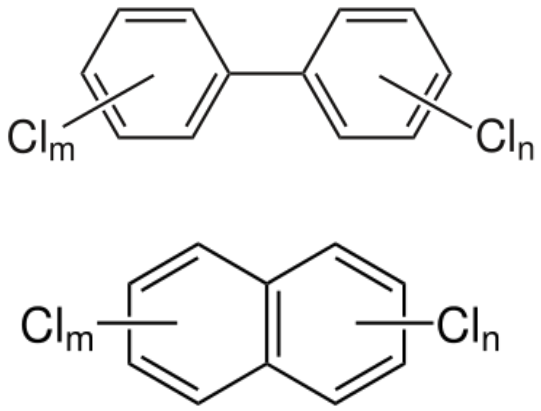
⇒ **MCCP will be listed at COP12 in 2025. A list of proposed exemptions for MCCP has been compiled by the POPRC (UNEP/POPS/POPRC.20/3). Likely change at COP when listed 2025.**

⇒ Countries likely do not know that they are using large amount of SCCP/MCCPs or get it imported. Even some producers might not be aware that they are producing SCCPs or CPs containing SCCPs.

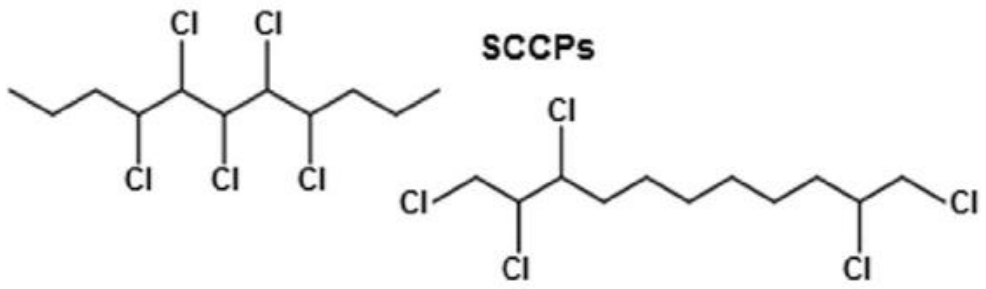
⇒ With a 5 years exemption MCCPs will at least be produced/used until 2031. Metal working fluids 2036.

Synergy of the SCCP/MCCP inventory: Assessment of remaining „Open Applications“ of PCB and PCN

- **PCBs** have been used from **1950s to ~1975 in the same “open applications” where SCCP/ MCCPs are used** (e.g. sealants, paints/coating, plastic/cables, rubber, lubricants, cutting oils).
- **PCNs** have also been used in the same applications as PCBs/CPs since 1930s with major use until 1970 and in few uses until 2000. **Very few PCN data in open applications.**
- **SCCPs and MCCPs have substituted PCBs and PCNs in these open applications in the 1970s but were also used in these open applications since the 1930s.**
- **Therefore the assessment of stocks of SCCPs/MCCPs, can also assess remaining PCBs & PCNs in these uses (mainly in buildings/structures having long service life >50 years)**.



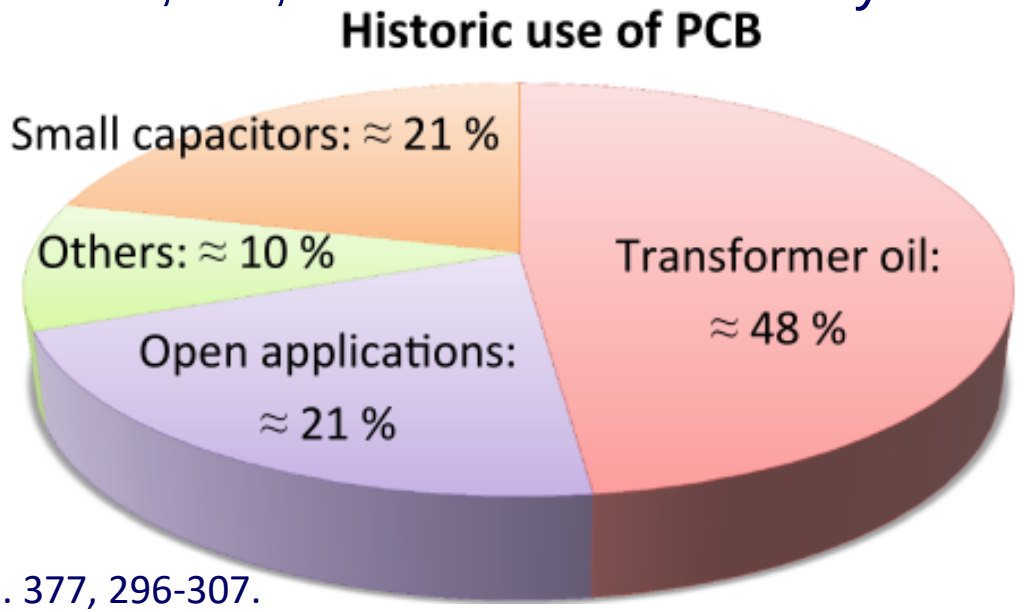
Regrettable Substitution in 1970s



Fantke et al. (2015) Sustainable Chemistry and Pharmacy 1, 1-8.

PCB and PCN in open applications – amount and major uses

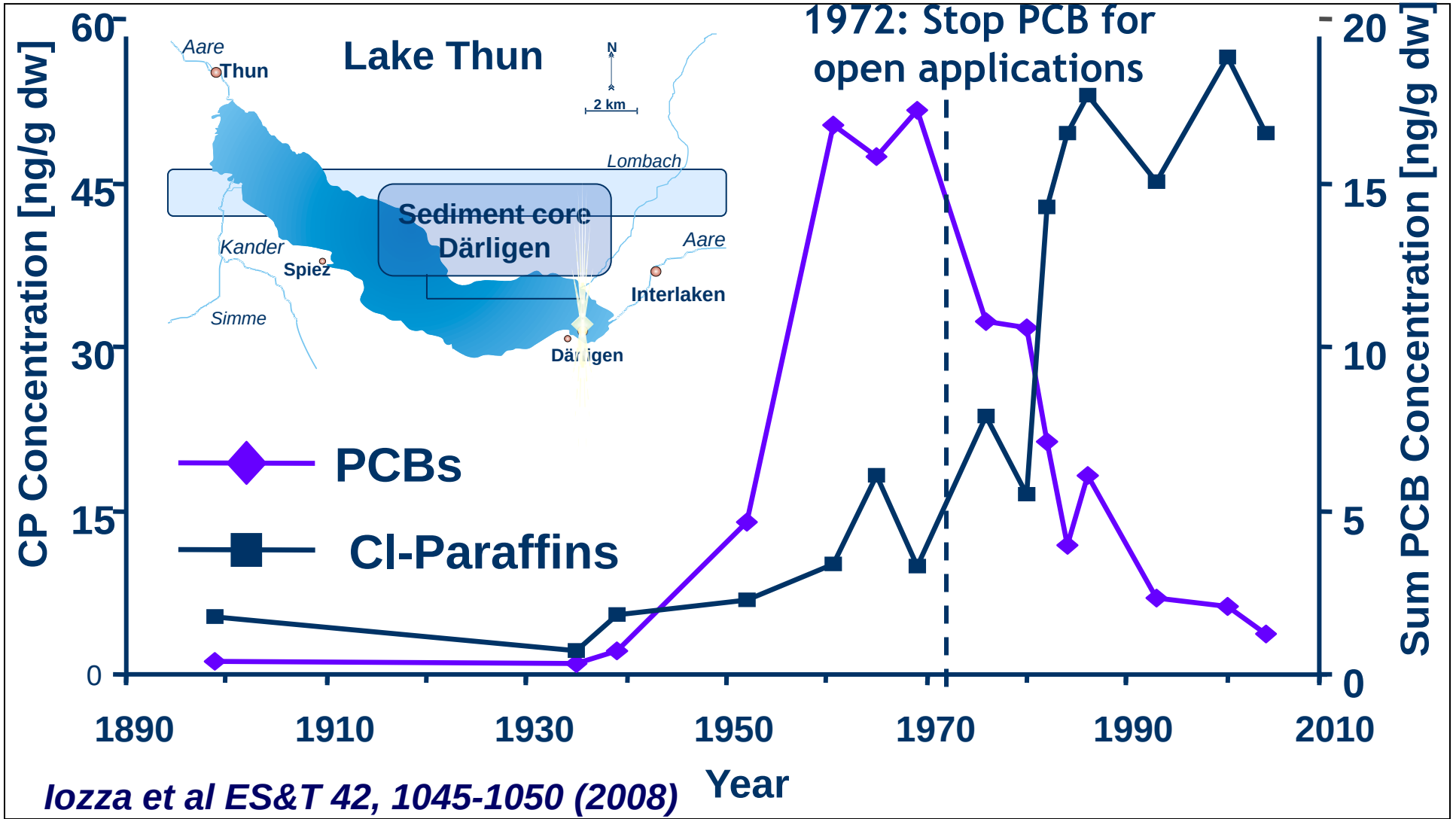
- From the 1.3 million tonnes of PCB produced from 1929 to 1990 (Breivik et al. 2007) the major use were in transformers and capacitors (ca. 70%) where SC activities mainly focus.
- However the ~21 % of PCBs which were used in open applications (~300,000 t) **caused and are still causing major PCB release and exposure in countries of major use**.
- Lower amount of PCNs in these uses (unknown share of the 150,000 t) (1930s to 1970)
- The most significant use of PCB in open applications was in elastic sealants/caulks and lower amount in paints in construction built 1950s to 1980 and in cables.
- The total use of SCCPs/MCCPs in “open application” were 33,800,000 tonnes and each year additional 1 Mt is produced/used.



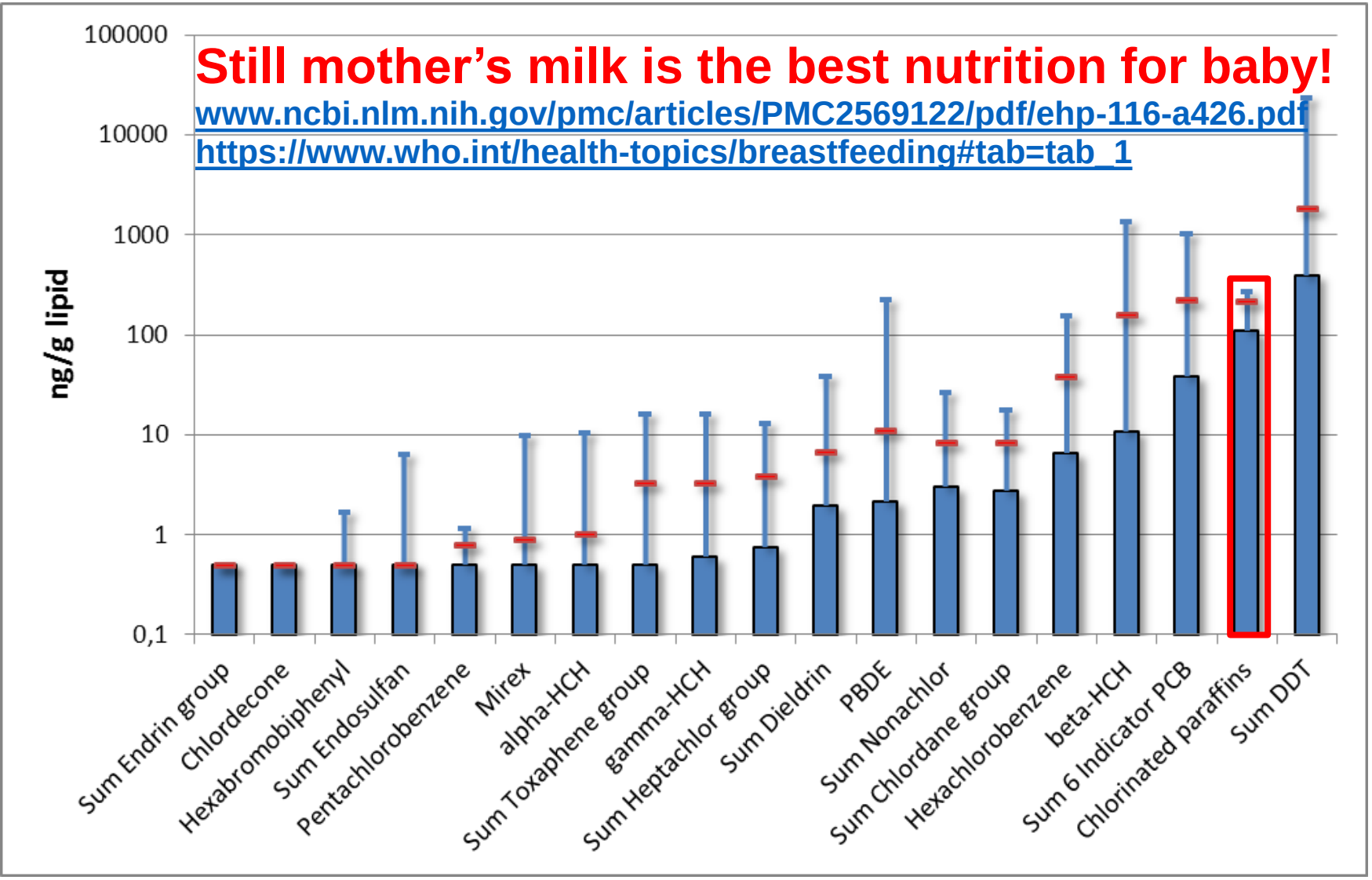
Breivik K et al. (2007) Science of the Total Environment,. 377, 296-307.

SCCP/MCCP substituted PCBs in early 1970s – mirrored in sediments

- Sediment cores document that the **major PCB release in Europe was from open application.**
- Sediment contamination by chlorinated paraffins increased continuously the last 40 years resulting in higher levels compared to peak PCB contamination end of 1970.



High SCCP/MCCP levels in WHO/UNEP human milk



POPs in human milk from global UNEP/WHO study under GMP of SC (65 countries; 2000-2012).

SCCP/MCCP levels in human milk are increasing in most regions and are higher than PCB.

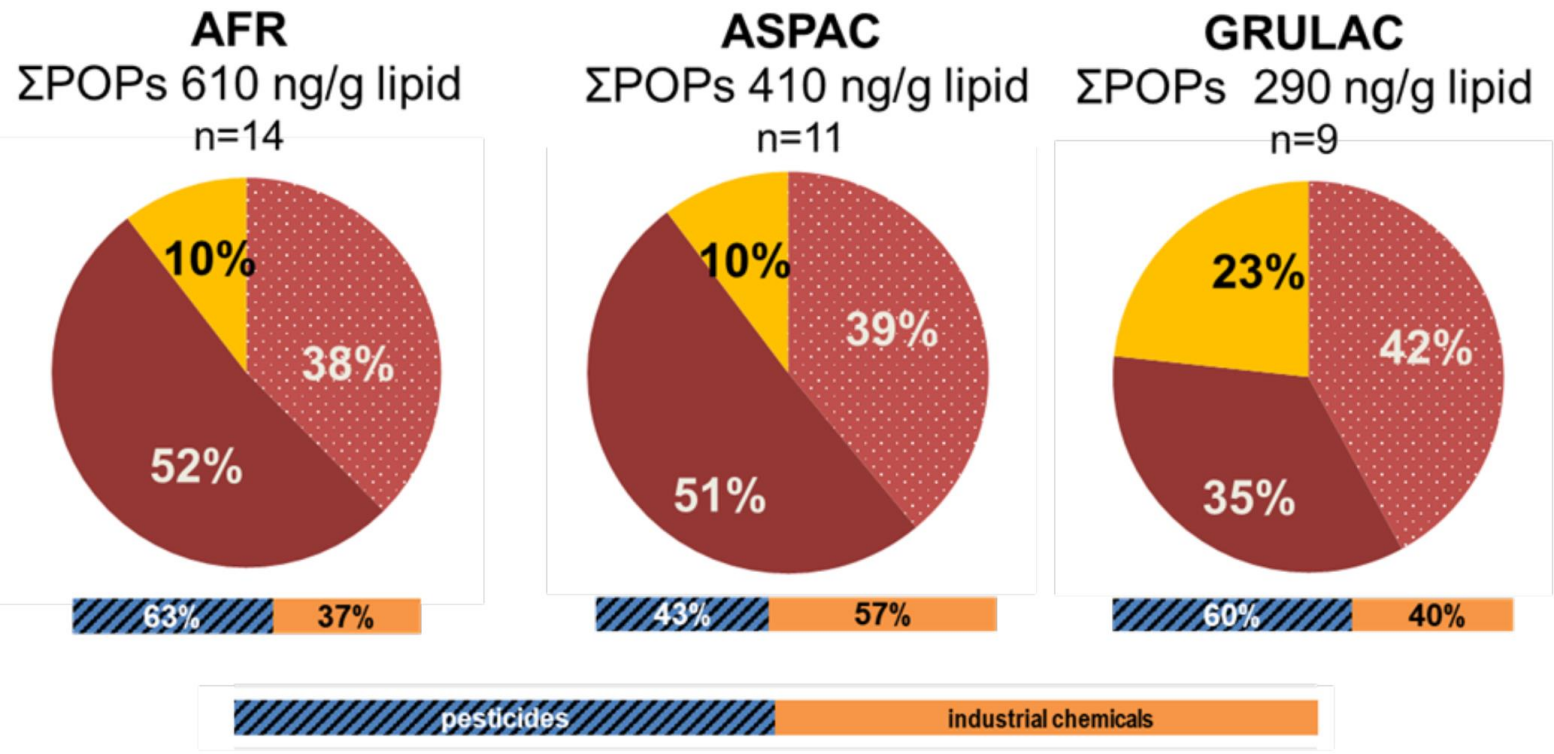
Only average/mean DDT levels are higher and DDT levels are decreasing in all region.

Ref: Krätschmer K, Malisch R, Schächtele A, Vetter W WHO & EU POPs Reference Laboratory 2019.

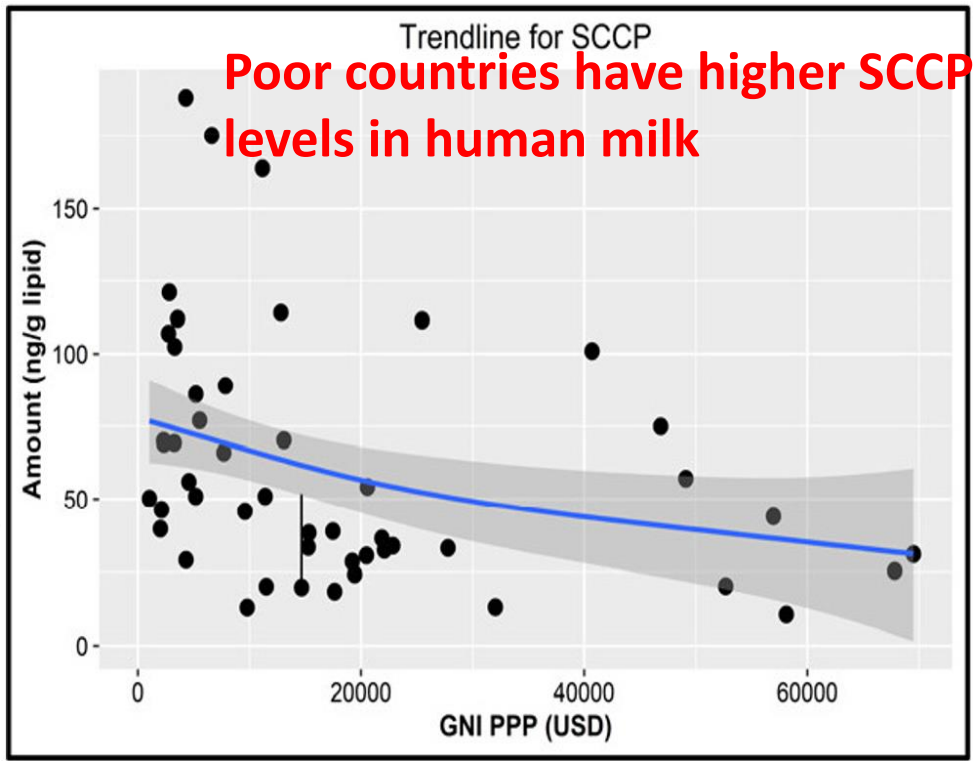
- **SCCPs/MCCPs have a lower toxicity compared to PCBs.**
- EFSA evaluated the data and concluded that the margin of exposure (MOEs) is 3 to 5 × 10^3.
- **But sensitive endpoint not yet assessed (e.g. developmental & neurotoxicity child)!.**

Chlorinated paraffins in human milk – poor countries have higher levels

- SCCP/MCCPs have the **highest mean industrial POP content** in **human milk** - 10 times >PCBs.
- **African and Asian countries have the highest MCCP & SCCP contamination** in human milk.
- **Mother milk is still the best food for babies (WHO recommends breast feeding for at least 6 month** https://www.who.int/health-topics/breastfeeding#tab=tab_1)



- **What are the main sources of CP-exposure in the countries??**



Fiedler (2023) Environ. Health 1, 1, 41-52

Krätschmer et al. (2021) EHP, 129(8) https://doi.org/10.1289/EHP7696; Figure: R. Malisch presentation COP10

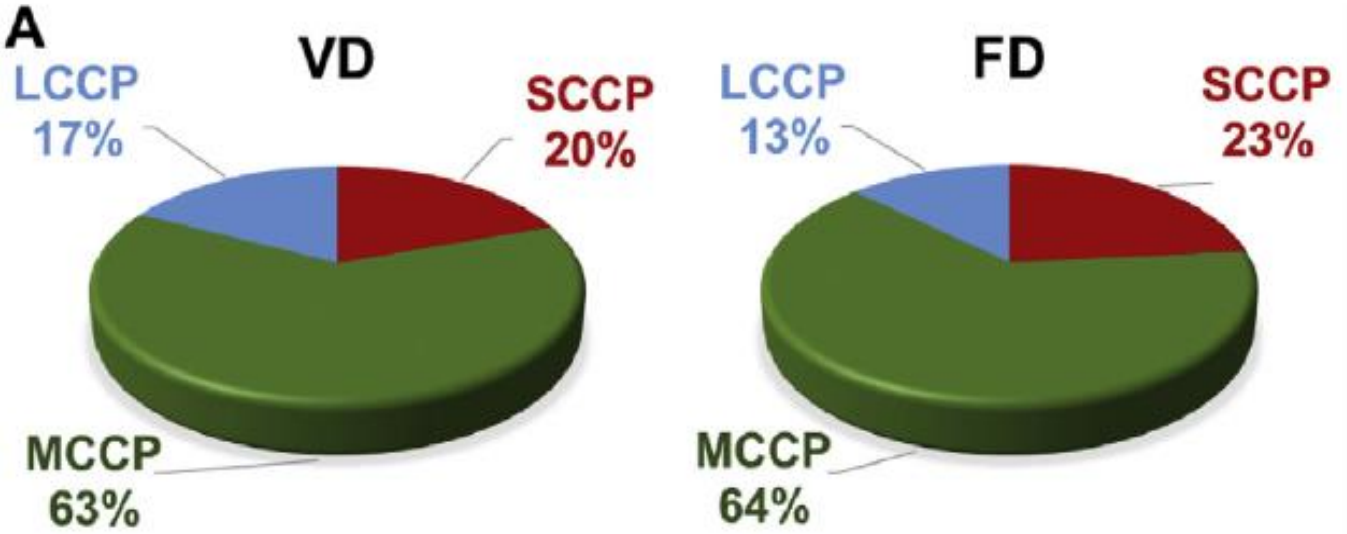
High SCCPs, MCCPs and LCCPs levels in South African house dust

- High levels of SCCPs, MCCPs, and LCCPs were detected in all house dust samples (**mean level ΣCPs 135 to 228 mg/kg and maximum for SCCP of 353 mg/kg and maximum for ΣCPs pf 663 mg/kg**).
- MCCPs were the dominant CP group (~63%) followed by SCCPs (~22%) and LCCPs.
- Similar house dust levels in a study in Beijing/China.

C

Congener group	VD (µg/g)				FD (µg/g)			
	Mean	Median	Min	Max	Mean	Median	Min	Max
ΣSCCP	48	14	5.1	214	62	17	5.4	353
ΣMCCP	69	46	13	200	142	47	21	498
ΣLCCP	17	13	4.3	74	24	9.4	1.9	108
ΣCP	135	68	36	488	228	94	33	663

A



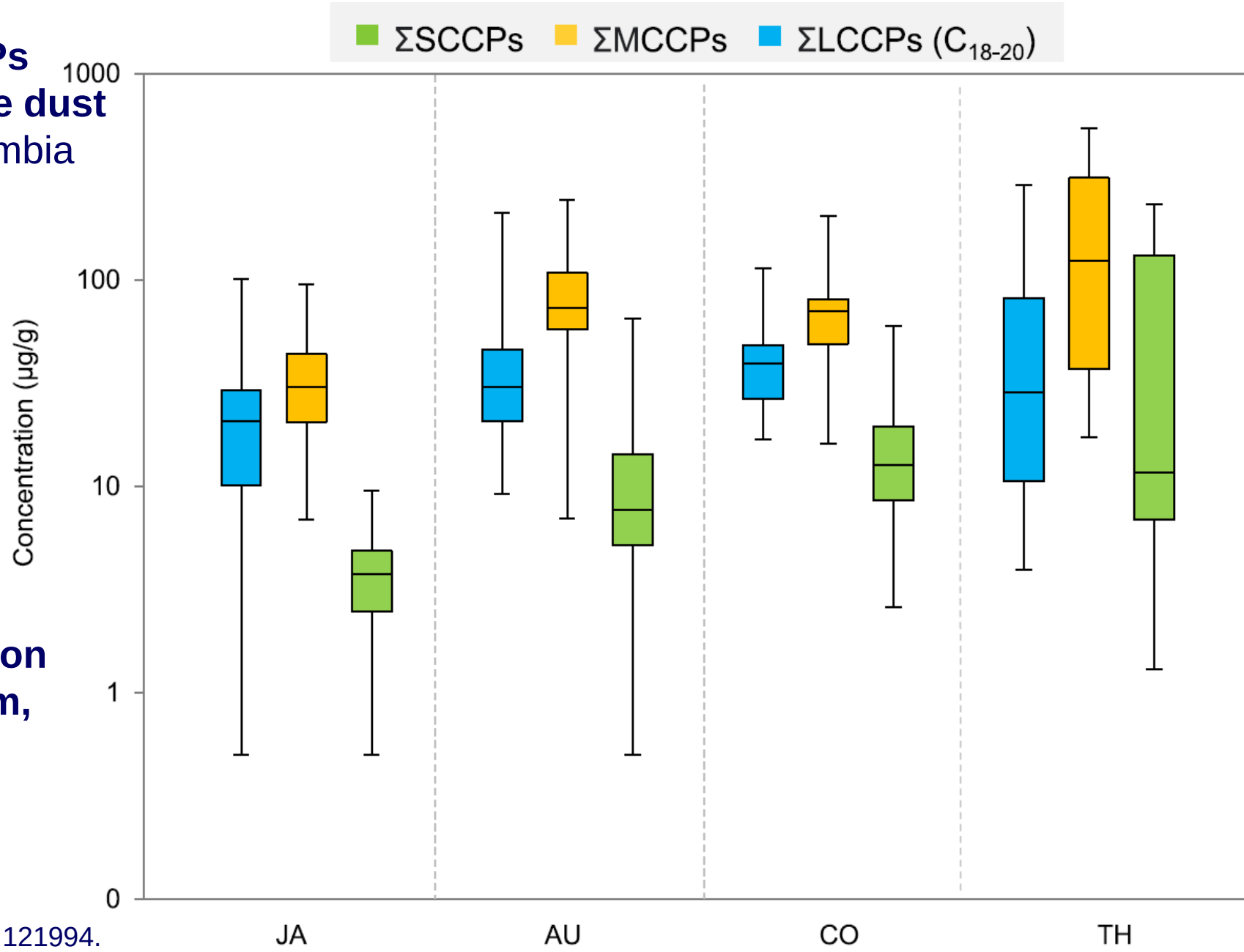
Brits et al. (2020) Chemosphere 238, 124643.

Global MCCPs and LCCPs contamination in house dust

- **High SCCPs, MCCPs, and LCCPs levels** were **detected in all house dust** samples in Australia, Japan, Colombia **with highest levels in Thailand**.

- MCCPs were the dominant CP group up to 100 mg/kg level followed by LCCP and SCCPs.

- **Release from plastic construction materials (PVC; PUR spray foam, rubber, paints and coatings) is likely the major source.**

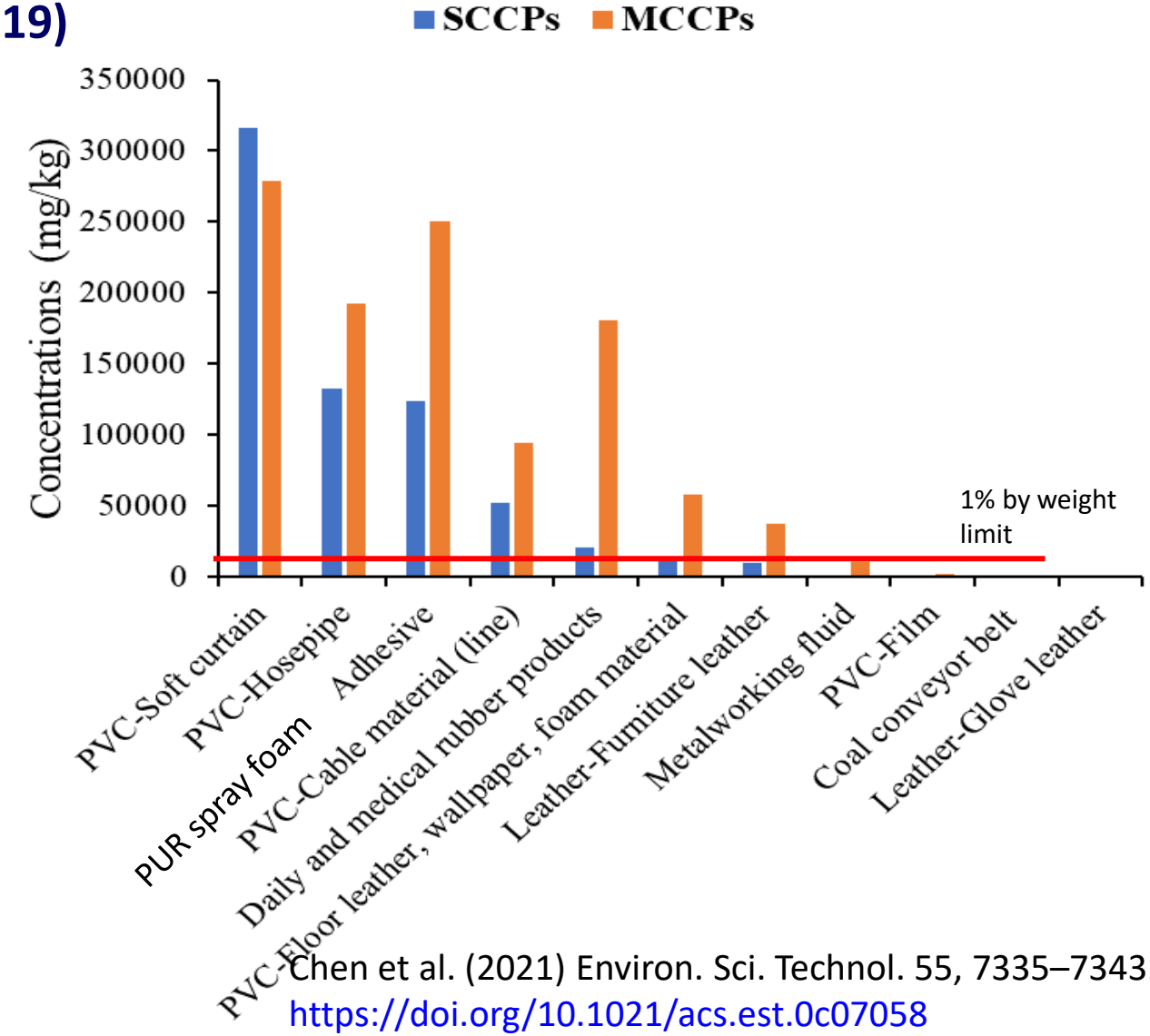


McGrath et al. (2023) Environmental Pollution 333, 121994.

Use of SCCPs and MCCPs in China (>50% of global use)

The use of SCCP/MCCPs in China & India drives the global use and presence in products since >90% of SCCPs & MCCPs in China are added to products which are partly exported globally.

- **124 product samples from markets in China (2018/2019)**
- **High use-share** in **PVC, rubber** & **PUR spay foam;**
- Low in metal working fluids; conveyor belt.

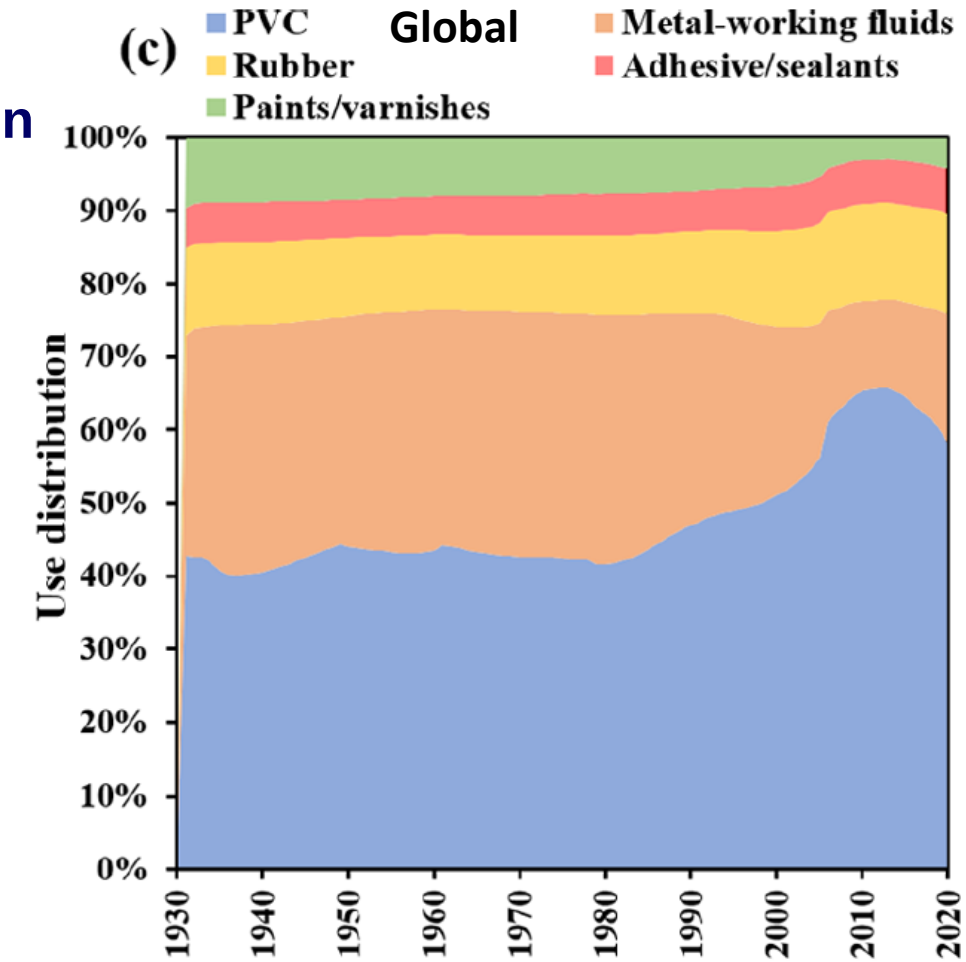


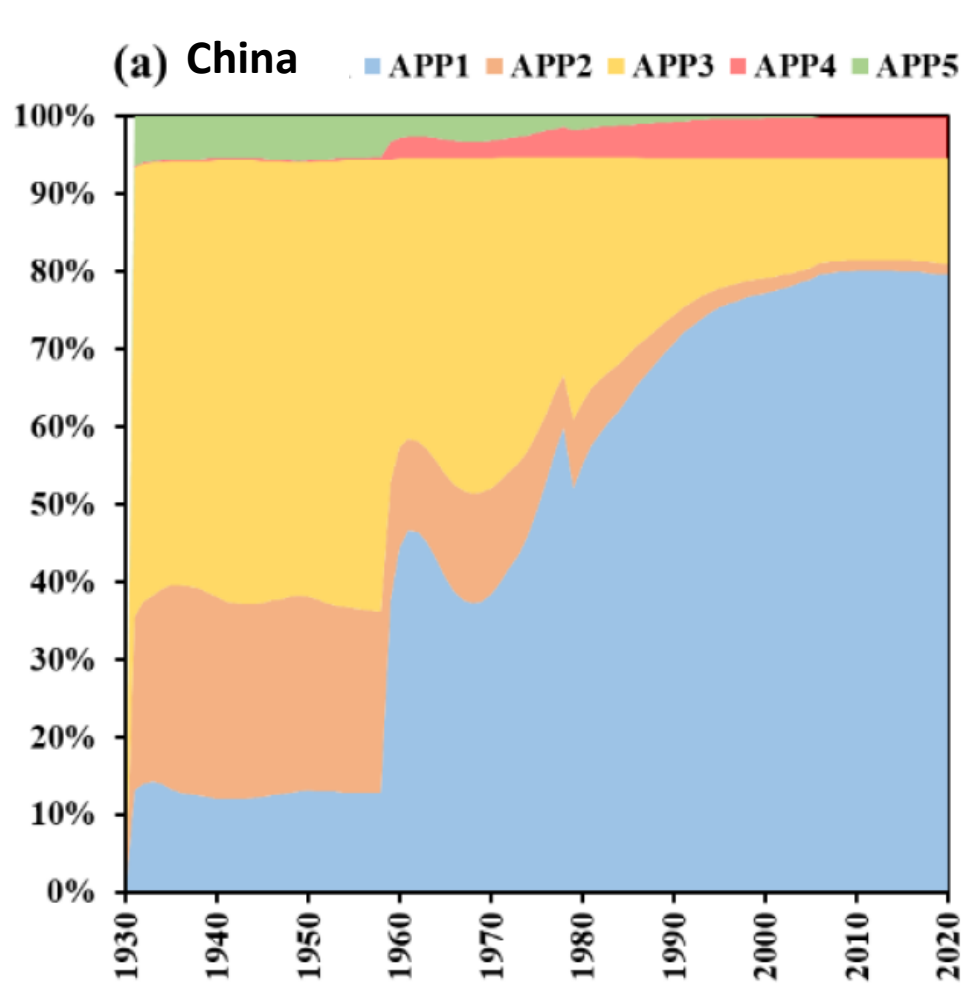
Chen et al. (2021) Environ. Sci. Technol. 55, 7335–7343.
https://doi.org/10.1021/acs.est.0c07058

Estimated former & current share of CP use globally & in China (review)

- A cumulative total of **~33.2 Mt of technical CPs** have been produced including **9.3 Mt SCCPs** (28%) and **18.9 Mt MCCPs** (57%) by 2020. Major global estimated uses in **PVC products (60%)**, followed by **rubber (15%), lubricants/MWF (15%), adhesives/sealants (6%) and paints/coatings (4%).**

- **The study likely underestimates uses in paints and leather (limited/no use data from India).**

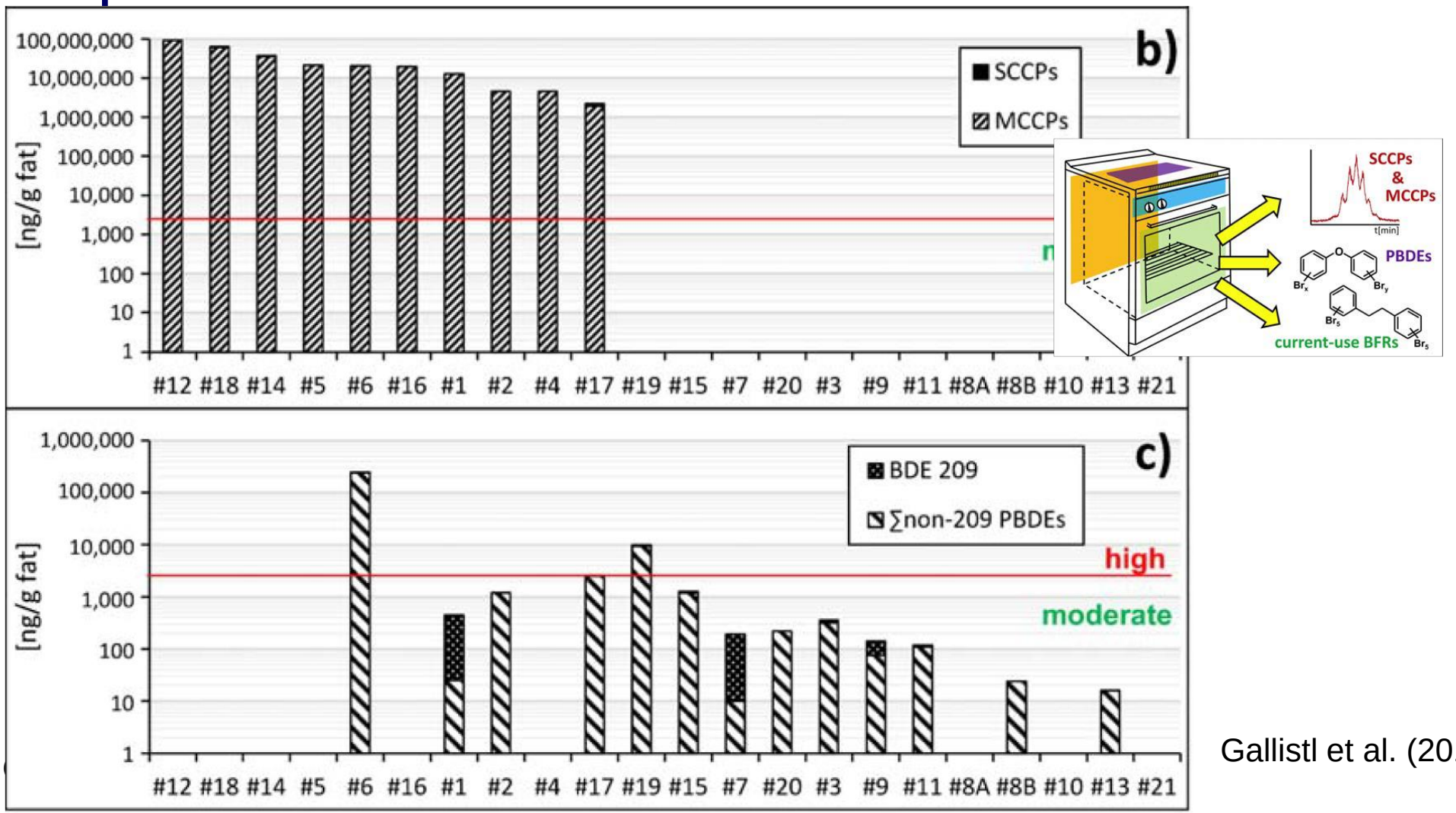




Review by Chen et al. (2022) ES&T https://doi.org/10.1021/acs.est.2c00264

SCCPs/MCCPs in Products – Baking Ovens

- High level SCCPs/**MCCPs** (mg/g) inside of **50% of German backing ovens (n=20).**
- **Source were cables/plastic with CP additive evaporating when the oven is heated up. PVC cables can contain 10 to 15% CPs.**
- **Direct exposure source** to food and humans.



Gallistl et al. (2018) Sci. Total Environ

Inventory guidance documents for the listed POPs and other guidance documents are available for the Stockholm Convention

General guidance

- Guidance for **developing** a NIP
- Guidance for **action plan costing**
- Guidance for **socio-economic assessments**

Dedicated detailed guidance for SCCP inventory.

Inventory guidances

- **POP Pesticide materials**
- **PCB guidance materials**
- **POP-PFAS inventory** guid.
- **PBDE inventory** guidance
- **HBCD inventory** guidance
- **PCN inventory** guidance
- **PCP inventory** guidance
- **HCBD inventory** guidance
- **SCCP inventory** guidance
- **Sectoral POP Inventory G**
- **Dioxin/U-POP Toolkit**
- **Guidance on POPs Data**
- **QA/QC Guidance**

Action plan development

BAT/BEP

- Guidelines for **BAT /BEP Unintentional POPs**
- Guidance for **BAT /BEP** for production & use **PFOS**
- Guidance for BAT /BEP for **recycling & disposal of articles** containing **PBDEs**
- Draft Guidance for **BAT/ BEP for the production and use of HBCD**
- Draft Guidance for **BAT/ BEP for production and use of PCP**

Alternatives

- **General guidance on alternatives to POPs**
- **Guidance Alternatives to HBCD**
- Consolidated **Guidance Alternatives to PFOS**
- Prelim. **Draft Guidance Alternatives to SCCPs**
- Prelim. **Draft Guidance Alternatives decaBDE**

Others

- Guidance for the **control of the import and export** of POPs
- **Monitoring of POPs in products & recycling**
- **Guidance on Labelling** of products and articles


Guidance on preparing inventories of short-chain chlorinated paraffins (SCCPs)

Detailed guidance

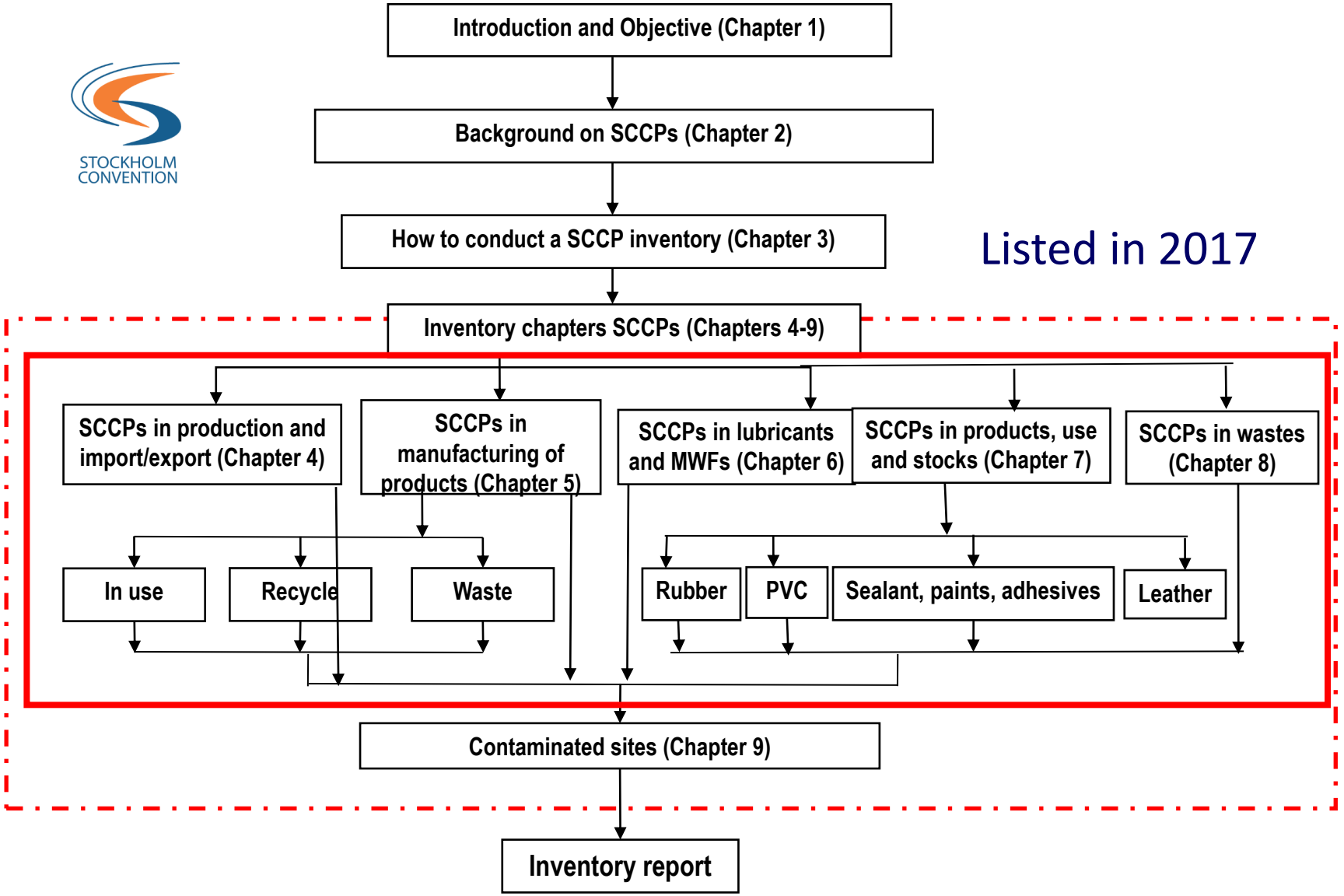
2019

Secretariat of the Basel, Rotterdam and Stockholm Conventions

http://www.pops.int/Implementation/NationalImplementationPlans/Guidance/tabid/7730/Default.aspx

BASEL / ROTTERDAM / STOCKHOLM CONVENTIONS

Content of SCCP inventory guidance (can cover MCCPs)



Listed in 2017

Inventory of SCCPs and MCCPs in import and use

- SCCPs and other chlorinated paraffins (CPs) containing SCCPs >1% can not be imported or exported for use since the **specific exemptions have expired 2023.**
- MCCP are not yet listed in the Convention and can be imported/exported.
- **Commercial CP mixtures often contain >1% SCCPs but are not labeled as SCCP and therefore it is recommended to assess the imports of all CP mixtures.**
- Such imports and exports should be recorded in the inventory including the quantities.
- **SCCPs is listed in Annex III to the Rotterdam Convention and are subject to the Prior Inform Consent (PIC) procedure. However it is not clear if this procedure is used by exporting countries.**
- For CPs mixtures possibly containing SCCPs >1%, **CAS numbers and trade names may be used in combination with HS codes for the search at custom level.**

Import of SCCPs, MCCPs and other CPs to the country

Experience has shown that chlorinated paraffins are **imported under different Harmonized System (HS) codes. These are mainly:**

- HS Code 27122010 Synthetic paraffin wax of a molecular weight of 460 or more but not exceeding 1560
- HS Code 27129090 (paraffin waxes)
- HS Code 38122090 Plasticizers, compound; for rubber or plastics
- HS Code 38249090 Chemical products and preparations of the chemical or allied industries, not elsewhere specified or included.

https://comtradeplus.un.org/

- **These HS codes <u>are unfortunately not specific for SCCPs</u> and are also <u>not specific for the class of chlorinated paraffins</u>.** However, in some countries additional information might be included in the import documents which can inform if individual imports/exports under these HS categories are chlorinated paraffins.
- **Companies importing these chemicals can be approached to clarify on the imported chemicals. CAS numbers** can be used in particular if the country is **implementing GHS.**

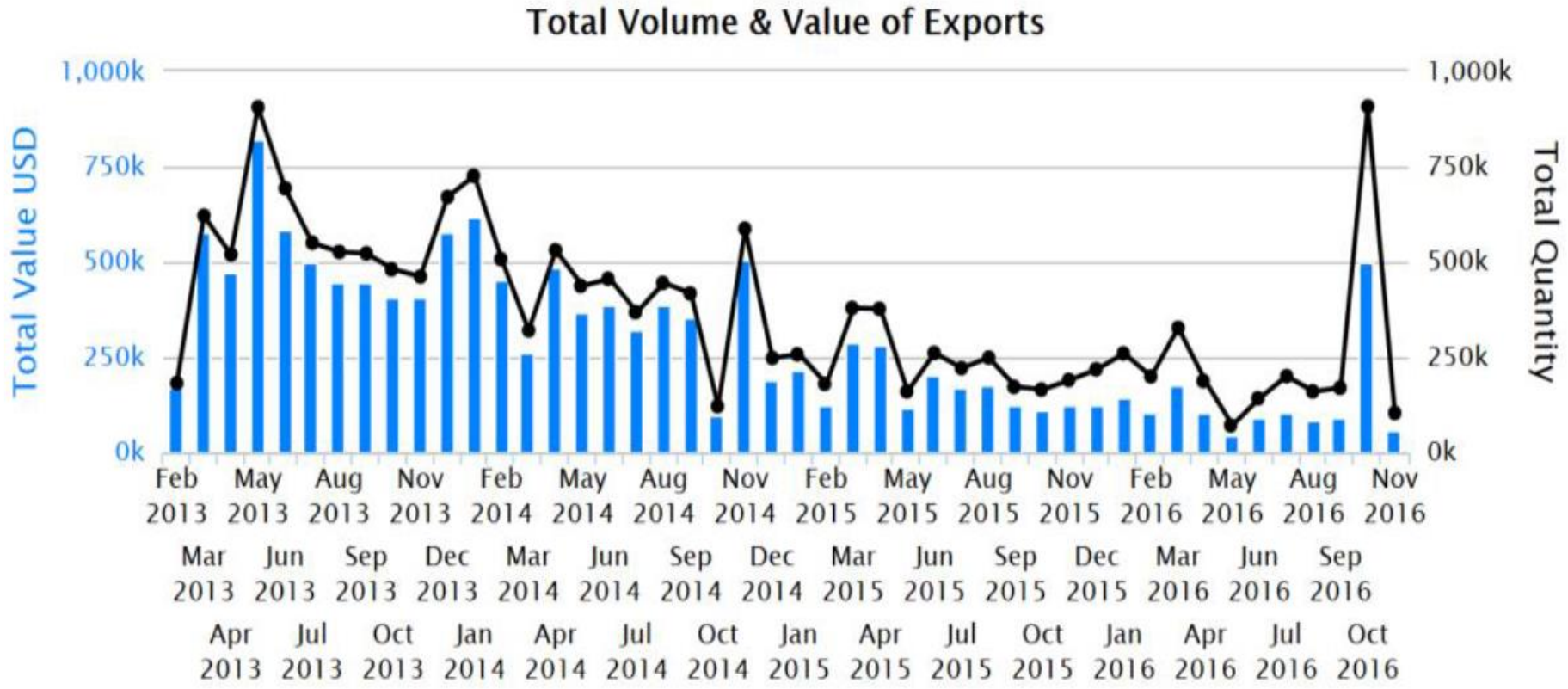
Inventory/assessment of SCCPs and MCCP in import and use

- **CAS numbers and trade names are compiled in the inventory guidance** and can be used to further assess imports (see inventory guidance).
- **CAS numbers** and trade names can also be used **to assess companies importing/trading chemicals and to assess companies which are possibly using CPs in their production**.

Chemical Abstract Service (CAS) Numbers of SCCPs and CPs which might contain SCCPs	**85535-84-8 (Alkanes C10-C13, chloro); 71011-12-6 (Alkanes, C12-13, chloro); 85536-22-7 (Alkanes, C12-14, chloro); 85681-73-8 (Alkanes, C10-14, chloro); 108171-26-2 (Alkanes, C10-12, chloro); 68920-70-7 (Alkanes, C6-18, chloro) 84082-38-2 (Alkanes, C10-21, chloro); 97659-46-6 (Alkanes, C10-26, chloro); 84776-06-7 (Alkanes, C10-32, chloro);** **CAS numbers without defined chain length which might contain SCCP>1%: 61788-76-9 (Alkanes, chloro); 63449-39-8 (Paraffin waxes and hydrocarbon waxes, chloro); 97553-43-0 Paraffins, normal C>10, chloro)** **CAS number of MCCPs: 85535-85-9 Alkanes, C14-17, chloro (which might possibly contain >1% SCCP depending on the producer).**
Generic trade names of chlorinated paraffins (IARC, 1990 and update)	A 70; A 70 (wax); Adekacizer E; Arubren; Cereclor; Chlorinated paraffins (CPs); Chlorcosane; Chlorocosane Chlorez; Chlorofin; Chloroflo; Chlorparaffin; Chlorowax, Chlorowax 500AO; Chlorowax 45AO, Chlorowax 52AO; Cloparin; Cloparol; Clorafin; CP F; CP-52, CP-55, CP-60, CP-70, CW; Diablo; Derminolfett; Derminolöl; EDC-tar; Electrofine; Enpara; FL X; Hordaflam; Hordaflex; Hordalub; Hulz; KhP; Meflex; Monocizer; Paroil; Poliks; Tenekil; Toyoparax; Unichlor

Assessment of export of CPs from producing countries (e.g. India)

- India has some export data for chlorinated paraffins online (https://www.zauba.com/).
- The available few record of exporting CPs from India can be **assessed for a first indication.**
- According to Indian export data, e.g. Brazil imported in 2013 approx. 500 t/month with decreasing amount 2014 and 2015. (see SCCP inventory Brazil Guida et al. (2022) Chemosphere 287, 132344. https://doi.org/10.1016/j.chemosphere.2021.132344)



Data from https://www.zauba.com/

Assessment of Import of SCCPs, MCCPs and other CPs to the country

Contact importers of chemicals and request information and data about:

- **Import quantity of SCCPs and MCCPs if available** (including CAS numbers);
- **Import quantity of other CPs and information on SCCP and MCCP content;** (Certificates on SCCP content; methods used for determining content)
- **Export quantity** of SCCPs and other CPs (including related CAS numbers and countries)?

- **What are the downstream users of imported SCCP, MCCP and other CP mixtures?**
- What are/were the **amount of SCCP and MCCP delivered to the downstream users**?
- **Information generated from the inventory of downstream users can be further used then for the assessment of the different use sectors** (see Chapter 5 of inventory guidance).

Use of SCCPs, MCCPs & other CPs **in the manufacture of products**

Inventory guidance Chapter 5.1: **Assessment if SCCPs, MCCPs or other CPs with unknown SCCP/MCCP content are used in the major production sectors with potential use**:

- **5.1.1 Additive in PVC production and assessment**
- **5.1.2 Rubber and rubber products**
- 5.1.3 Paints including waterproofing and fire-retardant paints
- 5.1.4 Leather production (fatliquoring)
- **5.1.5 Adhesives and sealants**
- 5.1.6 Production of textiles

- **Assessment if any of these productions are present in the country?**
- **All major sectors where SCCPs/MCCPs are/were possibly used in the manufacturing of products should be assessed for the current and past use of SCCPs and MCCPs in these productions and documented.**
- For this assessment industries and productions possibly using SCCPs/MCCPs in the country need to be evaluated and contacted. Questionnaires are Annexes in SCCP guidance.

Inventory of SCCPs and MCCPs: Production of PVC

- **PVC** seems the **major use** of **SCCP** and **MCCP**.
- The use of **SCCPs** as **secondary plasticizer** in **flexible PVC was exempted**, except for the use in toys and children's products. where the use is not allowed.
- **PVC is also a recommended specific exemption for listing of MCCPs** (wires, cables, calendered films; plastic insulation) (Decision POPRC-19/1; UNEP/POPS/POPRC.20/3).
- SCCPs or CP mixtures containing SCCPs are used mainly as secondary plasticizers.

- **Assessment of production of PVC products and used additives in the country.**
- **Flexible PVC** has **many applications**: electrical cable sheathing, in plumbing, conveyor belts, imitation leather, flooring, phonograph records, inflatable products or tubes for outdoor bulbs.
- **For the use in PVC, it is possible that pellets (masterbatch) containing SCCPs could be manufactured outside a country and then imported into the country** for further processing for final product (UK EPA 2000).

Inventory of SCCPs/MCCPs in **imports of plasticized PVC products**

- **For the assessment of SCCP/MCCP imports in major products known to contain CPs, a methodology was developed in pilot projects in Brazil, South Africa and Nigeria using the UN Comtrade Database.**
- In particular the **compilation of imports** of **HS codes** of **PVC, rubber and adhesives containing additives**.

Babayemi, Nnorom, Weber (2022) Emerging Contaminants https://doi.org/10.1016/j.emcon.2022.07.004
Guida et al. Chemosphere 287, 132344. https://doi.org/10.1016/j.chemosphere.2021.132344

HS Codes	Description
(3904)	(Polymers of vinyl chloride or of other halogenated olefins, in primary forms)
390422	Vinyl chloride, halogenated olefin polymers; **plasticised** PVC, in primary forms, mixed with other substances
391530	Vinyl chloride polymers; waste, parings and scrap
391810	**Floor, wall or ceiling coverings**; of PVC polymers, whether or not self-adhesive, in rolls or in the form of tiles
392043	Plastics; PVC, containing by weight **not less than 6% of plasticisers**; plates, sheets, film, foil & strip (not self-adhesive), non-cellular & not reinforced, laminated, supported or similarly combined with materials
392049	Plastics; polymers of vinyl chloride, containing by weight, **less than 6% of plasticiser**; plates, sheets, film, foil & strip (not self-adhesive), non-cellular & not reinforced, laminated, supported or similarly combined with materials
392112	Plastics; plates, sheets, film, foil & strip, of polymers of vinyl chloride, cellular

Source: https://www.foreign-trade.com/reference/hscode.htm?code=3904

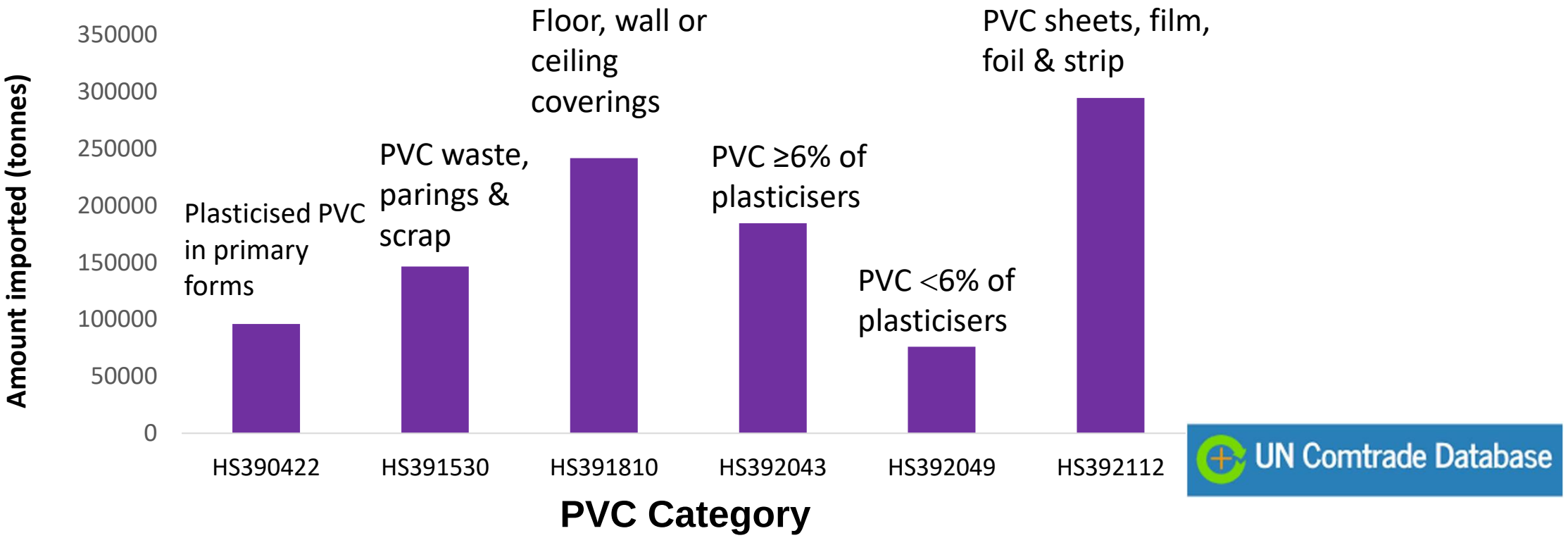
UN Comtrade Database

Inventory SCCPs/MCCPs: Imports of plasticized PVC

Assessment of imports of plasticized PVC to country using UN **Comtrade Database**

- **Individual HS codes of plasticized PVC** can be assessed for **total imports** (**not CP specific**)
- **For China the rough SCCP/MCCP content in PVC products is known** (Chen et al. 2021). **Therefore an initial estimate of the SCCPs/MCCPs amount in these imports is possible**.
- These factors could also be used for imports from other countries **for an upper estimate**.

Imports of plasticized PVC to Nigeria (1996 to 2018)



Babayemi, Nnorom, Weber (2022) Emerging Contaminants https://doi.org/10.1016/j.emcon.2022.07.004

Inventory of SCCPs/MCCPs: **Rubber production & rubber products**

- **SCCPs have also been used and are still used in rubber production** as flame retardants and/or plasticizers. **SCCPs exemption expired** but **several exemptions for rubber are proposed for MCCPs** (e.g. parts in vehicles, in EEE and aerospace and defense products) (Decision POPRC-19/1).
- The use of SCCPs/MCCPs and other FRs in rubber uses depends on the individual uses and the particular flammability standards.

Rubber uses possibly containing SCCPs/MCCPs (or other plasticizers)	Content (% wt)
Conveyor belting	10 – 16.8%
Rubber cable cover	3.8%
Rubber hose	6.2%
Industrial roller coverings	up to 20%
Pipe seals	4%
Fire resistant rubber products	10%
Shoe soles	6.5%
Industrial sheeting	13%

Rubber uses possibly containing SCCPs/MCCPs and additive content (BRMA 2001)

- **For rubber tyres normally no FRs are added** and therefore tyre production is not considered as a relevant use of SCCPs/MCCPs. However, CPs (including SCCPs) were detected in all car tyre granulates in Netherlands (10 and 75 mg/kg; SCCP <50 ppm (Brandsma et al. 2019).

Inventory of SCCPs/MCCPs: **Import of plasticized rubber and products**

- **The estimate of imports of SCCP/MCCP in major plasticized rubber products** to a country **using UN Comtrade Database has been developed (pilots in Brazil, South Africa Nigeria).**
- Based on **HS codes** of **rubber, the amount of imported rubber containing additives can be estimated**. SCCP & MCCP impact factors might be taken from Chen et al. 2021/measurements

Babayemi, Nnorom, Weber (2022) Emerging Contaminants https://doi.org/10.1016/j.emcon.2022.07.004
Guida et al. Chemosphere 287, 132344. https://doi.org/10.1016/j.chemosphere.2021.132344

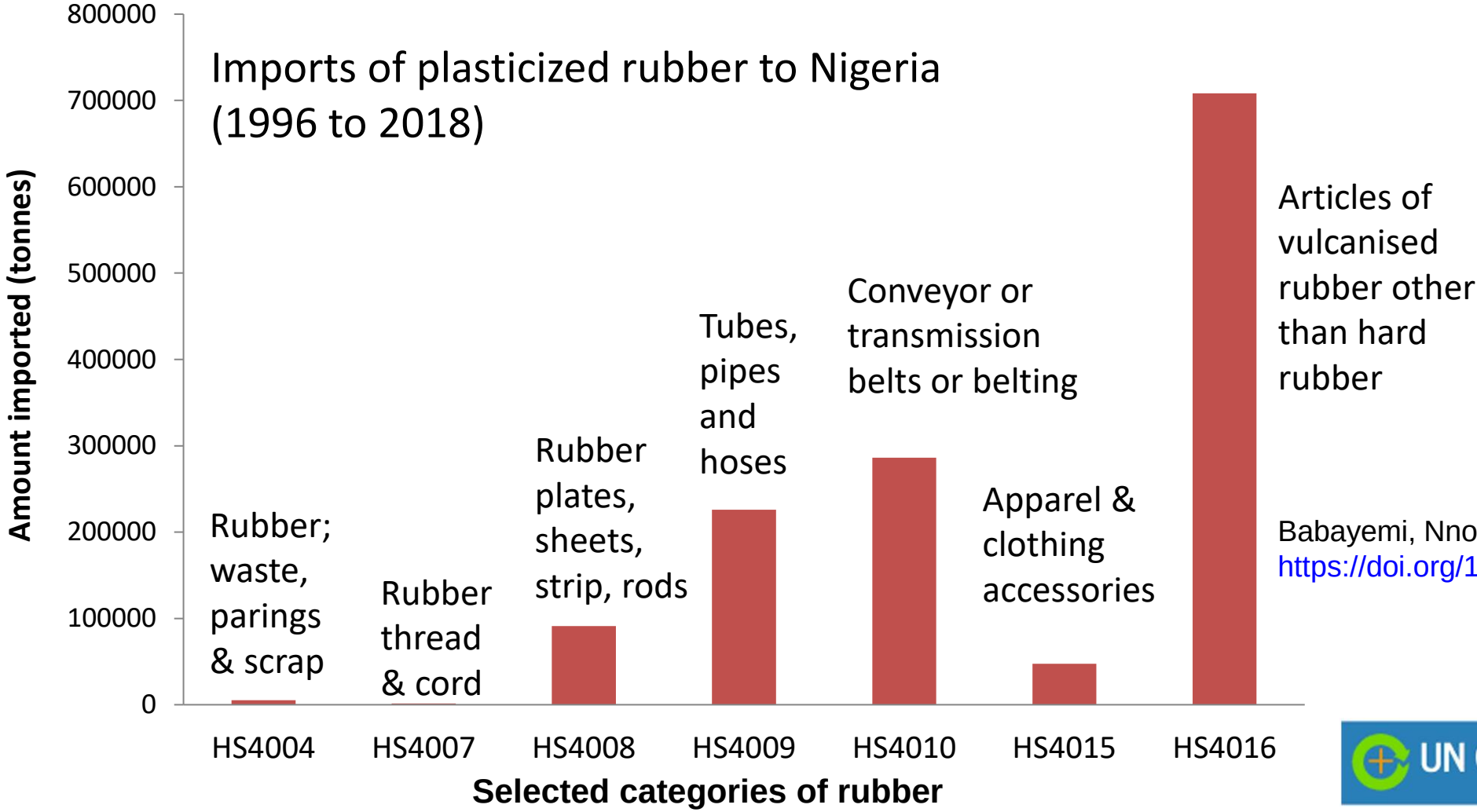
HS Code	Description
400239	Rubber; synthetic, halo-isobutene-isoprene rubber (CIIR or BIIR), in primary forms or in plates, sheets or strip
400241	Rubber; synthetic, chloroprene (chlorobutadiene) rubber (CR), latex, in primary forms or in plates, sheets or strip
400249	Rubber; synthetic, chloroprene (chlorobutadiene) rubber (CR), (other than latex), in primary forms or in plates, sheets or strip
400300	Rubber; reclaimed rubber, in primary forms or in plates, sheets or strip
400400	Rubber; waste, parings and scrap of rubber (other than hard rubber) and powders & granules obtained therefrom
4007	Vulcanised rubber thread and cord
4008	Plates, sheets, strip, rods & profiles, of vulcanised rubber other than hard rubber
4009	Tubes, pipes and hoses, of vulcanised rubber (other than hard rubber), with or without their fittings (e.g. joints, elbows, flanges)
4010	Conveyor or transmission belts or belting, of vulcanised rubber
4015	Articles of apparel and clothing accessories (including gloves, mittens and mitts), for all purposes, of vulcanised rubber other than hard rubber
4016	Articles of vulcanised rubber other than hard rubber

UN Comtrade Database

Inventory of SCCPs: Import of plasticized rubber products

Assessment of imports of plasticized rubber using data of the **UN Comtrade Database.**

E.g. conveyor belts are a major rubber application, require addition of FRs for uses with flammability standards (ISO 340:2013) and were exempted for SCCP. **Recommended exemptions for MCCP for rubber products** (automobile parts, certain EEE, aerospace & defense; UNEP/POPS/POPRC.20/3)

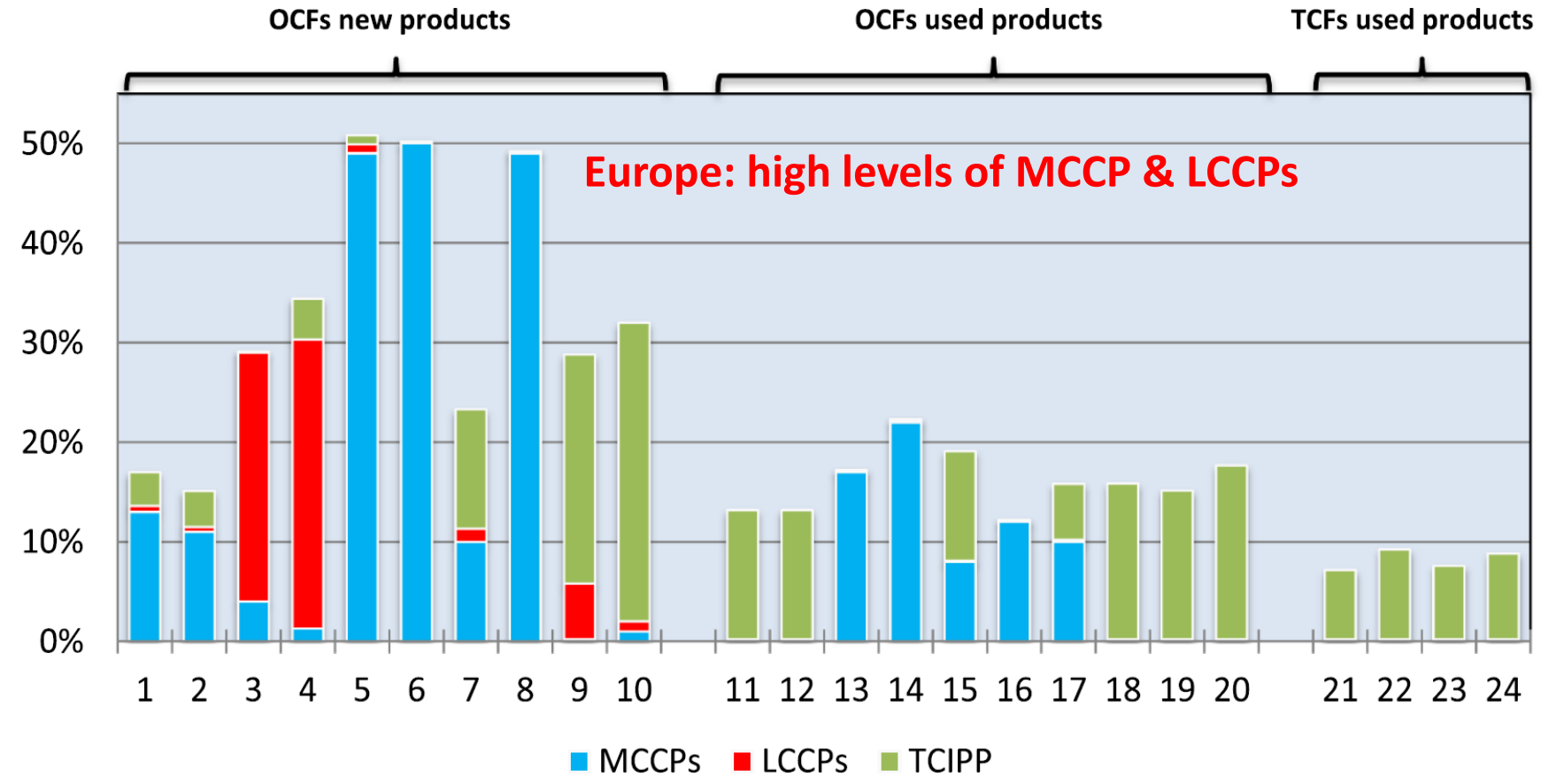


Babayemi, Nnorom, Weber (2022) Emerging Contamin
https://doi.org/10.1016/j.emcon.2022.07.004

UN Comtrade Database

SCCPs, MCCPs (and PFRs) in polyurethane (PUR) spray foam

- **Up to 50% CPs were included in one-component spray polyurethane foams** (OCF; low in TCF) adhesives with major use of CPs **(MCCP & LCCP) and phosphorus flame retardants (PFRs).**
- Lower levels of CPs and PFRs in PUR foam in use indicate that a share of FRs are released(~1%/a).
- High CP and PFR levels in indoor air/dust also indicate relevant indoor-releases from products.
- Inventory/assessment: Amount of SCCPs/MCCPs in current PUR spray foam in LMI-countries?



Brandsma et al. (2021) Journal of Hazardous Materials 416 (2021) 125758

China: high levels of MCCP & SCCPs in PUR spray foam (estimated impact factor) (Chen et al 2021 ES&T, 55, 7335–43)

Estimate of SCCP and MCCP imports in products to Nigeria

Based on SCCP & MCCP in PVC, rubber products and PUR foam in China (Chen et al. 2021) the **amount of imported SCCPs and MCCPs in PVC, rubber & PUR spray foams can be estimated.**

Import categories (1996 to 2018)	From China (tonnes)	SCCP (mg/g) (Base on Chen et al 2021)	Amount of SCCP imported (tonnes)	MCCP (mg/g) Base on Chen et al 2021)	Amount of MCCP imported (tonnes)
PVC					
HS390422	57,033	0.8 (0.08%)	46	0.1 (0.01%)	6
HS391530	87,035	54.9 (5.49%)	4,778	97.4 (9.74%)	8,477
HS391810	143,500	6.2 (0.62%)	890	8.5 (0.85%)	1,220
HS392043	109,620	180 (18%)	19,732	102.6 (10.26%)	11,247
HS392049	45,147	180 (18%)	8,126	102.6 (10.26%)	4,632
HS392112	174,887	0.8 (0.08%)	140	0.1 (0.01%)	17
Total	**617,222**		**33,712**		**25,599**
Rubber					
HS4004	184,545	0.2 (0.02%)	0.4	0.1 (0.01%)	0.2
HS4007	76,005	0.2 (0.02%)	0.1	0.1 (0.01%)	0.05
HS4008	294,422	16.2 (1.62%)	502	60.9 (6.09%)	1,888
HS4009	76,808	0.2 (0.02%)	15	0.1 (0.01%)	8
HS4010	97,333	0.2 (0.02%)	19	0.1 (0.01%)	8
HS4015	16,159	10.8 (1.08%)	175	57.8 (5.78%)	934
HS4016	240,838	2.8 (0.28%)	674	122.4 (12.24%)	29,479
Total	**986,110**		**1,386**		**32,317**
Adhesive/PUR spray	28,289	82.4 (8.24%)	**2,331**	71.4 (7.14%)	**2,020**
Grand Total			**37,429**		**59,936**

- **Further monitoring of PVC/rubber products** and of **PVC/rubber recycling needed.**

Babayemi, Nnorom, Weber (2022) Emerging Contaminants https://doi.org/10.1016/j.emcon.2022.07.004

Inventory of SCCP/MCCPs & PCB: **Sealants/Adhesives in Buildings**

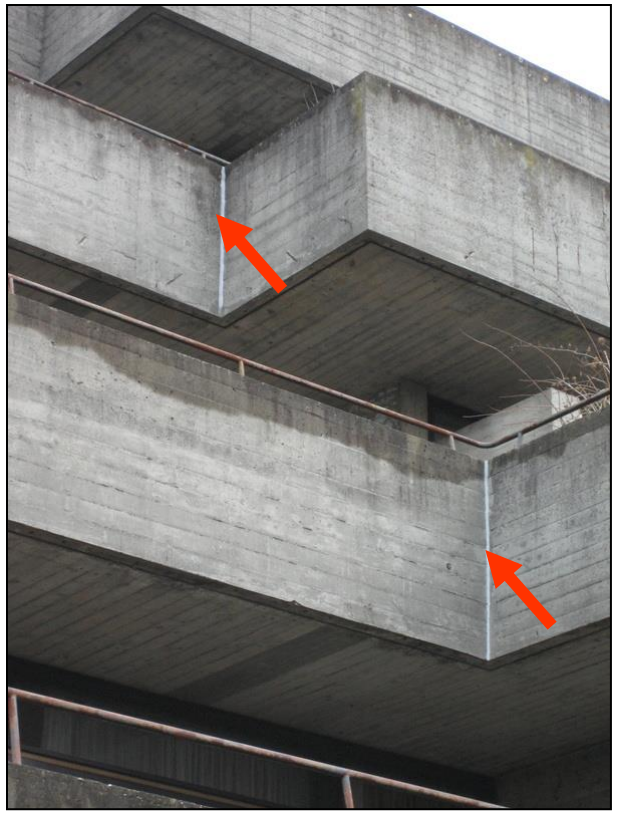
Inventory of SCCPs/MCCPs (and PCBs) in sealants and adhesives:

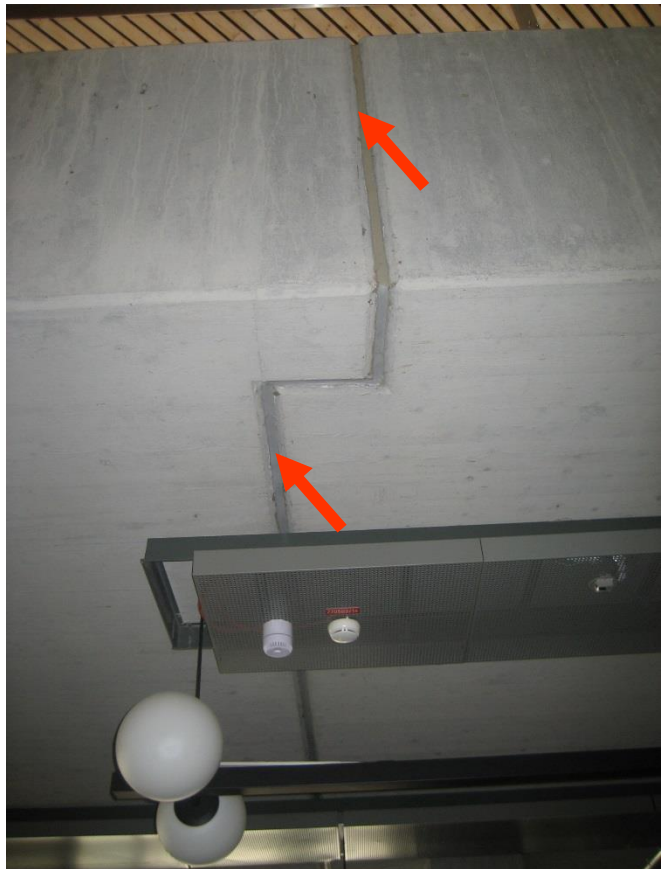
- Sealants/putty & adhesives in buildings and other constructions have been major open applications for PCBs which have been substituted by SCCPs and MCCPs.
- For PCBs, the uses were mainly from 1950s to 1970s in countries/regions.
- SCCPs/MCCPs are still used today for these applications. Exemption for SCCPs expired but will likely be listed for MCCP (Decision POPRC-19/1).
- **Inventory/assessment of current uses of SCCP/MCCP in adhesives and sealants.**
- **Assessment of past uses:** The buildings with a large amount of sealants are (prefabricated) concrete where sealants were/are used as joints. **Typical PCBs sealants were polysulfide sealants (e.g. Thiokol**). These sealants may also contain SCCPs/MCCPs (Content 5 to 35%).
- Other sealants that can contain SCCPs/MCCPs or PCBs are acrylic and butyl or polyurethane sealants. **CPs and PCB are/were not used in silicone sealants**.
- **Due to the long service life of sealants in buildings of 30 to 60 years and longer, a considerable share of the sealants used in the past are still in use**.

SCCP/MCCPs and PCBs in sealants

SCCPs/MCCPs & PCBs have been mainly used in concrete buildings (often pre-fabricated):

- In outdoor sealants in seams between concrete blocks.
- In indoor elastic sealant materials.
- In elastic sealants around windows and door frames.





Inventory/screening of SCCP/MCCPs & PCB in buildings – Country case

- **Some countries have used PCB and SCCP/MCCP sealants quite extensively.**
- **In Switzerland: 30% of the sealants tested and 50% of the tested houses constructed 1950 to 1975 contained PCB** (Kohler et al. 2005).
- **SCCPs/MCCPs were detected in ~1/3** of **pre-screened chlorine containing sealants.**
- **In the US: half of the school and other buildings with caulks constructed 1950 to 1972 are estimated to contain PCBs** (Herrick et al. 2004); no information on SCCP/MCCPs.
- In low/middle income countries with major construction in recent decades more CPs expected.

Kohler et al. (2005) Joint sealants: An overlooked diffuse source of polychlorinated biphenyls in buildings. ES&T, 39(7), 1967-1973.
Herrick, et al. (2004) An unrecognized source of PCB contamination in schools and other buildings, EHP 112, 1051-1053.

Inventory of SCCPs/MCCPs in **Paints and Coating**

Inventory of SCCPs/MCCPs in paints and coatings:

- SCCPs and MCCPs are still used in paints & coating as plasticizer or FR to improve resistance to water and chemicals and reduce flammability. SCCP received exemption for waterproofing and intumescent paints (expired); also proposed as exemption for MCCPs (UNEP/POPS/POPRC.20/3).
- The paints are used mainly in industrial/specialist applications (ECB 2008; RPA 2010; UNEP 2021).

Paints and coatings that may contain SCCPs	CP content (% wt)
Organic solvent borne intumescent coating for structural steel	20-30
Plastisol screen printing inks for textiles	10-25
Organic solvent borne chlorinated rubber systems for swimming pools/fishponds	5-20
Organic solvent borne chemical and water-resistant coatings	5-20
Organic solvent borne floor and wall paints	5-10
Intumescent coating for ferrous substrates	5-10
Intumescent coating for timber-based boards	2.5-10
Organic solvent borne acrylic container coatings	2-10
Organic solvent borne road marking paints	5-8
Organic solvent borne zinc rich (epoxy) primers	2-5
Organic solvent borne chlorinated rubber primers and topcoats	1-5
Organic solvent borne vacuum metallising lacquers	1-5
Organic solvent borne flame retardant coating for wood	1-5

Inventory of SCCPs/MCCPs in **Paints and Coating**

The inventory should cover paints produced in the country and imported to the county:

- **Assessment of paint productions: are SCCP/MCCPs used in paint production** in **country?**
- **Are paints containing SCCPs/MCCPs imported to the country?**
- For which applications are/were SCCP/MCCP containing paints used?
- What are the **reservoirs of SCCP/MCCP and PCB/PCN containing paints used in the past** (long term service life in buildings/construction)?
- **How are paints containing POPs removed and managed in end of life?**
- Experience with PCB paints: long term release and challenges with PCB-containing paint in silos for animal feed which has also resulted in the contamination of feed and milk.

SCCPs/MCCPs and PCB in anti-corrosion coatings

- The share of SCCPs/MCCPs and PCB in corrosion-resistant paints on metal constructions (mainly chlorinated rubber and PVC-copolymer coatings) is not known.
- **The removal of PCB-paints from bridges** (up to tonnes) **contaminated entire rivers/Fjords**.
- For “dry” applications **often heavy metal paints were used (lead,** zinc). **Also lead painted constructions can contaminate the environment especially when sand-blasted.**

Weber et al. (2018) ESPR 25:16325-16343; ESEU 30:42. https://rdcu.be/bax79;Jartun et al. (2009) Environ Pollut. 157, 295–302; Johnsen and Engoy (1999) Contamination from marine paints http://www.dtic.mil/dtic/tr/fulltext/u2/p010602.pdf

Pylons

Bridges

Ships and airplanes

UNEP: PCB IN OPEN APPLICATIONS: MACHINERY AND INSTALLATIONS; (Pictures ETI), http://chm.pops.int/Implementation/PCBs/DocumentsPublications/tabid/665

ETI Umwelttechnik AG

SCCPs/MCCPs and PCBs in anti-corrosion coatings in machinery and installations

Turbines and generators

Pumps and motors

Pipelines

Cranes

UNEP: PCB IN OPEN APPLICATIONS: MACHINERY AND INSTALLATIONS; Pictures ETI, http://chm.pops.int/Implementation/PCBs/DocumentsPublications/tabid/665

ETI Umwelttechnik AG

SCCPs/MCCP and PCB-containing paints in swimming pools

- In Switzerland it is estimated that 20 % of outdoor swimming pools are PCB contaminated.
- Swiss inventory of swimming pools currently developed by regional competent authorities.
- Also in Germany first city (Hannover) has screened their swimming pools for PCBs and detected PCB-levels in soils that were above the limit value for playgrounds in 2 out of 7 pool areas..
- Today likely chlorinated paraffins are used to some extent.

- Because of inappropriate handling during previous renovations the surrounding ground around swimming pools is sometimes contaminated above the PCB limit value for soil.

Removal of PCB-containing paint in a swimming pool in Zurich (Switzerland)

https://pollubat.ch/dokumente/

SCCPs/MCCPs in metalworking fluids and lubricants

- **Some uses of SCCPs/MCCPs are in production processes and not in products**.
- This includes the use of SCCPs/MCCPs **in metal working fluids (MWFs) and the use as lubricants** in a wide range of uses (automotive (engine oils, transmission fluids and gear oils), industrial automotive (heavy duty vehicles; agricultural equipment, construction and other earth moving equipment; military) rail, ships, industrial machinery, power generation (e.g. wind power facilities; electric generators), drilling in oil and gas exploration, petroleum refinery, food & beverage).
- A lubricant reduces friction between surfaces in mutual contact. MWFs are also lubricants applied to ensure workpiece quality, to reduce tool wear, and to improve process productivity.
- The uses for SCCPs were exempted in the Stockholm Convention (**expired 12/2023**). For **MCCPs an exemption for use until 2036 is proposed** (Decision POPRC-19/1; UNEP/POPS/POPRC.20/3).
- By the use, SCCPs/MCCPs are **released into the environment (total or partial losses).**
- Metal working fluids (MWFs) and lubricants can be produced or traded by the same companies. **Therefore recommended to address MWF and lubricants within one inventory activity.**
- **Assessment of lubricant production: are SCCP/MCCPs used in production** in **country?**
- **Are lubricants and MWFs imported to the country containing SCCPs/MCCPs?**
- For what applications are/were SCCP/MCCP-containing MWFs and lubricants used?
- Assessment of **contaminated sites** from **MWFs use** at production sites (total loss application).

SCCPs/MCCPs in fatliquoring of leather

- **The fatliquoring step is the last stage of leather preparation.** The amount of fatliquor used in this step is around 7–12 per cent, based on the shaved weight of the leather to be treated.
- The **main components** of the fat liquors are **water, natural fats, surfactants and can contain chlorinated paraffins typically around 10 % (range 5–to 20%) CPs**, the amount of chlorinated paraffins used in this step is around 7–12 g CPs/kg leather (RPA 1997; U.K. Env Agency 2009).
- Around 1% to 5% of the MCCPs/SCCPs are released to the waste 'washings' (RPA 1997). Depending on further treatment this SCCP is discharged to the drain or removed within a waste water step. The final fate of the residues should be noted or assessed. SCCP/MCCPs release from industries can e.g. be assessed in sewer films or sediments (Rieger and Ballschmiter 1995).
- **SCCP exemption for fatliquoring expired** and **for MCCPs not yet recommended by POPRC**.

Assessment:

- **Are fatliquors produced in the country? and are SCCP/MCCPs used in this production?**
- **Are fatliquors imported to the country containing SCCPs or MCCPs?**
- **Please note for the assessment: SCCP exemption expired; only MCCPs are allowed for use.**
- Assessment of **contamination** from releases at leather production sites (partial loss application).

Assessment of SCCPs (&MCCPs) in consumer products (European Union)

A wide range of consumer products are contaminated with SCCPs above the regulatory limit of 1500 mg/kg in the European market (RAPEX 2017) often PVC & rubber, include:

- **Toys** like **plastic doll**, **toy doctor set** (stethoscope), **bouncy toy**, stickers for children, rubber knife, **toilet seat for children**;
- **Sports equipment**: **Beach ball, baseball glove, Fitness gloves**, Abs trainer, **Yoga mats, all-purpose mat;**
- Artificial leather (PVC) wallet, handbags, mobile phone bag, brush case black, toiletry bag, wallet case for smartphones;
- Cables in motor vehicle sidelight, USB-cord, digital thermometer cable, extension lead, kettle cable, game controller (cable), electric kettle (cord), lighting chain (cord);
- Baking ovens and kitchen blenders;
- Other plastic/polymers like steering wheel cover, selfie stick, mobile phone case, rain cover for pushchair, cloche cover, garden equipment;
- **Other products (see Annex 1 SC SCCP inventory guidance).**

Product (2017 survey)	SCCP content mg/kg
Sports equipment: Boxing gloves	4400
Sports equipment: Gym ball	8500
Sports equipment: Yoga mats	8 000 – 69,000
Bathtub pillow	17 000
Electric shaver (cable)	9800
Hobby/sports equipment: Hot pack	4000
Exercise/sports equipment: tube (handle)	90 000
Speaker (cord)	10 000
Selfie stick (cord)	45 700
USB (cable)	16 000
In-ear headphones (USB cord)	3000
LED candle (cord)	13 000
Power cord/cable	26 000
Toy pistol (plastic cord)	7000
Radio controlled car (tyres)	17 000
Bath toy	13 400
Game controller	43 000
Plastic doll	8 600
Babies' sleeping bag (anti-slip knobs)	18 000
Breastfeeding pillow (packaging)	60 000
Handle (cycle parts)	3 500
Hammer (handle)	2 800
Claw hammer (handle)	7000

UNEP (2019) Guidance on preparing inventories of short- chain chlorinated paraffins (SCCPs) - Detailed guidance.
https://www.pops.int/Implementation/NationalImplementationPlans/Guidance/tabid/7730/Default.aspx

SCCP/MCCP use **impact recycling streams & circular economy**

Large amount of SCCP/MCCP in use. Plus Stockholm Convention with many specific exemptions for SCCPs and MCCP (listed 2025). For all major uses, **future recycling/circular economy problems:**

- Secondary plasticizers in **flexible PVC**, (**PVC recycling; C&D plastic waste**).
- **Rubber:** Additives and flame retardant in the production of transmission belts in the natural and synthetic rubber industry; (**rubber recycling**)
- Rigid PUR spray foam adhesives/sealant; **(construction and demolition (C& D) waste).**
- **Metal cutting/processing oil** (**oil recycling**)
- **Lubricant additives**, for engines of automobiles, electric generators and wind power facilities, and for drilling in oil and gas exploration, petroleum refinery to produce diesel oil; **(oil recycling)**
- **Leather** industry, in particular **fatliquoring in leather (leather recycling)**;
- Waterproofing and fire-retardant paints; **(buildings; C&D waste)**

Future recycling problems ahead!

The World Chlorine Council proposed exemption for PVC recycling (UNEP/POPS/POPRC.20/3).

Thank you for your attention ! Questions?

More Information https://www.pops.int/Implementation/NationalImplementationPlans/Guidance/tabid/7730/Default.aspx

Basel Convention: www.basel.int

Rotterdam Convention: www.pic.int

Stockholm Convention: http://chm.pops.int/

Montreal Protocol/Vienna Convention: http://ozone.unep.org

FAO: www.fao.org **WHO** www.who.int/ **GFC** https://www.chemicalsframework.org/

Alternatives https://www.subsportplus.eu/subsportplus/EN/Home/Home_node.html

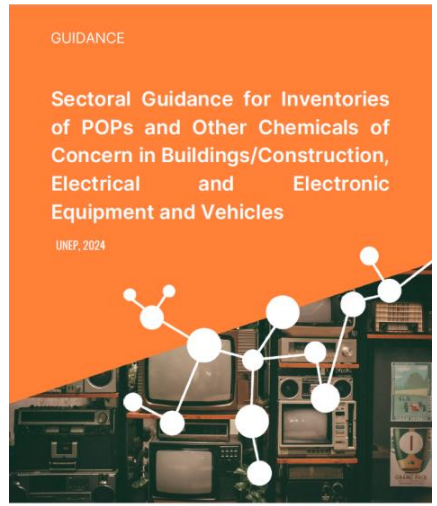
OECD/IOMC: http://www.oecd.org/chemicalsafety/

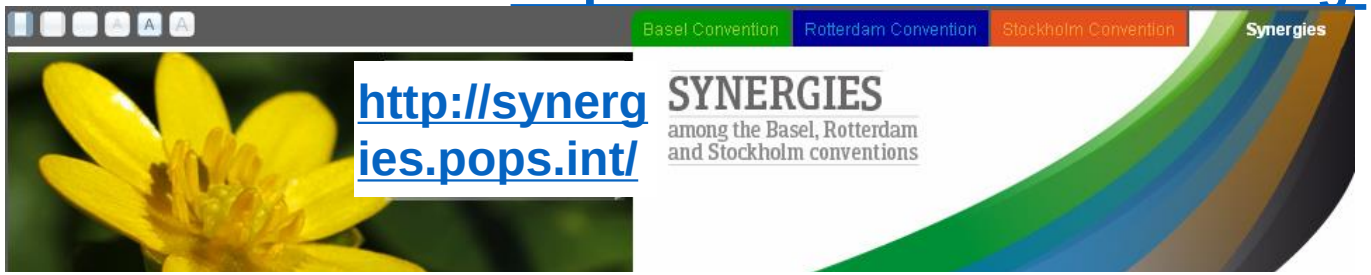
Science: www.ipcp.ch; http://greensciencepolicy.org/; www.unep.org/oewg-spp-chemicals-waste-pollution

Industry: http://www.suschem.org/; https://icca-chem.org/; https://cefic.org/

NGO: www.ipen.org; www.ciel.org/; www.ban.org; www.chemsec.org; www.wecf.org;

Better-world-links: http://www.betterworldlinks.org/





http://synergies.pops.int/

United Nations Framework Convention on Climate Change

MONTREAL PROTOCOL
caring for all life under the sun

MINAMATA CONVENTION ON MERCURY

https://www.greenpolicyplatform.org/case-studies/inventory-pops-transport-sector-nigeria

https://www.greenpolicyplatform.org/case-studies/inventory-pops-electrical-and-electronic-equipment-eee-and-related-waste-weee-nigeria

https://www.greenpolicyplatform.org/case-studies/case-study-inventory-pops-building-and-construction-sector-country