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STOCKHOLM CONVENTION

Guidance on preparing inventories of SCCPs

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STOCKHOLM CONVENTION

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

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Secretariat of the Basel, Rotterdam and Stockholm Conventions

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Author: Dr.Roland Weber, POPs Environmental Consulting, 73527 Schwäbisch Gmünd, Germany

Contact information:

Secretariat of the Basel, Rotterdam and Stockholm conventions
Office address: 11-13, Chemin des Anémones - 1219 Châtelaine, Switzerland
Postal address: Avenue de la Paix 8-14, 1211 Genève 10, Switzerland
Tel.: +41 22 917 8271
Email: brs@brsmeas.org

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Abbreviations and acronyms

BR	Polybutadiene rubber
BUA	Beratergremium für Umweltrelevante Altstoffe
CAS	Chemical Abstracts Service
CPs	Chlorinated paraffins
CR	Chloroprene rubber
CSO	Civil society organisation
DDT	Dichlordiphenyltrichlorethan
DIN	Deutsche Industrienorm
ECHA	European Chemical Agency
ECNI	Electron capture negative ionization
EPDM	Ethylene propylene diene monomer
ESM	Environmentally Sound Management
EU	European Union
EVA	Ethylene-vinyl acetate
GC	Gas chromatography
HBCD	Hexabromocyclododecane
HCH	Hexachlorocyclohexane
HS Code	Harmonized System Code
IARC	International Agency for Research on Cancer
ICAIA	International Chlorinated Alkanes Industry Association
IPCS	International Programme on Chemical Safety
ISO	International Organization for Standardization
LCCPs	Long-chain chlorinated paraffins
MCCPs	Medium-chain chlorinated paraffins
MS	Mass spectrometer
MWF	Metal working fluid
NBR	acrylonitrile and butadiene rubber
NGO	Non-governmental organisation
NR	Natural rubber
PBDEs	Polybrominated diphenyl ethers
PCBs	Polychlorinated biphenyls
PCBz	Polychlorinated benzenes
PCDDs	Polychlorinated dibenzo-*p*-dioxins
PCDFs	Polychlorinated dibenzofurans
PCNs	Polychlorinated naphthalenes
PCP	Pentachlorophenol
POPs	Persistent Organic Pollutants
PVC	Polyvinylchloride
RAPEX	Rapid Alert System for Non-Food Consumer Products (EU)
SBR	Styrene and butadiene rubber
SCCPs	Short-chain chlorinated paraffins
STP	Sewage treatment plant
UNEP	United Nation Environment Program
UNIDO	United Nation Industrial Development Organisation
USEPA	United States Environmental Protection Agency
WHO	World Health Organization

1. Introduction

1.1 Short-chain chlorinated paraffins under the Stockholm Convention

Chlorinated paraffins (CPs), or polychlorinated n-alkanes (CA), are complex mixtures of substances with the general molecular formula CxH(2x-y+2)Cly. Chlorinated paraffins are characterised by the carbon-chain length range of their n-alkanes and by the chlorine content of the product. According to their chain length, chlorinated paraffins are categorized into short-chain chlorinated paraffins (SCCPs, C10–C13), medium-chain chlorinated paraffins (MCCPs, C14–C17) and long-chain chlorinated paraffins (LCCPs, C17–C30) (IARC, 1990, Glüge et al., 2016).

In May 2017, by decision SC-8/11, the Conference of the Parties to the Stockholm Convention on Persistent Organic Pollutants (POPs) amended Annex A to the Convention to list short-chain chlorinated paraffins (SCCPs; Alkanes, C10–13, chloro: straight-chain chlorinated hydrocarbons) with chain lengths ranging from C10 to C13 and a content of chlorine greater than 48% by weight. Additionally, a limit for the presence of SCCPs in other chlorinated paraffin mixtures was set at 1% by weight.

SCCPs are listed with specific exemptions for production and use as shown in Table 1 below. On 18 December 2018, one year after the date of communication by the depository, the amendment listing SCCPs in Annexes A to the Convention entered into force for most Parties.[1]

Table 1: Specific exemptions for short-chain chlorinated paraffins

Chemical	Activity	Specific exemption
Short-chain chlorinated paraffins (Alkanes, C_{10-13}, chloro): straight-chain chlorinated hydrocarbons with chain lengths ranging from C_{10} to C_{13} and a content of chlorine greater than 48%, by weight For example, the substances with the following CAS numbers may contain short-chain chlorinated paraffins: CAS No. 85535-84-8; CAS No. 68920-70-7; CAS No. 71011-12-6; CAS No. 85536-22-7; CAS No. 85681-73-8; CAS No. 108171-26-2.	Production	As allowed for the Parties listed in the Register
	Use	• Additives in the production of transmission belts in the natural and synthetic rubber industry; • Spare parts of rubber conveyor belts in the mining and forestry industries; • 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; • Tubes for outdoor decoration bulbs; • Waterproofing and fire-retardant paints; • Adhesives; • Metal processing; • Secondary plasticizers in flexible polyvinyl chloride, except in toys and children's products.

More information on the chemical properties, environmental fate, monitoring data, environmental and health risks of SCCPs can be found in the risk profile (UNEP/POPS/POPRC.11/10/Add.2) (UNEP 2015a) and additional information (UNEP/POPS/POPRC.11/INF/14) adopted by the POPs Review Committee of the Stockholm Convention in 2015.[2] The documents, as well as the risk management evaluation and alternatives guidance, include information on global production and use of SCCPs and alternatives to SCCPs available at the time of the adoption.

[1] Amendments shall not enter into force for those Parties that have submitted a **notification** pursuant to the provisions of paragraph 3(b) of Article 22 of the Stockholm Convention. In accordance with paragraph 4 of article 22, the amendment will not enter into force with respect to any Party that has made a **declaration** regarding the amendment to the Annexes in accordance with paragraph 4 of Article 25. Such Parties shall deposit their instruments of ratification regarding the amendment, in which case the amendment shall enter into force for the Party on the ninetieth (90) day after the date of deposit with the Depositary.

[2] http://chm.pops.int/tabid/243/Default.aspx.

1.2 Purpose of the guidance

The purpose of this document is to provide Parties with guidance on the establishment of inventories of the SCCPs. The target audience is national focal points of the Convention and those involved in the process for NIP review and update, in particular the task teams and coordinators responsible for establishing the inventory.

In accordance with Article 7 of the Convention, following the decisions of the Conference of the Parties (COP) to list new POPs in the Convention, each Party shall review and update their national implementation plans (NIPs). The updated NIPs should be transmitted to the COP within two years of the date in which these amendments entered into force.

In accordance with Article 15 of the Convention, Parties are required to report to the Conference of the Parties on the measures it has taken to implement the provisions of the Convention and on the effectiveness of such measures in meeting the objectives of the Convention. This information includes statistical data on its total quantities of production, import and export of each of the chemicals listed in Annex A and Annex B or a reasonable estimate of such data.

Article 6, paragraph 1 (a) of the Stockholm Convention requires each Party to develop appropriate strategies for the identification of products and articles in use and wastes consisting of, containing or contaminated with POPs. The identification of the use of SCCPs and wastes containing SCCPs is the starting point for their effective environmentally sound management. Information obtained through an inventory of SCCPs may assist in meeting these obligations.

The information obtained through the establishment of the inventory of SCCPs could be compiled in the sample tables in appendix 1 to the present guidance and reported pursuant to Article 15 in the respective reporting cycle.

1.3 Other guidance documents to be consulted

The users of this guidance should consult *General guidance on POPs inventory development* (UNEP/POPS/COP.9/INF/19/Add.1) (UNEP, 2019) and other guidance documents to support review and updating of national implementation plans available on the website of the Stockholm Convention.[3]

Furthermore, this document should be used in conjunction with documents developed under the Basel Convention which provide guidance on the development of identification strategies and inventories in relation to POPs wastes including SCCPs:

(a) General technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants (UNEP/CHW/COP.14/7/Add.1) (UNEP, 2018a);

(b) Draft technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with short-chain chlorinated paraffins (UNEP/CHW/COP.14/7/Add.2) (UNEP, 2018b);

(c) Methodological guide for the development of inventories of hazardous wastes and other wastes under the Basel Convention (UNEP/CHW/COP.12/9/Add.1) (UNEP, 2015b);

(d) Draft guidance on preparing inventories of polychlorinated naphthalenes (PCNs) (UNEP/POPS/COP.8/INF/19, revised 2018) (UNEP, 2018c).

1.4 Objectives of the inventory

The main objective of developing an inventory is to obtain information to meet the objectives of the Convention.

More specifically, the objectives are to:

(a) Provide the basis for identification of the national priorities in the NIP (i.e. the quantities of the POP that are produced, used, stored as stockpiles, and generated as waste in the country, identify the important economic sectors and operators and the type of actions required for those sectors, estimate the capacities needed for implementation, identify sources that should be prioritised);

(b) Identify dispersive uses in open applications that may pose a risk to humans and the environment for prioritisation.

[3] http://chm.pops.int/tabid/7730/Default.aspx.

(c) Provide a basis for the evaluation whether the current national use, production, chemical and waste management meet the requirements of the Convention and identify areas where they do not;

(d) Provide information on the need for specific exemptions or acceptable purposes, if available;

(e) Support Article 15 reporting to the Convention;

(f) Identify the relevant stakeholders in the government, academia, industry, waste management, commerce, NGOs, etc.;

(g) Identify areas where financial or technical support are needed to fill in the information gaps in the inventory/fulfil the obligations of the Convention.

The information to be obtained for the inventory may include:

(a) Amounts of production, import, export of SCCPs at the national level;

(b) Uses of SCCPs in the country;

(c) Presence of products/articles consisting of, containing or contaminated with SCCPs on the market and in service;

(d) Imports of products/articles consisting of, containing or contaminated with SCCPs into the country;

(e) Waste streams of importance consisting of, containing or contaminated with SCCPs;

(f) Disposal practices for the POP, products/articles consisting of, containing or contaminated with SCCPs and its related substances when they become wastes;

(g) Stockpiles of SCCPs;

(h) Releases of SCCPs into the environment from point sources;

(i) Sites potentially contaminated with SCCPs;

(j) Potential harmful SCCPs exposure of humans and environment.

The information collected through inventories may be a basis for Parties to evaluate whether they comply with the obligations of the Convention with respect to SCCPs and identify areas where they need to develop effective strategies and action plans for managing these POPs in order to meet the obligations.

The inventory process is usually iterative. In establishing the inventory of SCCPs for the first time, Parties can identify resources and technical capacity needed to further improve the accuracy of the inventory.

2. How to develop an SCCP inventory

2.1 General guidance on POPs inventory development

Please refer to General guidance on POPs inventory development (UNEP/POPS/COP.9/INF/19/Add.1) (UNEP, 2019) for general approach to developing national inventories. The guidance describes general process to be taken in making an inventory. In summary, the following steps should be taken:

Step 1:	**Initiating the inventory development process**
	Establishing a national inventory team
	Identifying relevant stakeholders
	Defining the scope of the inventory
	Developing a workplan
	Contacting the stakeholders
Step 2:	**Choosing data collection methodologies**
	Indicative method
	Qualitative method
	Quantitative method
Step 3:	**Collecting and compiling data**
	Tier 1: Initial assessment
	Tier II: Main inventory
	Tier III: In-depth inventory
Step 4:	**Managing and evaluating the data**
Step 5:	**Preparing the inventory report**

2.2 Step 1: Initiating the inventory development process

For general description of Step 1, please refer to Chapter 2.2 of General guidance on POPs inventory development (UNEP/POPS/COP.9/INF/19/Add.1) (UNEP, 2019).

In initiating the inventory development process, Parties are advised to establish a multi-stakeholder **national inventory team**. It is important to clearly define the responsibilities for national inventory team in developing the inventory as to streamline the work.

The inventory team should cooperate with other inventory teams set up nationally under the Stockholm Convention. Since many of the uses of SCCPs overlap with the former or current uses of polychlorinated biphenyls (PCBs) and polychlorinated naphthalenes (PCNs) in open applications (cables, rubber, paints, adhesives/sealants or treatment of paper or textiles (IPCS, 2001; UNEP, 2018c; Wagner et al., 2014)), the inventory of SCCPs should be linked or integrated with the inventory of PCNs and PCBs in open applications.

To **define the scope of the** inventory, the national inventory team should identify relevant stakeholders who will be contacted for the information in the process. Potential sectors and stakeholders involved in the life-cycle of SCCPs are listed in Table 2 below.

Table 2: Sectors and stakeholders involved in the life-cycle of SCCPs

Sectors	Stakeholders
Ministries and authorities (For all sectors)	• Ministry of Environment • Ministry of Industry • Ministry responsible for waste management • Ministry of Construction • Ministry of Labour • Stockholm NIP coordinator and steering committee • Basel Convention focal point (and stakeholders) • Rotterdam Convention focal point • Customs; office of statistics
NGOs/CSOs	• Industry associations (plastic; rubber; paints; metal processing, chemicals/lubricants) • CSOs/NGOs working on POPs, hazardous chemicals and waste • CSOs/NGOs working on workers safety
Production of SCCP or other chlorinated paraffins >1%SCCPs	• Organochlorine industry • Producers of SCCPs or other chlorinated paraffins with SCCPs >1%
Manufacturing of products/articles where SCCPs are used or have been used	• Industries producing soft PVC and making products from (soft) PVC • Industry producing cables for electrical equipment and cables sheaths • Industry producing rubber products (conveyor belt, hoses) • Industry producing paints and other coatings (intumescent paints or water proof paints such as chloroprene paints, lacquers and PVC copolymer paints) • Industry producing adhesives and/or sealants • Industries producing metal working fluids • Industries producing lubricants • Industries producing fatliquoring agents • Industries producing leather (using fatliquors) • Compounders (formulators) of textile backcoatings • Industries producing impregnated/flame retarded textiles
Industrial users of SCCP containing products	• Construction companies (users of cables, sealants, paints, flooring) • Users/industries of rubber products (conveyor belts; other rubber belts, rubber belts for printers, cables, other flame retarded rubber products) • Companies using water proof paints (road marking, swimming pools) • Producers of cables; producers of electrical electronic equipment • Users/industries and importers of paints (including chloroprene paints and lacquers and PVC copolymer paints and thinners) • Producers of lubricants and metal working fluids • Users/consumers of metal working fluids • Consumer of lubricants including automotive (gasoline stations; car repair), agricultural machinery, rail, power generation (e.g. wind power facilities; electric generators), drilling in oil and gas exploration, petroleum refinery, military, food & beverage, earth moving equipment.
Consumer goods containing SCCPs	• Retailers of products possibly containing SCCP (soft PVC products, rubber products, lubricants, paints, adhesives/sealants) • Importers/exporters of (soft) PVC • Importer/exporter of treated rubber or synthetic rubber (e.g. conveyor belts, transmission belts; other flame retarded rubber)

Sectors	Stakeholders
	• Importers/exporters of water proofing and fire-retardant paints and coatings • Importers/exporters of lubricants and metal working fluids • Importers/exporters of sealants and adhesives
Companies recycling SCCP containing material	• Recyclers of cables or other PVC; Recyclers of rubber products; • Recyclers of scrap; recyclers of waste wood • Recyclers of lubricants and waste oils
End-of-life treatment	• Waste management companies • Companies operating waste incinerators or plants doing co-processing • Landfill owners

2.3 Step 2: Choosing data collection methodologies

There are a number of different approaches that have been used for gathering information for POPs inventories, i.e. indicative method, qualitative method and quantitative method. For more information on those methodologies, please refer to Chapter 2.3 of General guidance on POPs inventory development (UNEP/POPS/COP.9/INF/19/Add.1) (UNEP, 2019).

Questionnaires are valuable instruments for primary data collection in inventory programs. Based on contact and consultation meetings with stakeholders, questionnaires with explanatory notes can be developed and sent to the relevant stakeholders to gather the information needed to compile data for a Tier II or Tier III assessment. Questionnaires for SCCP producers, users, or companies importing or selling SCCPs and other chlorinated paraffins as well as products containing SCCPs or other chlorinated paraffins are available in appendix 3 to 8 to the present guidance and can be modified and adjusted as needed.

Samples of products and articles can be gathered during on-site inspections at factories, markets, in buildings and construction possibly containing SCCPs, recycling locations, and waste disposal/storage facilities.

Information on sampling and analysis of SCCPs including international standards is compiled in appendix 2 to the present guidance. Some studies on presence of SCCPs in consumer products have been published such as SCCP from kitchen blender (Yuan et al. 2017), baking ovens (Gallistl et al. 2018), tire granulates (Brandsma et al. 2018) and consumer goods in Japan (Kajiwara and Matsukami 2018).

2.4 Step 3: Collecting and compiling data

For general description of Step 3, please refer to Chapter 2.4 of General guidance on POPs inventory development (UNEP/POPS/COP.9/INF/19/Add.1) (UNEP, 2019).

An initial assessment (**Tier I**) is carried out to obtain an overview of the relevant uses and stakeholders to be contacted in the key sector under investigation. Tier I methods usually rely on available literature and statistics in combination with calculations based on already existing information, such as the risk profile (UNEP/POPS/POPRC.11/10/Add.2) (UNEP 2015a) and risk management evaluation (UNEP/POPS/POPRC.12/11/Add.3) (UNEP 2016) adopted by the POPs Review Committee.[4]

Main inventory (**Tier II**) will follow to generate data on the main sectors through interviews and questionnaires to the national stakeholders, and further identify missing information.

If needed and resources are available, a more in-depth inventory (**Tier III**) can be initiated after evaluation of the data gathered in the main inventory.

2.4.1 Tier I: Initial assessment

In Tier I, information may be available only as chlorinated paraffin mixtures, rather than SCCPs. This information is still valuable and should be noted. Communication with industry associations may provide an indication of the production or import of SCCPs or other chlorinated paraffins potentially containing >1% SCCPs.

Expected outputs of the initial assessment include:

[4] http://chm.pops.int/tabid/243/Default.aspx.

(a) A list of industry associations and authorities relevant to the production of SCCPs;

(b) A list of producers of SCCPs and other chlorinated paraffins possibly containing SCCPs;

(c) A list of users of SCCPs and other chlorinated paraffins possibly containing SCCPs in various sectors (see Table 2 above);

(d) A list of importer and exporter of SCCPs and other chlorinated paraffins;

(e) A list of stakeholders in the supply-chain;

(f) HS codes used, where relevant;

(g) Initial information on the production of SCCPs in the country;

(h) Initial information on the uses of SCCPs in the country;

(i) Initial information on the import and export of SCCPs in the country;

(j) Data on production volumes and trade volumes accessible by desk studies;

(k) Product categories in the same uses which may additionally contain PCBs or PCNs from former uses (rubber, cables, paints, sealants/adhesives);

(l) Priority list of products/articles on the consumer market that may contain SCCPs;

(m) Average service life of the products/articles identified as containing SCCPs;

(n) Compilation of information as basis for Tier II assessment and initial feedback from stakeholders.

2.4.2 Tier II: Main inventory

Tier II should aim at compiling estimates of quantity of SCCPs and chlorinated paraffin mixtures possibly containing >1% SCCPs produced, imported and used in production and products.

Examples of tables that could be used in developing main inventory are available in appendix 1 to the present guidance.

Since various chlorinated paraffin mixtures containing SCCPs are in use and often MCCPs and LCCPs are used as alternatives to SCCPs, the Tier II inventory should identify, to the extent possible:

(a) Chlorinated paraffin mixtures containing >1% SCCPs;

(b) Chlorinated paraffin mixtures with unknown % of SCCPs; and

(c) MCCPs and LCCPs mixtures certified as containing <1% SCCPs.

Expected outputs of the main inventory (Tier II) include:

(a) Detailed information on the production of SCCPs and other chlorinated paraffins containing SCCPs >1%;

(b) Detailed information on the use of SCCPs and other chlorinated paraffins containing SCCPs >1% in manufacturing of products (PVC, rubber, adhesives/sealants, paints, fatliquoring leather, textiles);

(c) Detailed information on the use of SCCPs in metal working fluids and lubricants;

(d) Detailed information on the products/articles containing SCCPs (including total quantity);

(e) All major producers, users, importers and exporters approached, questionnaires filled out with the responses;

(f) Compilation of information and data provided by major stakeholders and their supply-chain stakeholders on total annual production, use, export and import of SCCPs

(g) Data on production volumes and trade volumes;

(h) Data gaps on SCCP content in chlorinated paraffin mixtures identified and the need for Tier III inventory elaborated;

(i) Overview on domestic supply-chain networks;

(j) Additional stakeholders identified and contacted;

(k) Information in relevant material safety data sheets (MSDS) assessed;

(l) The amount of SCCPs waste generated at production sites assessed and quantified;

(m) Potentially contaminated sites.

In Tier I and Tier II, chlorinated paraffins used in the manufacture of products could be considered as potentially containing SCCPs or contaminated with SCCPs unless companies can prove that the SCCP content is ≤1% (e.g. by a certificate from the supplier or an accredited laboratory). If providers or users of chlorinated paraffins can certify that the SCCP content is ≤1%, then the respective chlorinated paraffin mixture or product can continue to be used.

It could be challenging to assess SCCPs in chlorinated paraffin mixtures where the SCCP content is unknown. The range of SCCPs content in chlorinated paraffins released from 12 kitchen food blenders reported to be between 4 and 59% (average 28%) (Yuan et al., 2017: Table A4 in appendix 2). The average content of SCCPs in global CP production is estimated to be at least 16.5% (Glüge et al., 2016). Those figures could be used in estimating the SCCPs content in chlorinated paraffins of unknown composition (approximately 20%).

2.4.3 Tier III: In-depth inventory

The in-depth inventory may include sampling and analysis of SCCPs. Laboratory analysis is necessary in identifying consumer products containing SCCPs. Chlorinated paraffin mixtures with unknown composition could be analysed to determine the SCCP content.

Standard sampling and analytical procedures should be established and agreed upon before the start of a sampling campaign. Sampling and analysis should comply with specific national legislation, where it exists, or with international regulations and standards and Good Laboratory Practice. Appendix 2 to the present guidance provides overview of general steps taken in sampling and analysis of SCCPs.

The in-depth inventory may establish a material and substance flow analysis to best visualize and understand the stocks and flows of SCCPs in the individual product groups. With a dynamic substance and material flow analysis and the information on the current use/stock of the respective products and the service life of the products, the products entering the waste stream can be estimated and calculated. Such dynamic substance flow analysis has been conducted for SCCPs (Eriksson et al., 2012; Bolliger and Randegger-Vollrath 2003), HBCD (Li et al., 2016) or PBDEs (Morf et al., 2008; Abbasi et al., 2015).

2.5 Step 4: Managing and evaluating the data

For general description of Step 4, please refer to Chapter 2.5 of General guidance on POPs inventory development (UNEP/POPS/COP.9/INF/19/Add.1) (UNEP, 2019).

The compiled data (draft inventory) should be assessed by stakeholders and possibly by an external expert. Depending on the feedback, further information may need to be gathered.

2.6 Step 5: Preparing the inventory report

The final stage of the inventory is preparation of the inventory report. This report includes results of inventories of all key sectors investigated by the country compiled in a single document.

The essential elements of the report are:

(a) Objectives and scope;

(b) Description of data methodologies used and how data were gathered, including all the assumptions and conversion factors adopted as a result of expert judgment;

(c) Final results of the inventory for each sector considered a priority for the country (using a format to be provided in this guidance, as such or adapted from that format);

(d) Results of the gap analysis and limitations identified for completion of the inventory;

(e) Further actions (e.g. stakeholder involvement, data collection strategies) to be taken to complete the inventory and recommendations.

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

3. Information on SCCPs

3.1 Identity and production of SCCPs and other chlorinated paraffins

SCCPs are complex chlorinated paraffin mixtures that are viscous, colourless or yellowish dense oils (Environment Canada, 2008) with a range of synonyms (see Table 3 below).

Table 3: Names, synonyms and CAS numbers and selected properties of SCCPs

Common name (abbreviation)	Short-chain chlorinated paraffins (SCCPs)
IUPAC name	Alkanes, C_{10-13}, chloro;
Synonyms	Alkanes, chlorinated; alkanes (C_{10-13}), chloro-(50%-70%); alkanes (C_{10-13}), chloro-(60%); chlorinated alkanes, chlorinated paraffins; chloroalkanes; chlorocarbons; polychlorinated alkanes; paraffins chlorinated.
Molecular formula	CxH(2x-y+2)Cly, where x=10-13 and y=1-13
Chemical Abstract Service (CAS) Numbers of SCCPs and other chlorinated paraffins which may contain SCCPs	85535-84-8[5] (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 may 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 numbers of MCCPs (85535-85-9) Alkanes, C14-17, chloro (which can contain <1% (Euro Chlor 2017) but some may 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
Pour point (no distinct melting)	-30.5 °C (49% chlorine); 20.5 °C (70% chlorine) (ECB, 2000)
Water solubility	0.15 – 0.47 mg/L (ECB, 2000) 0.006 – 2.2 mg/L (BUA 1992)
Toxicity	SCCPs are classified in Group 2B by the IARC - possibly carcinogenic to humans based on sufficient evidence of carcinogenicity in experimental animals and mechanistic considerations (IARC, 1990).

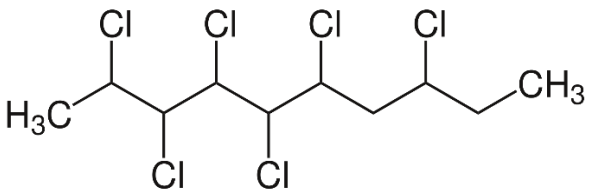

Figure 1: Structure of a SCCP congener ($C_{10}Cl_6$)

[5] This CAS number represents the commercial SCCP product that is produced by the chlorination of a single hydrocarbon fraction consisting of n-alkanes that have a carbon chain length distribution consisting of 10, 11, 12 and 13 carbon atoms; however, this CAS number does not specify the degree of chlorination of the SCCP. Please note that there are other CAS numbers which may represent or contain SCCPs.

Chlorinated paraffins or chlorinated n-alkanes, including SCCPs, have been produced commercially since the 1930s with some minor production already before 1920s (Glüge et al., 2016). Annual global production volumes of chlorinated paraffins between 1944 and 1977 were reported to be between 20,000 and 35,000 tonnes per year (t/year), with the United States (US) as the major producer (Hardie 1964; Howard et al. 1975). The production increased significantly after 1977, when Japan and Europe increasing or started production (IARC, 1990; Tsunemi 2010). The highest production volumes were reached, however, only after 2006, when China scaled up its CP production from 260,000 t/year in 2006 to 1,000,000 t/year in 2013 (Xu et al., 2014; ICAIA 2012; 2013 and 2014).

Due to the uncertainty of the share of mixtures of chlorinated paraffins in some countries, only limited information is available on total SCCP production (UNEP, 2015a). Glüge et al., 2016 estimated in their review that approx. 165,000 t of SCCPs were likely produced globally. China was the largest volume producer of chlorinated paraffins, exceeded 1,000,000 t in 2013 (Glüge et al., 2018).

3.2 Use of SCCPs and other chlorinated paraffins

Chlorinated paraffins are chemicals with different carbon lengths and degrees of chlorination, which give different properties. Because of their versatility, they are used in a wide range of applications. Due to the flexibility in the degrees of chlorination, SCCPs were often substituted by MCCPs or LCCPs with adjusted degrees of chlorination for the respective use. MCCPs and LCCPs with <1% SCCP content are not restricted under the Stockholm Convention.

SCCPs have been used to replace polychlorinated biphenyls (PCBs) and polychlorinated naphthalenes (PCNs) in a wide range of open applications (e.g. cables, sealants, paints). However, SCCPs have been reported to be not suitable for uses requiring high heat stability (e.g., capacitors, transformers) (Howard et al. 1975).

SCCPs were used as fire-retardant, plasticizer, water-repellent and for lubrication in different uses and products. The main SCCP uses were/are in polyvinylchloride (PVC), rubber, metal-working fluids and other lubricants, paints, coatings, sealants, adhesives, textiles and leather (see Table 4 below).

A major use of SCCPs is in **PVC as secondary plasticizers** in applications such as electrical cables (IARC 1990, ECB 2000, 2008; USEPA 2009). Market surveys in the EU revealed that SCCPs are used in a wide range of PVC consumer products (see UNEP, 2018b, annex II).

Another major use of SCCPs was in natural and synthetic **rubber products** as flame retardants (ECB 2000, 2008). Rubber containing SCCPs has been used in conveyor belts, rubber cables, sound-insulating materials in hoses as well as seals in the electrical installation and in vehicles.

SCCPs was used in **waterproofing or intumescent paints and coatings** as plasticizer or flame retardant to improve resistance to water and chemicals and reduce flammability (ECB 2000; USEPA 2009, UNEP 2015a). The paints are used mainly in industrial/specialist applications such as marine primer paints and fire-retardant paints (ECB 2000; RPA 2010), road marking paints, anti-corrosive coatings for metal surfaces, swimming pool coatings, decorative paints for internal and external surfaces (RPA 2010).

SCCPs have been used in the **leather industry** as fat liquoring agents (ESWI, 2011). They are usually applied to the moist dressed leather and normally in the upper price segment (ECB 2000).

SCCPs are used in **adhesives** including chlorinated rubber coatings, polysulphide, polyurethane, acrylic and butyl sealants used in building and construction and in sealants for double and triple glazed windows (IARC 1990; ECB 2008, Danish EPA 2014).

SCCPs have been used in **metal processing** as metal working fluids and other lubricants. Uses are as extreme-pressure additives in metal-machining fluids (lubricants and coolants), engineering and metal working operations such as drilling, machining/cutting, drawing and stamping e.g. in the automobile industry, precision engineering industry and in machinery construction since around 1930 (IPCS 1996, ECB 2008). In the EU, 70% of all use of SCCPs were used as metal working lubricants in 1994 (RPA 2010), until the prohibition in 2003 (ECB 2008). Similarly, nearly all use of SCCPs in Canada was related to metalworking (Environment Canada, 2008).

SCCPs have been used in **textile finishing** as flame-resistant and water repellent in military tenting, sail cloths and industrial protective clothing and tarpaulins (ECB 2000). Typical applications for back-coated textiles included furniture upholstery, seating upholstery in transport applications, and interior textiles such as blinds and curtains (Zitko & Arsenault 1974; RPA, 2010).

SCCPs may be found in materials and consumer articles as they have been used in materials such as plastics, textiles, leather, rubbers, inks, paints, adhesives and surface coatings to produce apparel, footwear and accessories (KEMI 2016). The articles containing SCCPs are mainly soft plastic items made of PVC (i.a. toys, beauty cases, exercise mats made of PVC plastic, stickers for wall decoration, dress costumes, etc.) (BTHA, 2016). It has been demonstrated that

the presence of chlorinated paraffins in household appliances can contaminate food during preparation and is an unexpected exposure pathway and should be addressed (Yuan et al., 2017: Gallistl et al., 2018).

Other former applications that are no longer allowed in accordance with Annex A to the Stockholm Convention include sealants, solvent in a nasal spray, component in clear lacquers for wood and hardboard, fire-proofing of wood, paper-sizing, antistatic agents on nylon, and coating for tableted calcium hypochlorite, used in the treatment of sewage and swimming pool waters.

Table 4: Uses and concentrations of SCCPs in products

Uses	SCCP content (mg/kg)	Source
PVC (Chapters 5.1.1; 6.1.1) (e.g. cables, consumer goods)	Up to 100 000	BTHA, 2016 KEMI, 2016
EVA foam (Chapter 5.1.1; 6.1.1) (mats; others)	Up to 70 000	BTHA, 2016
Rubber (Chapters 5.1.2; 7.1.2) (e.g. Additive/flame retardant in natural and synthetic rubbers in conveyer & transmission belt, cables, hoses, seals, uses in vehicles)	10 000-40 000, can be up to 150 000 100 000-170 000 in conveyor belts 100 000 in conveyor belts, 100 000-170 000 for other rubber products	ECB, 2008 RPA, 2010
Paints/coatings	25 000-100 000 in intumescent coatings 50 000-200 000 in anti-corrosive and protective coatings 10 000-100 000 in road markings	RPA, 2010 ECB, 2008 RPA, 2010
Leather fat liquoring (e.g. furniture; clothes)	10 000 (in leather) 20 000 (mean) 200 000 in fat-liquoring mix	ECB, 2000 RPA, 2010 ESWI, 2011
Adhesives/sealants	50 000-140 000 200 000-300 0000	ECB, 2008 Danish EPA, 2014
Textiles (flame retardant backcoating; paint)	Potential flame retardant in cellulosic textiles 40 000-150 000 in backcoating of textiles	BTHA, 2016 RPA, 2010
Metal working fluids (e.g. high-pressure additives, cutting and drilling fluids)	50 000-700 000 in oil-based cutting fluids Average 500,000 <10 000 in emulsion-based cutting fluids	BUA, 1992 ECB, 2000, 2005 BUA, 1992
Lubricants (e.g. rail, ship, automotive, industrial machinery, power generation (e.g. wind power facilities, electric generators))	10 000 – 600 000 300 000 – 700 000	MSDSs Sloan, 1986

3.2.1 Plasticizers in polyvinyl chloride (PVC)

The specific exemptions for SCCPs include secondary plasticizers in flexible polyvinyl chloride (PVC), except in toys and children's products; tubes for outdoor decoration bulbs.

SCCPs or chlorinated paraffin mixtures containing SCCPs are used mainly as secondary plasticisers. The primary plasticisers are generally phthalates or phosphate esters (Houghton 1993). Primary plasticisers in PVC are used to increase the elongation properties and softness of the polymer. Secondary plasticisers, when used in combination with primary plasticisers, cause an enhancement of the plasticising effect, and so are known as extenders.

Flexible PVC has many applications such as electrical cable sheeting, in plumbing, conveyor belts, imitation leather, flooring, signage, phonograph records, inflatable products or tubes for outdoor decoration bulbs. The articles containing SCCPs are mainly soft plastic items made of PVC (i.a. toys, beauty cases, exercise mats made of PVC plastic, stickers for wall decoration, dress costumes, etc.) (BTHA, 2016).

The industry using PVC should be approached to obtain the information on the use and quantitative data of SCCPs and other chlorinated paraffins containing >1% SCCPs in the respective uses. To compile this information, the

individual companies producing PVC and products made from PVC as well as related associations could be contacted.

Pellets (masterbatch) containing SCCPs could be manufactured outside the country and then imported into the country for further processing (UK Environment Agency, 2009).

It should be noted that other POPs have been used as additives in PVC in the past (before 1980s) for example PCNs and PCBs. PVC may contain other hazardous chemicals or heavy metals (lead, cadmium).

The analysis of SCCPs in consumer products on the European market revealed that a wide range of PVC products and some plastic/polymer products made from ethylene-vinyl acetate (EVA) foam were contaminated with SCCPs above the EU limit of 0.15% and a range of products above 1% (see UNEP, 2018b, annex II). Several of the products contained cables, cords or extension lead where the PVC/plastic was above regulatory limit (up to 4.7%). A range of PVC parts in toys were contaminated with SCCPs such as bath toys (1.34% SCCPs), bathtub pillow (1.7% SCCPs) or toys with cables and cords. Other PVC and Ethylene-vinyl acetate (EVA) polymer product contaminated with SCCPs >1% were yoga mats (up to 6.9% SCCP). One source of SCCPs and MCCPs release from food blenders were polymer parts and polymer coatings (Yuan et al., 2017).

3.2.2 Rubber

The specific exemptions for SCCPs include additives in the production of transmission belts in the natural and synthetic rubber industry; spare parts of rubber conveyor belts in the mining and forestry industries.

SCCPs are added to rubber products as flame retardants and/or plasticizers.

Conveyor belts are one of the major applications. According to the Conveyor Belt Guide (2018), rubbers such as natural rubber (NR), styrene and butadiene rubber (SBR), polybutadiene rubber (BR), acrylonitrile and butadiene rubber (NBR), butadiene or isoprene rubber and ethylene propylene diene monomer (EPDM) rubber have very poor flame resistance (Conveyor Belt Guide, 2018). Therefore, these rubber types require the addition of flame retardants for uses where flammability standards exist such as for conveyor belts (ISO 340:2013).

Chlorobutadiene rubber (e.g. chloroprene, also known as neoprene or CR) and PVC have inherent flame resistance but SCCPs may be added. Chloroprene rubber may be used for mining conveyor belt compounding alongside chlorinated paraffins for both the cover compound and the skim compound (Dick 2001). Chlorinated paraffins may be used in 15% weight in a cover per hundred chloroprene and at 30 parts by weight per hundred chloroprene in a skim coat (Dick 2001).

The use of SCCPs and other flame retardants in rubber applications depends on the individual uses and the related safety and flammability standards. Table 5 below lists rubber applications that may contain SCCPs or chlorinated paraffins with >1% SCCPs.

Table 5: Rubber applications that may contain SCCPs or chlorinated paraffins with >1% SCCPs (Source: BRMA, 2001)

Rubber applications that may contain SCCPs	Chlorinated paraffins 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%

3.2.3 Leather

The specific exemptions for SCCPs include leather industry, in particular fatliquoring in leather.

The fatliquoring is the last stage of leather preparation. The formulation of leather fatliquors is by a simple mixing process using an enclosed system at ambient temperature (UK Environment Agency 2009). The main components of fatliquors are water, natural fats (e.g. fish oils), surfactants and chlorinated paraffins. Chlorinated paraffins account for about 10 % (range 5-15 %) by weight of the formulated fat liquor (UK Environment Agency 2009).

The amount of fatliquor used in this step is around 7-12 %, based on the shaved weight of the leather to be treated (i.e. around 70-120 g of fatliquor/kg of leather). Since the fatliquor typically contains around 10 % (range 5-to 20%) chlorinated paraffins, the amount of chlorinated paraffins used in this step is around 7-12 g chlorinated paraffin/kg leather (range 3.5-18 g chlorinated paraffin/kg leather) (RPA 1997; UK Environment Agency 2009). The final chlorinated paraffins content in treated leather products is approximately 1% of the leather weight.

When offered to the leather, between 95% and 99% of the SCCPs may be taken-up by the leather, leaving between 1% and 5% of the SCCPs in 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 could be noted or assessed. SCCPs release from industries can e.g. be assessed in sewer films or sediments (Rieger and Ballschmiter 1995).

Chlorinated paraffins including SCCPs are used in leather treatment for light-fastness and a dry surface feel mainly in leathers for the top end of the quality range (Entec 2008). This may include leather used for furniture, clothing or car seats. Different chlorinated paraffin mixtures are used in leather treatment and SCCPs were already phased out in some regions (e.g. EU).

Since the chlorinated paraffins are relatively strongly bond to the leather (Entec 2008), SCCP treated leather products retain most of SCCPs and products in use with decade long service life such as leathers furniture or clothes should be considered in the inventory.

3.2.4 Paints

The specific exemptions for SCCPs include waterproofing and fire-retardant paints.

SCCPs and other chlorinated paraffins are used as plasticisers and flame retarding agents in paints and coatings. These paints are mainly used by professional painters but are to some extent also used in private households.

The main types of paints that are likely to contain chlorinated paraffins are those based on chlorinated rubber, vinyl copolymers and acrylic based coatings (ECHA 2008). SCCPs may be used in cross-linkable polyester systems for the production of long-term road markings (RPA 2010).

Chlorinated rubber-based paints are typically used in aggressive environments such as marine, industrial applications or liquid manure pit. Vinyl copolymer-based paints are used mainly for exterior masonry (ECHA 2008).

Applications of SCCPs and other CP contain paint formulations include:

(a) Road marking paints;

(b) Anti-corrosive coatings for metal surfaces;

(c) Swimming pool coatings, fishpond coatings and water tank coatings;

(d) Decorative paints for internal and external surfaces;

(e) Masonry paints;

(f) Intumescent coatings;

(g) Textile printing inks.

Table 6 below lists paints and coatings that may contain SCCPs or chlorinated paraffins with >1% SCCPs.

The application of chlorinated paraffins in paints depends on the type of paint and application and is between 1 and 30% by weight in paints based on resins such as chlorinated rubber, vinyl copolymers and acrylics.

If details on the SCCPs content in these paints is unknown, then 10% may be chosen as an estimate for SCCPs content since this is considered typical for these type of paint (ECHA 2008). With an average of approximately 20% SCCPs share of global CP production (Glüge et al., 2016) the average SCCPs contribution in these paints is estimated to be 2%.

Table 6: Paints and coatings that may contain SCCPs or chlorinated paraffins with >1% SCCPs (Source: Environment Agency for England and Wales 2007; von Eckhardt & Grimm 1967; RPA 2010)

Paints and coatings that may contain SCCPs	Chlorinated paraffins Content (% wt)
Organic solvent borne intumescent coating for structural steel	20-30 %
Plastisol[6] 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 %

3.2.5 Adhesives

The specific exemptions for SCCPs include adhesives.

SCCPs and other chlorinated paraffins are used as plasticisers and flame retardants in the production of adhesives and sealants. Adhesives and sealants are often considered together because they both adhere and seal; both must be resistant to their operating environments; and their properties are highly dependent on how they are applied and processed (Petrie 2000). The difference between adhesives and sealants can be difficult to define as some are used as adhesives and vice versa. Generally, sealants are considered to be materials that are installed into a gap or joint to prevent water, wind, dirt or other contaminants from passing through the joint or crack. Adhesives, on the other hand, are used to transfer loads and are typically designed with much higher tensile and shear strength than sealants (Palmer and Klosowski, 1997).

Chlorinated paraffins are used in different adhesive and sealant materials including polysulphide, polyurethane, butyl and acrylic based products which come in one- or two-parts (two-part products appear to be more common) (RPA 2010). They are used in building and construction, sealants for double and triple glazed windows, road marking tapes, artificial grass, military uses (RPA, 2010) and flooring (e.g. parquet, carpet) where they have substituted the former use of PCBs in adhesives (ARGUK 2017; Wagner et al., 2014).

Solid waste can be generated during the production process, which may be up to 5% of the amount of sealant produced as a result of machine cleaning or scrap material.

SCCPS and other chlorinated paraffins are typically added at amounts of 10–15 % and up to 20% by weight of the final sealant (BUA, 1992). Applications of sealants include the following (RPA 2010):

(a) Filling of expansion and movement joints (either horizontal or vertical);

(b) Filling of gaps around doors, windows, dorm windows, arches;

(c) Sealants for water storage applications (reservoirs) and for protecting areas from oil and fuel spillages, areas around petrol stations, sewage treatment works;

(d) Sealants for underground facilities such as basements and subways;

(e) Waterproofing of constructions such as bridges and culverts;

(f) Sealants for automotive windows and sealants that may act as intumescent (fire protection coatings);

(g) Sealants in waterproof roof coating.

[6] Plastisol is a suspension of PVC or other polymer particles in a liquid plasticizer (e.g. SCCP, MCCP, other CPs).

SCCPs content may vary widely and can be as low as 2% (in the adhesive for road marking strips) and up to 95% in accelerators for two-part sealants. The most common concentrations shown in MSDS are 10-30% (RPA 2010).

Since sealants can have long service life of 50 years and longer (e.g. in buildings, reservoirs, sewage treatment works, culverts) the quantity of SCCP containing sealants in use is of particular interest. Some adhesives applications have long service life (e.g. in flooring).

3.2.6 Metal processing

The specific exemptions for SCCPs include metal processing.

Metalworking fluids are liquids, which are supplied to a manufacturing process of a metal in a way that allows for increased productivity based on lubricating and cooling effects (Brinksmeier et al., 2015). In various manufacturing processes, metalworking fluids (MWFs) are applied to ensure workpiece quality, to reduce tool wear, and to improve process productivity (Brinksmeier et al., 2015). MWF play a significant role in manufacturing processes such as forming (Bay et al., 2010), cutting (Weinert et al., 2004), and grinding (Brinksmeier et al. 1999). By their lubricating and cooling properties, MWFs contribute to the avoidance of thermal damage of the workpiece material and reduce wear of the tool.

Liquids which are included in the term MWFs have been classified based on different criteria. According to DIN 51385, MWFs are classified following their composition as oil-based or water-based MWFs (DIN, 2013). They can be categorized according to the manufacturing process as cutting fluid, grinding oil or forming oil.

For oil-based fluids, the chlorinated paraffin content of the fluid ranges from about 5% wt. for light machining up to 70% wt. for heavy drawing processes (metal forming fluids) (BUA, 1992).

Chlorinated paraffins are used in a wide variety of cooling and lubricating fluids used during metal cutting, grinding and forming operations (Brinksmeier et al., 2015). Chlorinated paraffins are in particular used as extreme pressure additive in metal working.

Neat cutting oils find application in a variety of machining operations such as drilling, hobbing, turning, honing, and broaching as they help to enhance the surface finish along with increasing the tool life.

Metal working fluids may have impact on occupational health. According to the German ordinance on occupational diseases, 23% of patients with toxic, toxic-degenerative and allergic contact eczema frequently got in contact with metal working fluids (Bagschik et al., 1998; Barth, 2003).

3.2.7 Lubricants

The specific exemptions for SCCPs include lubricant additives.

There are a wide range of lubricants uses. Lubricants are used in 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 (e.g. machine bearings, centrifuge, rotary compressors, air compressors), power generation (e.g. wind power facilities; electric generators), drilling in oil and gas exploration, petroleum refinery, food & beverage (European Commission 2016; UNEP, 2017).

Many of lubricant uses are open applications with related releases referred to as “Total Loss Lubricants” or “Partial Loss Lubricants” (European Commission 2018). Furthermore, some applications have a particular risk for human exposure. This includes for example all lubrication for the food & beverage sector where direct impact to food can occur. For example, high levels of SCCPs have been detected in food oils in an Asian country (Cao et al., 2015). The SCCP contamination did not stem from the seeds/environment (Cao et al., 2015) and therefore stem from the oil production or refining process. Agriculture and direct exposure at workplace through lubricants should be considered.

3.2.8 Textiles

The current use of SCCPs in textiles is not exempted and is considered low. SCCPs could be applied in textiles as flame retardants, water repellents and rot-preventing textile finishes. Type of textiles that may contain SCCPs include backcoated textiles in furniture upholstery, seating upholstery in transport applications, and interior textiles such as blinds and curtains as well as industrial protective clothing and tents (military and commercial).

SCCPs were used for the production of tent fabrics which have been substituted with rot-flame-water proofing based on a combination of MCCPs, decabromodiphenyl ether and biocide in a formulation based on aqueous dispersions (RPA 2010).

In the European studies, only one textile (the print on a sweater) contained 0.23% SCCPs. It is not recommended to conduct an inventory for SCCP in textiles unless undertaken in conjunction with other POPs currently and formerly used in the textile industry (e.g. decabromodiphenyl ether, hexabromocyclododecane, perfluorooctane sulfonic acid).

3.3 Import and export of SCCPs

SCCPs is listed in Annex III to the Rotterdam Convention and are subject to the Prior Inform Consent (PIC) procedure.

Although there is no specific Harmonized System (HS) codes for SCCPs. HS codes can provide indicative information that could be use in Tier I and can be used for further assessment. Experience has shown that chlorinated paraffins are imported under different HS codes. These are mainly:

(a) HS Code 27122010 Synthetic paraffin wax of a molecular weight of 460 or more but not exceeding 1560;

(b) HS Code 27129090 (paraffin waxes);

(c) HS Code 38122090 Plasticisers, compound; for rubber or plastics;

(d) HS Code 38249090 Chemical products and preparations of the chemical or allied industries, not elsewhere specified or included.

Those codes are not specific to SCCPs nor chlorinated paraffins. However, in some countries additional information may be included in the import documents which can inform if individual imports/exports under these HS categories are chlorinated paraffins.

For SCCPs mixtures, CAS numbers and trade names (see Table 3 above) may be used in combination with above mentioned and further HS codes for the identification at the custom level.

Care should be taken to avoid double counting any import and the respective use of SCCPs in manufacturing of products when documenting the life cycle. For example, by not double counting the quantity of the imported SCCPs and further use of SCCPs in production and use and to clearly document this in the report.

Information on export of SCCPs and other chlorinated paraffins possibly containing SCCPs should be gathered from the chemical industry, chemical associations that are producing or trading SCCPs. All relevant information obtained and gaps, should be included in the inventory.

3.4 SCCPs in wastes

Compared to most other POPs, historical production and use of SCCPs are high (Glüge et al., 2016). Therefore, the amount of waste impacted by SCCP can be expected to be high. However, as the use started already in the 1930s and hazardous waste management capacity and practices were not developed until 1970s, it can be assumed that a large amount of wastes containing SCCPs have already been disposed of (ESWI 2011).

For further guidance on SCCPs in wastes, please refer to the updated general technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants (UNEP/CHW/COP.14/7/Add.1); draft technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with short-chain chlorinated paraffins (UNEP, 2018b); and methodological guide for the development of inventories of hazardous wastes and other wastes under the Basel Convention (UNEP/CHW/COP.12/9/Add.1).

Paragraph 1(d)(iii) of Article 6 of the Convention requires each Party to take appropriate measures such that wastes consisting of, containing or contaminated with a chemical listed in Annex A, B or C are not permitted to be subjected to disposal operations that may lead to recovery, recycling, reclamation, direct reuse or alternative uses of persistent organic pollutants.

Therefore, a robust inventory for SCCP containing wastes should be developed as a basis for the environmentally sound management (ESM) of these wastes. This assessment should be combined with activities for the Basel Convention in a synergistic approach.

3.5 Sites potentially contaminated by SCCPs

Sites where SCCPs have been produced or used could potentially be contaminated with SCCPs depending on the use and waste management practice. Sites where recycling or recovery of SCCP-containing materials takes place may be impacted by SCCPs. Sediments in downstream of sewage treatment plants of factories using SCCPs were frequently contaminated with SCCPs or SCCPs/MCCPs in the mg/kg scale (see Table 7 below).

Table 7: SCCP levels in environmental matrices impacted or not impacted by industrial sources and activities

Sample matrix	Sampling site	Level of SCCPs/chlorinated paraffins	References
Soil (dry weight)	Background Switzerland (grassland), (urban park)	3 µg/kg 35 µg/kg	Bogdal et al., 2017
	Paddy soil around e-waste areas	30.4 to 530 µg/kg	Yuan et al., 2017b
	Soil inside production site	28,000 - 554,000 µg/kg	Wang et al., 2018
	Soil farmland around production site	102 to 441 µg/kg	Wang et al., 2018
Sediment (dry weight)	Lake Thun/Switzerland 1960 and 2000	0.003 and 0.032 µg/kg	Iozza et al., 2008
	Sediment impacted from landfill	19.4 µg/kg (ww)	Borgen et al., 2003
	Lock at production site 2 km downstream of production site	53,000 – 63,000 µg/kg* 1600 µg/kg*	CEFAS 1999
	PVC production/paint manufacture; 100 m, 800 m, 2.5 km downstream STP	21,100 µg/kg*;,<200 µg/kg*; 5,300 µg/kg*	CEFAS 1999
	Producer PVC compounds; 300 m and 500 m downstream STP	25,600 µg/kg** 58,400 µg/kg**	CEFAS 1999
	PVC cable manufacturer at STP and 300 m downstream	19,000 µg/kg** 12,800 µg/kg**	CEFAS 1999
	Metal working/leather finishing 100 m downstream	2,500 µg/kg* 4,900 µg/kg*	CEFAS 1999
Sewage sludge	Sewage sludge UK	7000 – 200,000	Stevens et al., 2003
	Sewage sludge China	800 – 52,700	Zeng et al., 2012
Sewer skin in sewer system	Domestic sewer	500 – 7000 µg/kg	Rieger and Ballschmiter 1995
	Industry impacted sewer	17,000 – 65,000 µg/kg	
Water	Lake Ontario, Canada	0.3 – 1.2 ng/L	Muir et al., 2003
	River water, Japan	7.6 – 31.1 ng/L	Iino et al., 2005
	River water, China	18 – 652 ng/L	Wang et al., 2018b
	Llobregat river, Spain	300 – 2100 ng/L	Castells et. al., 2004
	Landfill leachate, Norway	64,000 – 614,000 ng/L	Harstad 2006

*Mixture of SCCPs and MCCPs.

**Mainly MCCPs.

A screening tool for water release of SCCPs (and other POPs) are “sewer films” attached to the wall of the sewer. Levels of SCCPs in sewer films in industrial areas had 65,000 µg/kg while the sewer films in domestic sewer had levels of 500 µg/kg (Rieger and Ballschmiter 1995).

In accordance with the provisions of Article 6 (1) (e), Parties shall endeavour to develop appropriate strategies for identifying sites contaminated by chemicals listed in Annex A, B or C. Creating and maintaining an inventory and database of sites contaminated by POPs is an important step for a regulatory agency in formulating a strategy for the management of contaminated sites.

This chapter aims at giving step-by-step guidance for identifying and establishing an inventory of sites contaminated by SCCPs in a tiered approach.

The inventory team is recommended to consider the step-by-step approach of UNIDO's “*Persistent Organic Pollutants: Contaminated Site Investigation and Management Toolkit”* (UNIDO 2010), which contains the identification of POP-contaminated sites (not specific to SCCPs), assessing related risks and setting priorities. Furthermore, the UNEP BAT/BEP group is developing a guidance for POPs contaminated sites which should be available shortly.

The inventory should compile information collected during the site investigation from Module 2, preliminary site investigation, stage 1 and/or stage 2, of the UNIDO Toolkit. This information includes the site profile, past and present activities, spill releases, and site owners.

Contaminated sites may be generated during the entire lifecycle of POPs, including their production, manufacturing of products containing POPs, use, recycling and their end-of-life.

Production sites and related landfills and sites where SCCPs have been used in production may be contaminated with SCCPs. Landfills may be the ultimate destination of SCCP-containing products and materials in many countries without appropriate destruction capacity. Even for the EU it is estimated that 67% of SCCPs were landfilled largely in products for the period 1994 to 2010 (ESWI 2011). Monitoring of leachates at 19 municipal waste landfills in Nordic countries revealed a median release of 339 µg/l (Harstad 2006).

A site is generally considered contaminated by POPs when the concentration of one or more contaminants exceeds the regulatory criteria or poses a risk to humans and/or the environment. Since currently no regulation limits for SCCPs in soil exist, contamination may be compared with regulatory limits for PCBs.

Table 8 lists potential sites contaminated with SCCPs due to activities at a different life cycle stage of SCCPs.

Table 8: Potential SCCP-contaminated sites along the life cycle of SCCPs

Live cycle stage	Activities	Locations (with potential other chemicals of concern)
SCCP production	Current and former production sites	Production site (other POPs produced at the site and UPOPs)
	Disposal of waste from SCCP production	Landfills related to waste from production (other POPs produced at the site; UPOPs)
	Former water discharge from production sites	River sediment and flood plains related to releases from production site (other POPs (formerly) produced at the site; UPOPs)
Used in manufacturing of products and mixtures	Production sites of soft PVC	Site of production; Landfill site of related wastes; Impacted surface waters (sediment and flood plains) (PCBs)
	Production sites of rubber (using additives)	Site of production of rubber products; Landfill site of related wastes; Impacted surface waters (sediment and flood plains) (PCBs; PCNs)
	Production of paints and coatings	Sites of production (PCBs; PCNs, heavy metals)
	Production of impregnated textiles and leather	Textiles and leather production sites; Landfill site of related wastes; (PCBs; PCP; PFOS)
	Production of lubricants and metal working fluids (cutting oils, heat exchange oils; lubricants; solvents in chemical production)	Sites where SCCPs were used in lubricants and MWF productions Landfill site of related wastes; (PCBs; PCNs)
	Wood treatment (intumescent paint)	Wood treatment sites (PCP; PCNs, PCBs, endosulfan; HCH; DDT; mirex)
Use of SCCPs	Use of SCCPs containing metal working fluids	Factories were metals are pressed, stamped, drilled, cutted or otherwise treated where cutting oil was/is used (for factories operating before 1975 also PCNs or PCBs)
	Use of SCCPs containing lubricants	engines of automobiles, electric generators and wind power facilities, and for drilling in oil and gas exploration, petroleum refinery to produce diesel oil; food & beverage
	Application of SCCP containing paints for buildings, bridges, towers and	Sites where SCCP paints have been used and have been removed. Soil impacted from

Live cycle stage	Activities	Locations (with potential other chemicals of concern)
	other metal construction and waterproof paints related removal	removal from buildings, bridges etc. (PCBs, PCNs, lead, cadmium)
	Ship painting and paint removal	Docks where ships were painted and repainted (PCBs; PCNs, DDT; Sn-organics. lead)
End-of-life treatment	Recycling and disposal of lubricants, MWFs and other SCCP liquids	Waste oil refineries; waste oil collection (PCBs)
	Recycling of (soft) PVC, certain rubber belts/products,	Recycling areas and landfills with disposed wastes
	Cable smouldering for copper and e-waste recycling (smelters; open burning)	Recycling areas and landfills with disposed wastes (UPOPs; PCDD/Fs, PCBs, PCNs)
	Scrapping/breaking of ships	Ship breaking/scrapping areas (PCBs; PCNs; DDT; Sn-organics)
	Open burning of SCCP containing products	Related sites and sites were residues/ashes are disposed
	(Former) application of SCCP impacted sludge	Application/agricultural land

3.6 Releases of SCCPs into the environment

Releases of SCCPs into the environment may occur during the production, storage, transportation, industrial and consumer usage of SCCP-containing products, disposal and burning of waste, and landfilling of products (Tomy et al., 1998). An overview on estimated releases from the life cycle of SCCPs is compiled in Figure 2 below.

There is currently no evidence of any significant natural source of chlorinated paraffins (including SCCPs) (UK Environment Agency 2003).

SCCPs may be released from products and articles during the service life as well as after their disposal, unless properly managed. ESWI (2011) assumes that about 8 % of the SCCPs in sealants is emitted during lifetime. Landfill leachates and sludge from waste water treatment may contain SCCPs (Danish EPA, 2014; Harstad, 2006; Stevens et al., 2003; Zeng et al., 2012).

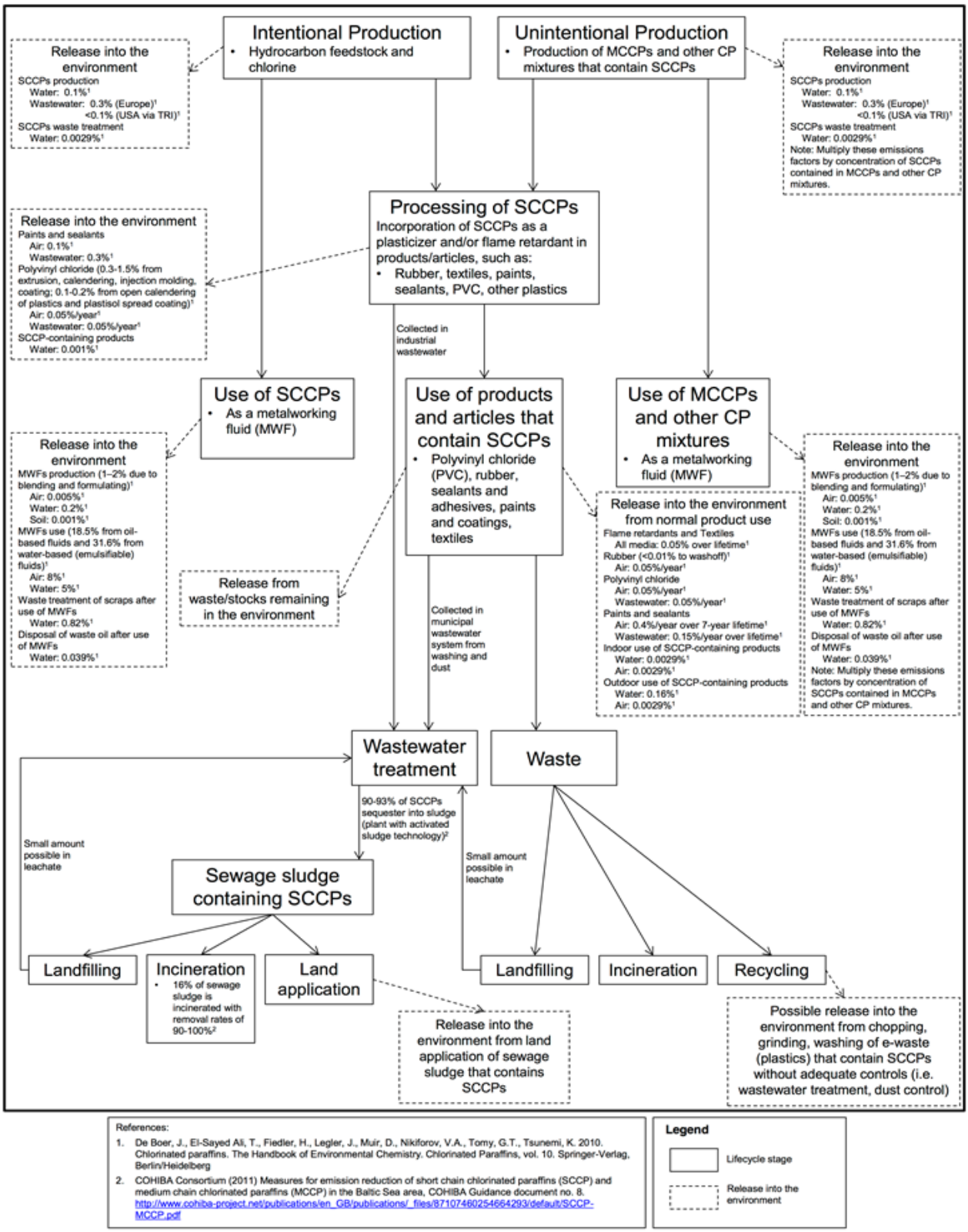

Figure 2: Lifecycle and estimated releases of SCCPs (De Boer et al., 2010; COHIBA Consortium 2011) Note: Emission factors apply to annual consumption/use of SCCPs and products that contain SCCPs. The factors are expressed as percentages; therefore, to estimate the amount of a release in a specific scenario the concentration of SCCPs in the product is multiplied by the emission factor.

3.6.1 Releases from production

Releases from formulation of metalworking fluids

Losses of chlorinated paraffins, including SCCPs, could occur during blending of metalworking fluids. It has been estimated that the likely loss of lubricant at a formulation site is typically in the region of 1%, with a maximum of 2% (ECB 2000). Most of these losses are controlled losses, such as off-specification material that could not be reused but collected and sent for disposal.

Releases from production of rubber

SCCPs are used as a flame retardant, softener or process oil in rubber. SCCPs used as flame retardants are added to rubber in a proportion of 1–10%. The UK risk assessment (UK Environment Agency 2003) discussed the release estimates for plastics additive substances used in the polymer industry, such as MCCPs: the release factors for flame retardants (during the polymer processing step for thermoplastics are 0.1% to air (boiling point <300°C/unknown; vapour pressure <1 Pa) and 0.05% to wastewater. For thermosetting resins, the release factor to air is 0 and the release factor to wastewater is 0.0005 (0.05%).

Releases from production of textiles and polymeric materials

In some applications (e.g., waterproofing fabrics) small amounts of chlorinated paraffins could be applied directly to the textile in an emulsion, which may cause releases to wastewater (ECB 2000, UK Environment Agency 2001). Releases could occur from washing step of these textiles, which are generally used in furniture and other interior decorations.

Releases from production of paints and sealants

Some SCCPs are used in paints to a small extent. Losses to air and wastewater from formulation of SCCP-containing paints and coatings are estimated to be insignificant (UK Environment Agency 2003). Losses to wastewater during the manufacture of sealants are reported to be low or zero. Scrap material and machine cleaning can account for up to 5% solid waste.

3.6.2 Releases from use of products containing chlorinated paraffins

Releases from use of metalworking fluids and lubricants

Large amounts of SCCPs are releases from the use in metal working fluids and lubricants. Experiences from industrial countries indicate that from the use of metal working fluids 18 to 31% of SCCPs are released into the environment. Losses of SCCPs due to carry-off from workpieces were estimated to be 2.5 kg/site per year for a small user (100-L capacity) and 2500 kg/site per year for a large user (95000-L capacity) based on the early 1990s (Government of Canada 1993). The estimated annual losses of chlorinated paraffins from cutting fluid, based on the replacement rates, are thought to be 48% for a large machine shop, 75% for a medium-sized machine shop and 100% for a small machine shop (ECB 2000).

Release from paints, sealants and varnishes

The UK draft risk assessment assumed a release factor for MCCPs to water for outdoor use in paints and sealants of 0.15% per year over 5–7 years and the same fractional release over the 20- to 30-year lifetime of sealants (UK Environment Agency 2003). No estimate of leaching loss from paints was available in the EU assessment of SCCPs (ECB 2000); however, it can be assumed to be similar to that for MCCPs/LCCPs or somewhat higher due to the higher volatility with the lower chain length. Coating and paints are sometimes removed from objects by abrasive blasting resulting in the environmental release of the total or a share of pollutant inventory as has been discovered with PCB paints and related environmental contamination (Jartun et al., 2009; Weber et al., 2018a,b).

Releases from PVC and other plastic

Plasticizers can migrate within the material and leach out of it over time, ending up in the environment or result in human exposure. Recent studies on chlorinated paraffins from food blenders and baking ovens have revealed that leaching of SCCPs and MCCPs from PVC/plastic in polymer coating, gasket or cables (Gallistl et al., 2018; Yuan et al., 2017) can result in human exposure.

Losses from volatilization — Rubber

SCCPs are reported to be used in rubber, with applications mostly in high-density conveyor belts. Releases from use of SCCPs in polymers such as rubber or PVC may occur via volatilization or from loss of polymeric material as particles during wear and abrasion of the products. Volatilization MCCPs during the lifetime of the product is assumed to be 0.05% (UK Environment Agency 2003.

Releases from leather fatliquoring

Leather fatliquoring is an open application with associated releases. SCCPs are slowly released from leather. SCCPs can be released from leather via skin contact and can result in exposure.

3.6.3 Releases during disposal

For the EU it is estimated that 67% of SCCPs were landfilled largely in products for the period 1994 to 2010 (ESWI 2011). Landfilling is a major disposal route for polymeric products in Canada. POPs are released from landfills in leachates at varying degree depending on their physico-chemical properties (Weber et al., 2011). The median concentrations of SCCPs in 19 leachates in Norway were 339 µg/l (Harstad 2006). Emissions of these products, which are effectively dissolved in polymers, could occur for centuries after disposal (IPCS 1996).

The releases and bioavailability of chlorinated paraffins from polymers that are landfilled or from losses of polymeric material as particles during wear and abrasion of flooring, rubber products, etc., are unknown. These releases could be sources of input of chlorinated paraffins to air and soils in urban and industrial areas (UK Environment Agency 2001, 2003).

Polymer-incorporated chlorinated paraffins could be released during recycling of plastics, which may involve processes such as chopping, grinding and washing. If released as dust from these operations, the chlorinated paraffins could be adsorbed to particles because of high sorption coefficients.

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Appendix 1. Examples of tables to compile information

Table A-2: Sample table - Production, import/export, use in manufacturing of products, use in MWFs and lubricants and products containing SCCPs and other chlorinated paraffins containing SCCPs.

Use of SCCPs	Total quantity of products (t)	SCCP content (%)	Total quantity of SCCPs (t)
Production of SCCPs		**	
Production of chlorinated paraffins*			
Import of SCCPs		**	
Import of other chlorinated paraffins *			
Export of SCCP		**	
Export of other chlorinated paraffins *			
SCCPs in manufacturing of products			
Production of PVC			
Production of rubber			
Fire-retardant and water- proofing paint			
Fatliquoring in leather			
Production of adhesives and sealants			
Metal working fluids (MWF)			
Oil based MWF based on SCCPs		Average 50%	
Oil based MWF containing chlorinated paraffins with known/measured SCCP content		Known/measured concentration	
Oil based MWF containing chlorinated paraffins with unknown composition		Average 10%	
Emulsion-based metal working fluids with SCCP		1 %	
Emulsion-based MWF containing chlorinated paraffins* with unknown composition		0.2 %	
Lubricants			
Automotive for consumer market			
Industrial automotive			
Power generation			
Industrial machinery			
Drilling in oil and gas exploration			
Petroleum refinery			
Other lubricant uses			
Products containing SCCPs			
PVC imported (in sale)			
PVC in use/stock			
PVC entering end of life			
Rubber products imported (in sale)			
Rubber products in use/stock			
Rubber entering end of life			
Paints imported (in sale)			
Paints in use/stock			
Adhesives/sealants imported (in sale)			
Adhesives/sealants in use/stock			

*Containing SCCPs; if no information and certificate on the SCCP content can be provided by producers or importers, then 20% SCCP content may be assumed (considering that 165000 t of SCCPs are produced/year (Glüge et al., 2016)).

**100% or measured concentration.

Table A-3: Sample table – Information on alternatives to SCCPs.

Use of SCCPs	Alternatives	Comments regarding performance and cost
Manufacturing of products		
Production of PVC		
Production of rubber		
Fire-retardant and water- proofing paint		
Fatliquoring in leather		
Adhesives and sealants		
Metal processing		
Cutting		
Grinding		
Extreme pressure additive for stamping		
Extreme pressure additive deep drawing		
Others (please note)		
Others (please note)		

Appendix 2. Overview of sampling and analysis of SCCPs

A five-step approach is suggested to determine the occurrence and quantities of POPs in chemicals, products, wastes and materials (UNEP, 2018d). This five-step approach can be applied for SCCPs in different products, including consumer products or samples from industrial processes, chemical formulas and industrial blends consumer products, arriving at the boarders and wastes or contaminated sites and is shortly described in this appendix. Such surveys might be conducted by the customs, authorities responsible for consumer protection and market survey or by other relevant authorities or research institutions.

Step 1: Survey of products and articles containing respective POPs

Before collecting samples, a survey should be conducted to determine the availability of articles that possibly contain or have been contaminated with SCCPs. For selection of samples the need for Tier III inventory information could be assessed along the life cycle. Relevant stakeholders contacted during inventory development could be contacted for support and input and for samples. Following areas could be assessed:

(a) SCCPs and other CP mixtures produced and imported;

(b) SCCPs in manufacturing of products;

(c) SCCPs in consumer goods and industrial uses and stocks:

  (i) PVC;

  (ii) Rubber products;

  (iii) Paints and coatings;

  (iv) Sealants and adhesives;

  (v) Leather and fatliquors;

  (vi) Textiles;

(d) Lubricants and metal working fluids;

(e) Wastes possibly containing SCCPs:

  (i) Wastes generated in production, manufacturing and use;

  (ii) Waste categories;

(f) Sites contaminated with SCCPs (e.g. soils, sediments, sludge).

If access to samples is easy then the team conducting the study might take the samples. Otherwise stakeholders could be included in the sampling as appropriate.

Step 2: Sample collection and pre-screening

Standard sampling procedures should be established and agreed upon before the start of the sampling campaign.

The pre-screening of samples can include specific approaches:

(a) Considerations on the different use areas and products:

  (i) Production of SCCPs and other chlorinated paraffins;

  (ii) Products manufactured with SCCPs or other chlorinated paraffins;

  (iii) Metal working fluids and lubricants possibly containing SCCPs;

  (iv) Products on the market possibly containing SCCPs;

(b) CAS numbers, chemical names or product names (see Table 3).

(c) Certain risk criteria (e.g. HS codes, importing company, receiving company or use for a specific purpose) or certain chemical properties or performance (lubricant; flame retardant).

Sampling should comply with specific national legislation, where it exists, or with international regulations and standards. Where no standard procedure exists, the sampling procedure should be documented including the documentation of the storage and shipment until reaching a laboratory accredited for the respective POPs or otherwise accredited for performing an adequate analysis of the respective sample and selected POPs.

A sampling protocol is to be used and should contain the following information:

(a) Type of sample;

(b) Location of sampling;

(c) Any relevant information on the sample.

The sample should be wrapped in aluminium foil and transferred into a vessel or container (e.g. glass or another inert material) with a cap or screw top. The vessel should be labelled (readable, persistent against solvents and water, with unique information e.g. code related to sampling protocol, if the sample represents any hazard this should be noted, and the sample labelled respectively). The collected samples should be stored adequately (e.g. appropriate temp.; possibly exclusion of light).

Specific care should be given to cross contamination in the laboratory. Samples of pure chemicals or products with high SCCP/POPs content should not contaminate the laboratory when samples containing trace quantities (e.g. air samples) are analysed. Procedural blanks, which are blanks that are treated exactly like the samples, provide good indication if there are background or crossover contamination.

Step 3: Screening in the laboratory

Products, materials or wastes can be screened for the presence of chlorine including X-ray fluorescence XRF or sliding spark spectroscopy (UNEP, 2018d). These mobile screening methods can be used during the field sampling. The non-destructive XRF method might even be used for selections of samples in stores and shops. The sensitivity of the screening methodology should cover the regulatory limit for a respective POP for a certain sample category. Some XRF might reach detection limits for chlorine of approx. 100 mg/kg while others might reach only a limit of 1 g/kg. Additionally, there are laboratory equipment, usually being more sensitive, compared to the mobile equipment used in the field.

When screening methods are applied, it needs to be ensured that the detection limit of the screening method is more sensitive than the legislation limit required for the content of SCCPs.

Step 4: Quantification

Usually quantification requires that the chemical is extracted from the sample and the extract subjected to a clean-up procedure. Extraction methods and the clean-up procedures should be validated and where available taken from standard norms (see below available ISO standards for SCCPs). If own procedures are used, they should have proven to lead to correct results and being robust against modifications in the sample matrix.

Extractions and clean-up can be relatively simple. Similar to PCBs, SCCPs can be extracted from the sample matrix by organic solvents by means of different techniques. Various extraction and clean-up methods for polymers are described in the guidance for monitoring of POPs in products (UNEP, 2018d) which can be used for such matrices containing SCCPs. SCCPs can be cleaned by sulfuric acid and different clean-up columns. A clean-up procedure for all POPs is described in the monitoring guidance using Florisil (see Figure A1). If samples are analysed which might contain PCBs and PCNs (sealants, adhesives, paints, coatings, waste oils) such a monitoring should be combined with the screening of PCBs and PCNs in these applications. Here an aliquot of the extract can be subjected to another clean-up and analysis (see Figure A1).

Finally, instrumental analysis with appropriate sensitivity to achieve the required detection limits needs to be used for the data acquisition and quantification. Currently, several different methods are available for the instrumental quantification of SCCPs. Most of them are based on gas chromatography with mass spectrometry with negative ion chemical ionization (GC/MS-NCI) (Tomy et al. 1997; Reth et al., 2005; Yuan et al., 2017; Krätschmer et al., 2018; Sprengel & Vetter 2019). Both low resolution setups (Reth et al., 2005; Sprengel und Vetter 2019) and high resolution (Tomy et al. 1997; Yuan et al., 2017; Krätschmer et al., 2018) has been shown to be suitable for this task. Details can be found in the respective publications.

Quantification is either done with internal standards (e.g. isotope labelled standards, such as carbon ^{13}C-labelled chemicals for mass spectrometric detection) or other appropriate analytical standards, or by external calibration via commercially available CP mixture standards. Recently, it has been reasoned that the selection of appropriate standards is integral to the quantification procedure (Schinkel et al., 2018).

The detection limits in products and in wastes is between 1 mg/kg (German Federal Environment Agency 2015) and up to 10 mg/kg (ESWI, 2011).

International standards for analysis of SCCPs

Three ISO standard methods are available including one for leather. A new standard for analysis of SCCPs in textiles is under development (ISO/NP 22818). These are:

(a) **ISO 12010:2012:** Water quality – Determination of short-chain polychlorinated alkanes (SCCPs) in water – Method using gas chromatography-mass spectrometry (GC-MS) and negative-ion chemical ionization (NCI);

(b) **ISO 18219:2015:** Leather – Determination of chlorinated hydrocarbons in leather – Chromatographic method for short-chain chlorinated paraffins (SCCP);

(c) **ISO 18635:2016:** Water quality – Determination of short-chain polychlorinated alkanes (SCCPs) in sediment, sewage sludge and suspended (particulate) matter – Method using gas chromatography-mass spectrometry (GC-MS) and electron capture negative ionization (ECNI);

(d) **ISO/NP 22818:** Textiles – Determination of SCCP and MCCP in textile products out of different matrices by use of GC-ECNI-MS (under development).

Challenges with analysing SCCPs

There are a range of analytical difficulties regarding SCCP measurements, such as complex compositions (thousands of isomers and homologues); unviability to quantify individual components; instrument detector response; lack of reference substances matching commercial products; poor description of reference materials; high detection limits (when compared to other POPs) and elevated analytical cost (UNEP, 2018b).

Step 5: Documentation and reporting/inventory

The results could contribute to Tier III inventory in the different chapters and improve the reliability of the inventory. This should be described in the reporting and in integration into the inventory report.

The result of the screening could be documented in an appropriate form. The reporting might include the compilation in the form of a report on the monitoring study including scope, samples, procedures, and results. Gaps and further suggested monitoring can be included.

New results contributing to the improvement of this inventory guidance can be reported to the Secretariat of the Stockholm Convention.

Case studies on screening SCCPs in products

In recent years some monitoring studies of SCCPs and other chlorinated paraffins were conducted and an assessment of the analytical and sampling approaches taken might be useful.

(a) A study on 16 kitchen food blenders revealed high release of SCCPs and MCCPs from most of the assessed kitchen blenders into food (Yuan et al, 2018). SCCPs had a high share of the releases (see Table A-4). The monitoring of components after dismantling revealed that self-lubricating bearings and/or polymer components disassembled from the hand blenders were the source of the chlorinated paraffins (Yuan et al 2018). The CP leakage showed no decreasing levels after 20 times of hand blender usage (Yuan et al., 2018) indicating long term exposure for consumers.

(b) In a screening of chlorinated paraffins and other flame retardants in 21 baking ovens in Germany, high levels of chlorinated paraffins (1000 mg/kg in fat in the oven) mainly of MCCPs and lower levels of SCCPs were detected inside of 10 of the backing ovens while the other 11 ovens were virtually free of chlorinated paraffins (Gallistl et al., 2018). The exceptionally high concentrations and exclusive presence of chlorinated paraffins in half of the samples produced strong evidence that these compounds were released from the baking oven itself. This hypothesis was supported by detection of chlorinated paraffins at even higher concentrations in the inner components of one dismantled baking oven.

(c) Unintentional POPs in chlorinated paraffins. A monitoring of chlorinated unintentional POPs in chlorinated paraffin mixtures and products revealed high levels of PCBs, PCNs and PeCBz.

(d) Within the screening of SCCPs on the European market (RAPEX system), the most common sources of SCCP in toy material are secondary plasticiser in PVC (BTHA 2016). An analysis of the levels of SCCP identified in PVC materials (including toy figures, sheet PVC and faux leather) indicates a typical range of 0.3% to 10%. PVC containing SCCPs may be used as a backing sheet for hook and loop fasteners and the backs of plastic stickers. Rubber used in toy car tyres has contained SCCP. Furthermore, SCCP have been found in EVA foam yoga mats up to 7% (see UNEP, 2018b, annex II). The toys using similar materials may need checking for compliance.

Table A-4: Chain length categories of chlorinated paraffins (SCCP, MCCP and LCCP) released from commercial kitchen hand blenders and related average chlorination degree (Yuan et al., 2017). Error! Bookmark not defined.

Product	Purchased	SCCP	MCCP	LCCP	Average chlorine (%)
Hand blender	2014	9	91		54
Hand blender	2014	19	81		55
Hand blender	2016	12	88		52
Hand blender	2016	59	35	6	57
Hand blender	2014	33	67		55
Hand blender	2016	33	67		56
Hand blender	2014	9	91		53
Hand blender	2014	4	92	4	54
Hand blender	2014	12	88		51
Hand blender	2014	56	44		56
Hand blender	2014	52	48		56
Hand blender	2016	53	47		56

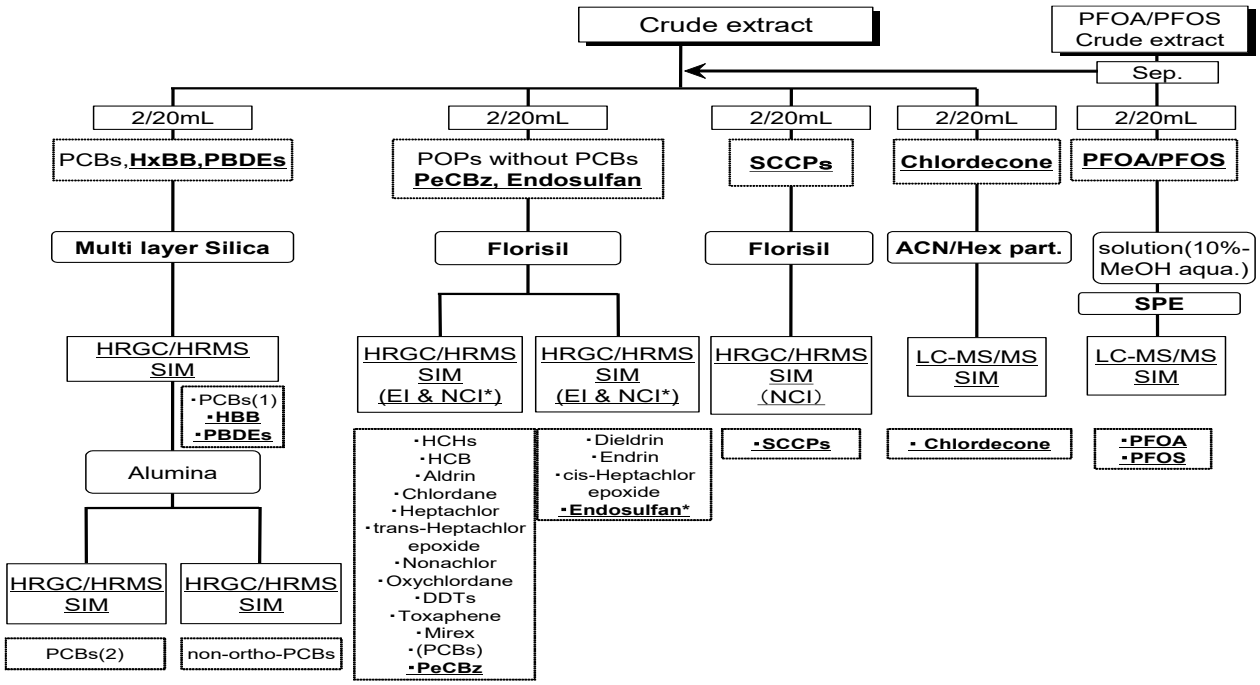

Figure A-1: Clean-up of an air sample and instrumentation for analysis of all listed POPs in air (courtesy Prof. Takumi Takasuga; Shimadzu Techno Research, Japan) (UNEP, 2018d).

Appendix 3. Questionnaire for compiling information on the production and import/export of SCCPs and other chlorinated paraffins possibly containing SCCPs

Persistent organic pollutants (POPs) are toxic chemicals that adversely affect human health and the environment. They persist for long periods of time in the environment and can accumulate in the food chain and finally contaminate people. The Stockholm Convention is a global treaty which supports the phase out of POPs.
In 2017 Short-Chain Chlorinated Paraffins (SCCPs)[7] with a chain length of C10-13 and a chlorine content of >48% were listed as POPs in Annex A, with specific exemptions. Additionally, a limit for the presence of SCCPs in medium-chain chlorinated paraffins (MCCPs) and other chlorinated paraffin mixtures (CPs) was set at 1% by weight otherwise these are POPs.

Therefore the government is assessing the current production, import, export and use of SCCPs[9] and other chlorinated paraffin mixtures containing more than 1% SCCPs[8] Based on the assessment of the current use and alternatives available for SCCPs in lubricants, the government will decide on further steps to restrict the use of SCCPs or to grand exemptions for continuing use and gradual phase out of SCCPs.

The following survey has been developed to gather relevant information from producers and importer and export of SCCPs and other chlorinated paraffins.

Name of establishment Registration number	
Address	
Name of respondent	
Position	
Telephone/Mobile	
Email	
Signature/date	

This questionnaire is divided in 4 sections

Section A: General

Section B: For producer of SCCPs and other chlorinated paraffins

Section C: Import of SCCPs

Section D: Export of SCCPs

Section E: Waste management and recycling

Please fill in the section(s) below which are relevant for your activity domain (manufacturer/importer/user/recycler/waste manager etc.).

[7] SCCPs: Short Chain Chlorinated Paraffins (molecule: $C_xH_{(2x-y+2)}Cl_y$ where x = 10-13; y = 3-12; Cl >48%).

Section A: General

1. **Do you produce ☐ or import ☐ or trade/sell ☐ and/or import ☐ ?**

2. **Are you aware that SCCPs are listed as POPs in the Stockholm Convention and will be restricted with the option of continued use after exemptions have been registered by the government? Your action?**
   - ☐ Yes
   - ☐ No
   - ☐ We have stopped the production ☐ the import ☐ of SCCPs in _____year
   - ☐ We are planning to stop the production ☐ the import ☐ of SCCPs in _____month/year
   - ☐ We plan to continue production ☐ the import ☐ of SCCPs and will ask for exemption.

3. **Are you aware that medium chain chlorinated paraffins (MCCPs) and other CP mixtures with a content of more than 1% SCCPs is a POP and may be restricted depending on exemptions?**[8]
   - ☐ Yes
   - ☐ No
   - ☐ We can guarantee that the MCCPs/CPs contain less than 1% SCCPs (please attach certificates).
   - ☐ We do not know the SCCPs content of the MCCPs and other chlorinated paraffins produced ☐ imported ☐
   - ☐ We plan to measure the SCCPs content of the MCCPs/CPs produced ☐ imported ☐

Section B: <u>For producer</u> of chlorinated paraffins

4. **Since when do you produce chlorinated paraffins?** _____

5. **Do you produce or import any of the following chemicals?**

Chemical Abstracts Service (CAS) Numbers of SCCPs and other chlorinated paraffins which may contain SCCPs or which may be contaminated with SCCPs

85535-84-8 (SCCPs (C10-13))		71011-12-6 (Alkanes, C12-13, chloro) 108171-26-2 (Alkanes, C10-12, chloro)	
85536-22-7 (Alkanes, C12-14, chloro) 85681-73-8 (Alkanes, C10-14, chloro)		84082-38-2 (Alkanes, C10-21, chloro) 97659-46-6 (Alkanes, C10-26, chloro) 84776-06-7 (Alkanes, C10-32, chloro)	
68920-70-7 (Alkanes, C6-18, chloro)		61788-76-9 (Alkanes, chloro) 63449-39-8 (Paraffin waxes and Hydrocarbon waxes, chloro) 97553-43-0 (Paraffins, normal C>10, chloro)	
Other chlorinated paraffins (**CAS number?**_____)		85535-85-9 (MCCPs; C14-18, chloro)	

6. **Do you guarantee the chlorinated paraffins produced or imported that they contain less than 1% SCCPs?** _____

Which SCCP concentration limit is guaranteed? _____

[8] CP mixtures which contain SCCPs >1% (chlorine content >48%) as impurity are considered POPs.

Which analytical method do you use to measure SCCP in CP mixtures?

What is the limit of detection of SCCPs in other chlorinated paraffins?

Section C I: Production of SCCPs or other chlorinated paraffins

7. Please fill the table below on the quantities of SCCPs and other chlorinated paraffins produced, chain length

Year	A) SCCPs produced (t/a; Chain length)	Chlorine content	CAS		B) Other chlorinated paraffins produced (t/a; Chain length)	% SCCPs	Chlorine Content	CAS
2020 (estimate)								
2019 (estimate)								
2018								
2016								
2015								

Section C II: Export of SCCPs or other chlorinated paraffins

8. Please fill the table below on the quantities of exported SCCPs and other chlorinated paraffins

Year	A) SCCPs exported (t/a; Chain length)	Chlorine content	CAS		B) Other chlorinated paraffins exported (t/a; Chain length)	% SCCPs	Chlorine Content	CAS
2020 (estimate)								
2019 (estimate)								
2018								
2016								
2015								

Section D: Importation of SCCPs or other chlorinated paraffins

9. a) Please fill the table below on the quantities of imported SCCPs and other chlorinated paraffins

Year	A) SCCPs imported (t/a; Chain length)	Chlorine content	CAS		B) Other chlorinated paraffins imported (t/a; Chain length)	% SCCPs	Chlorine Content	CAS
2020 (estimate)								
2019 (estimate)								
2018								
2016								
2015								

Section E: Recycling and waste management of SCCPs

10. Do you recycle/reuse any SCCPs or other chlorinated paraffins from any use?

- ☐ No
- ☐ Yes_ From which uses? _____

_____

11. Please elaborate on the waste management of waste from production and use.

a. What wastes are generated from SCCP/CP production and how are they managed?

_____

_____

_____

_____

b. Do you contribute to the end of life management and treatment of SCCPs/CPs you sold? How?

_____

_____

_____

_____

_____

12. Have you ever conducted an environmental audit? If yes, please elaborate more (date, internal, external, consultancy firm….)

_____

_____

13. Do you have ISO 14001? Yes___ No___ Or a similar certificate_____

Appendix 4. Questionnaire for compiling information on the use of SCCPs in the manufacturing and import of PVC products

Persistent organic pollutants (POPs) are toxic chemicals that adversely affect human health and the environment. They persist for long periods of time in the environment and can accumulate in the food chain and finally contaminate people. The Stockholm Convention is a global treaty which supports the phase out of POPs. In 2017 Short-Chain Chlorinated Paraffins (SCCPs)[9] with a chain length of C10-13 and a chlorine content of >48% were listed as POPs in Annex A, with specific exemptions. Additionally, a limit for the presence of SCCPs in medium-chain chlorinated paraffins (MCCPs) and other chlorinated paraffin mixtures (CPs) was set at 1% by weight otherwise these are POPs.

SCCPs are used as plasticizers in flexible PVC (e.g. secondary plasticizers in flexible PVC). The use of SCCPs as secondary plasticizers in flexible PVC has been exempted (except in toys and children's products) in the Convention but will need to be phased out after a certain period.

Therefore the government is assessing the current production, import and use of SCCPs[9] and other chlorinated paraffin mixtures containing more than 1% SCCPs[9]. Based on the assessment of the current use and alternatives available for SCCPs in lubricants, the government will decide on further steps to restrict the use of SCCPs or to grand exemptions for continuing use and gradual phase out of SCCPs.

The following survey has been developed to gather relevant information that will support these activities.

Name of establishment Registration number	
Address	
Name of respondent	
Position	
Telephone/Mobile	
Email	
Signature/date	

This questionnaire is divided in 4 sections

Section A: General

Section B: For producer of PVC products

Section C: Imported PVC

Section D: Alternatives to SCCPs

Section E: Waste management and recycling

Please fill in the/those section(s) below which is/are relevant for your activity domain (manufacturer/importer/user/recycler/waste manager etc.).

[9] SCCPs: Short Chain Chlorinated Paraffins (molecule: $C_xH_{(2x-y+2)}Cl_y$ where x = 10-13; y = 3-12; Cl >48%).

Section A: General

1 Do you produce ☐ or import ☐ or trade/sell ☐ or use ☐ PVC products?

2 Are you aware that SCCPs are listed as POPs and will be restricted with the option of continued use after exemptions have been registered by the government? Your action?

- ☐ Yes
- ☐ No
- ☐ We have stopped the use of SCCPs in _____year
- ☐ We are planning to stop the use of SCCPs in _____month/year
- ☐ We plan to continue use of SCCPs and will ask for exemption for the use

3 Are you aware that medium chain chlorinated paraffins (MCCPs) and other CP mixtures with a content of more than 1% SCCPs may be restricted depending on exemptions?[10]

- ☐ Yes
- ☐ No
- ☐ We have a guarantee that the MCCPs/CPs contain less than 1% SCCPs
- ☐ We do not know the SCCPs content of the MCCPs and other chlorinated paraffins used
- ☐ We plan to measure the SCCPs content of the MCCPs/CPs used

Section B: <u>For producers</u> of PVC products

4 What type of PVC products do you produce? _____

5 Do you use any of the following chemicals/CAS in the production of PVC?

Chemical Abstracts Service (CAS) Numbers of SCCPs and other chlorinated paraffins which may contain SCCPs or which may be contaminated with SCCPs

85535-84-8 (SCCPs (C10-13))		71011-12-6 (Alkanes, C12-13, chloro) 108171-26-2 (Alkanes, C10-12, chloro)	
85536-22-7 (Alkanes, C12-14, chloro) 85681-73-8 (Alkanes, C10-14, chloro)		84082-38-2 (Alkanes, C10-21, chloro) 97659-46-6 (Alkanes, C10-26, chloro) 84776-06-7 (Alkanes, C10-32, chloro)	
68920-70-7 (Alkanes, C6-18, chloro)		61788-76-9 (Alkanes, chloro) 63449-39-8 (Paraffin waxes and Hydrocarbon waxes, chloro) 97553-43-0 (Paraffins, normal C>10, chloro)	
Other chlorinated paraffins (**CAS number?**_____)		85535-85-9 (MCCPs; C14-18, chloro)	

Please describe here if you have a guarantee for any of the chlorinated paraffins used that they contain less than 1% SCCPs. _____

Which SCCP concentration limit is guaranteed?_____

6 What function do the SCCPs have in the PVC?

- ☐ Plasticizer
- ☐ Flame retardant
- ☐ Solvent
- ☐ Other_____

7 What other chemicals and additives do you use in PVC production?

Plasticizers: _____

Antioxidants: _____

Other chemicals: _____

[10] CP mixtures which contain SCCPs >1% (chlorine content >48%) as impurity are considered POPs.

8 Please list below* the amount of SCCPs and MCCPs (other chlorinated paraffins listed in question 5) used in the production of PVC

PVC Product (type; name)	% of SCCPs in the PVC	% MCCPs in the PVC	CAS numbers	Country/company of origin of SCCPs/ MCCPs or other chlorinated paraffins if imported (and HS Code)	Company/Source of SCCPs/MCCPs/other chlorinated paraffins if locally purchased (and contact)	Use of the PVC	Year (can be modified)	Quantity Produced (tonnes)
							≤ 2016	
							2017	
							2018	
							2019 (estimate)	
							≤ 2016	
							2017	
							2018	
							2019 (estimate)	
							≤ 2016	
							2017	
							2018	
							2019 (estimate)	

*Please feel free to provide more information on separate sheet

Section C: Importation of PVC products

9 a) Please fill the table below on the quantities of imported PVC containing SCCPs

Year (can be modified)	Total quantity/type of imported PVC per year (tonnes) containing SCCPs	% of SCCPs in PVC	CAS numbers of SCCPs	Total quantity sold/used locally (tonnes)	Total quantity exported (tonnes)
2019 (estimate)					
2018					
2016					

b) Please fill the table below regarding the quantities of PVC containing MCCPs or other chlorinated paraffins possibly contaminated by SCCPs in imported products

Year (can be modified)	Total quantity/type of imported PVC containing MCCPs or other CP (tonnes)	% of MCCPs or other chlorinated paraffins in PVC	CAS number of chlorinated paraffin	Total quantity sold locally (tonnes)	Total quantity exported (tonnes)
2019 (estimates)					
2018					
2017					

Section D: Alternatives to SCCPs

10 Are you aware of any alternatives to SCCPs in PVC?

- ☐ No
- ☐ Yes, please list known alternatives_____
- ☐ Are you using alternatives? Please list_____

11 Are you interested and willing to switch to an alternative for SCCPs (please keep in mind that SCCPs will have to be phased out over time)?

- ☐ Yes
- ☐ No, not at the moment. If no, then please elaborate more on the reasons:

Economic Reasons:
Technical Reasons:
Other Reasons:

12 What are your requirements/needs to switch to an alternative to SCCPs or other chlorinated paraffins contaminated by SCCPs?

Section E: Recycling and waste management of PVC

13 Do you use recycled PVC for your production □ in your PVC product imports □ ?

- □ Yes, if yes then please go to question number 14
- □ No, if no then please go to question number 19
- □ I do not know

14 In which products do you use recycled PVC or are recycled PVC used? (please list)

_____

15 Do you mix PVC from recycling with virgin PVC (what %)?

_____

16 What are the sources of PVC for recycling or the recycled products?

- □ From your premises, what %: _____
- □ Collection from the local market, what %: _____
- □ Others _____

17 What are additives of concern and concentration in the recycling of or in recycled PVC?

SCCP contents (%): _____
Other additives of concern (content %)_____

18 What is the quantity of PVC products produced □ imported □ from recycled PVC*?

Total quantity of PVC produced □ imported □ from recycled PVC per year*	
Year	Quantity (tonnes and/or quantity units**)
2016	
2017	
2018	
2019 (estimates)	

*details can be compiled in a separate sheet/table for other years or years modified
**like number of window frames, doors etc.

19 Please elaborate more on your internal waste management procedure regarding the PVC waste in production.

a) PVC waste stockpiles

_____

_____

b) PVC waste sold:

Locally:

_____

_____

Exported:

_____

c) PVC waste reused in the same company: _____

20 Please elaborate on the waste management of PVC from end-of-life products.

21 How is PVC from end of life from housing and construction managed?

_____

_____

22 How is the end-of-life treatment of PVC in other product and waste categories (please describe for individual product/waste category)

23 Have you ever conducted an environmental audit? If yes, please elaborate more (date, internal, external, consultancy firm….)

24 Do you have ISO 14001? Yes___ No___ Or a similar certificate_____

Appendix 5. Questionnaire for compiling information on the use of SCCPs in the manufacturing and import of SCCPs in rubber

Persistent organic pollutants (POPs) are toxic chemicals that adversely affect human health and the environment. They persist for long periods of time in the environment and can accumulate in the food chain and finally contaminate people. The Stockholm Convention is a global treaty which supports the phase out of POPs. In 2017 Short-Chain Chlorinated Paraffins (SCCPs)[11] with a chain length of C10-13 and a chlorine content of >48% were listed as POPs in Annex A, with specific exemptions. Additionally, a limit for the presence of SCCPs in medium-chain chlorinated paraffins (MCCPs) and other chlorinated paraffin mixtures (CPs) was set at 1% by weight otherwise these are POPs.

SCCPs are used as additive, process oils or flame retardants in rubber. The use of SCCPs in additives in the production of transmission belts in the natural and synthetic rubber industry and in spare parts of rubber conveyor belts in the mining and forestry industries have been exempted in the Convention but will need to be phased out after a certain period.

Therefore the government is assessing the current production, import and use of SCCPs[11] and other chlorinated paraffin mixtures containing more than 1% SCCPs[12]. Based on the assessment of the current use and alternatives available for SCCPs in lubricants, the government will decide on further steps to restrict the use of SCCPs or to grand exemptions for continuing use and gradual phase out of SCCPs.

The following survey has been developed to gather relevant information that will support these activities.

Name of establishment Registration number	
Address	
Name of respondent	
Position	
Telephone/Mobile	
Email	
Signature/date	

This questionnaire is divided in 5 sections:

Section A: General

Section B: Rubber produced in the country

Section C: Imported rubber

Section D: Alternatives to SCCPs

Section E: Waste management and recycling

Please fill in the section(s) below which is/are relevant for your activity domain (manufacturer/importer/user/recycler/waste manager etc.).

[11] SCCPs: Short Chain Chlorinated Paraffins (molecule: $C_xH_{(2x-y+2)}Cl_y$ where x = 10-13; y = 3-12; Cl >48%).

Section A: General

1 Are you aware that short chain chlorinated paraffins (SCCPs) are listed as POPs and become restricted?

- ☐ Yes
- ☐ No
- ☐ We have stopped the use of SCCPs in _____Year
- ☐ We are planning to stop the use of SCCPs in _____Year
- ☐ We plan to continue use of SCCPs and will ask for use exemption_____

2 Are you aware that medium chain chlorinated paraffins (MCCPs) with a content of more than 1% SCCPs can become restricted?[12]

- ☐ Yes
- ☐ No
- ☐ We have a guarantee that the MCCPs contain less than 1% SCCPs
- ☐ We do not know the SCCPs content of the MCCPs used
- ☐ We plan to measure the SCCPs content of the MCCPs used

3 Do you produce ☐ or import ☐ or use ☐ rubber/rubber articles containing SCCPs or other chlorinated paraffins (CPs) listed in the table in question 5 which could contain SCCPs under the specific exemptions granted under Stockholm Convention?

- ☐ Additives in the production of transmission belts in the natural and synthetic rubber industry
- ☐ Spare parts of rubber conveyor belts in the mining and forestry industries
- ☐ Other rubber products. Please specify

Section B: Rubber/rubber articles produced in the country

4 What type of rubber and what kind of rubber articles do you produce?

_____

5 Do you use any of the following chemicals in the production process

Chemical Abstracts Service (CAS) Numbers of SCCPs and other chlorinated paraffins which may contain SCCPs or which may be contaminated with SCCPs

85535-84-8 (SCCPs (C10-13))		71011-12-6 (Alkanes, C12-13, chloro) 108171-26-2 (Alkanes, C10-12, chloro)	
85536-22-7 (Alkanes, C12-14, chloro) 85681-73-8 (Alkanes, C10-14, chloro)		84082-38-2 (Alkanes, C10-21, chloro) 97659-46-6 (Alkanes, C10-26, chloro) 84776-06-7 (Alkanes, C10-32, chloro)	
68920-70-7 (Alkanes, C6-18, chloro)		61788-76-9 (Alkanes, chloro) 63449-39-8 (Paraffin waxes and Hydrocarbon waxes, chloro) 97553-43-0 (Paraffins, normal C>10, chloro)	
Other chlorinated paraffins (**CAS number?**_____)		85535-85-9 (MCCPs; C14-18, chloro)	

Please describe here if you have a guarantee for any of the chlorinated paraffins used that they contain less than 1% SCCPs.

_____

Which SCCP concentration limit is guaranteed?_____

6 What function do the SCCPs have in the rubber?

[12] Chlorinated paraffins mixtures which contain SCCPs >1% (chlorine content >48%) as impurity are considered POPs.

- ☐ Additive
- ☐ Flame retardant
- ☐ Other_____

7 What other additives or flame retardants do you use in rubber production?

_____
_____
_____

8 Please list below* the amount of SCCPs and MCCPs (other chlorinated paraffins listed in question 2) used in the production of rubber

Rubber/Rubber article (type; name)	% of SCCPs in the rubber/rubber article	% MCCPs in the rubber/rubber article	CAS numbers	Country/company of origin of SCCPs/ MCCPs or other chlorinated paraffins if imported (and HS Code)	Company/Source of SCCPs/MCCPs/other chlorinated paraffins if locally purchased (and contact)	Use of the rubber/rubber article	Year	Quantity Produced (tonnes)
							2017	
							2018	
							2019	
							2020 (estimate)	
							2017	
							2018	
							2019	
							2020 (estimate)	
							2018	
							2019	
							2020	

*Please feel free to provide more information on separate sheet

Section C: Imported rubber/rubber articles

9 a) Please fill the table below on the quantities of imported rubber/rubber articles containing SCCPs

Year	Total quantity/type of imported rubber/rubber articles per year (tonnes) containing SCCPs	% of SCCPs in rubber/rubber article	CAS numbers of SCCPs	Total quantity sold/used locally (tonnes)	Total quantity exported (tonnes)
2018 (estimate)					
2017					
2016					

b) Please fill the table below regarding the quantities of imported rubber/rubber article containing MCCPs or other chlorinated paraffins possibly contaminated with SCCPs

Year	Total quantity/type of imported rubber/rubber articles containing MCCPs/other chlorinated paraffins (t)	% of MCCPs or other chlorinated paraffins in rubber	CAS number of chlorinated paraffin	Total quantity sold locally (tonnes)	Total quantity exported (tonnes)
2019 (estimates)					
2018					
2017					

Section D: Alternatives to SCCPs in rubber production

10 Are you aware of any alternatives to SCCPs in rubber production?

- ☐ No
- ☐ Yes, please list known alternatives_____
- ☐ Are you using alternatives? Please list_____

11 Are you interested and willing to switch to an alternative to SCCPs (please keep in mind that SCCPs will have to be phased out over time)?

- ☐ Yes
- ☐ No, not at the moment. If no, then please elaborate more on the reasons:

Economic Reasons:
Technical Reasons:
Other Reasons:

12 **What are your requirements/needs to switch to an alternative to SCCPs or chlorinated paraffins contaminated by SCCPs?**

Section E: Waste management and recycling

13 Do you use recycled rubber for your production?

- ☐ Yes, if yes please go to question number 13
- ☐ No, if no please go to question number 18

14 In which products do you use recycled rubber? (please list)

15 Do you mix rubber from recycling with virgin rubber (what %)?

16 What are the sources of rubber for recycling?

- ☐ From your premises, what %: _____
- ☐ Collection from the local market, what %: _____
- ☐ Others (e.g. import) _____

17 What are additives/flame retardants of concern in the recycling of rubber (please list)

18 What is the quantity of rubber articles produced from recycled rubber*?

Total quantity of rubber produced from recycled rubber per year*	
Year	Quantity (tonnes and/or quantity units**)
2015	
2016	
2017	
2018 (estimates)	

***details can be compiled in a separate sheet/table

**like number of rubber articles etc.

19 Please elaborate more on your internal waste management procedure regarding the rubber waste in production.

a) Rubber waste stockpiles

b) Rubber waste sold:

Locally: **Exported:**

c) Rubber waste reused in the same company

20 Please elaborate on the waste management of rubber from end-of-life products.

21 How is rubber from end of life from transportation and conveyor belts managed?

22 How is the end-of-life treatment of rubber in other product and waste categories (please describe for individual product/waste category)

23 Have you ever conducted an environmental audit? If yes, please elaborate more (date, internal, external, consultancy firm….)

Appendix 6. Questionnaire for compiling information on the production, import and use of SCCPs in metal working fluids[13]

Persistent organic pollutants (POPs) are toxic chemicals that adversely affect human health and the environment. They persist for long periods of time in the environment and can accumulate in the food chain and finally contaminate people. The Stockholm Convention is a global treaty which supports the phase out of POPs. In 2017 Short-Chain Chlorinated Paraffins (SCCPs)[14] with a chain length of C10-13 and a chlorine content of >48% were listed as POPs in Annex A, with specific exemptions. Additionally, a limit for the presence of SCCPs in medium-chain chlorinated paraffins (MCCPs) and other chlorinated paraffin mixtures (CPs) was set at 1% by weight otherwise these are POPs.

SCCPs are used as additives as metal working fluids in a range of processes (stamping, milling, thread cutting/rolling, boring). The use of SCCPs in metal processing has been exempted in the Convention but will need to be phased out after a certain period.

Therefore the government is assessing the current production, import and use of SCCPs[14] and other chlorinated paraffin mixtures containing more than 1% SCCPs[15]. Based on the assessment of the current use and alternatives available for SCCPs in lubricants, the government will decide on further steps to restrict the use of SCCPs or to grand exemptions for continuing use and gradual phase out of SCCPs.

The following survey has been developed to gather relevant information that will support these activities.

Name of establishment Registration number	
Address	
Name of respondent	
Position	
Telephone/Mobile	
Email	
Signature/date	

This questionnaire is divided in 5 sections:

Section A: General

Section B: Metal working fluids produced in the country

Section C: Imported metal working fluids

Section D: Alternatives to SCCPs

Section E: Waste management and recycling

Please fill in the section(s) below which is/are relevant for your activity domain (manufacturer/importer/user/recycler/waste manager etc.).

[13] The questionnaire can in a slightly modified way be used as questionnaire for lubricants

[14] SCCPs: Short Chain Chlorinated Paraffins (molecule: $C_xH_{(2x-y+2)}Cl_y$ where x = 10-13; y = 3-12; Cl >48%).

Section A: General

1 Are you aware that short chain chlorinated paraffins (SCCPs) are listed as POPs and will be restricted?

- ☐ Yes
- ☐ No
- ☐ We have stopped the use of SCCPs in _____Year
- ☐ We are planning to stop the use of SCCPs in _____Year
- ☐ We plan to continue use of SCCPs and will ask for use exemption

2 Are you aware that medium chain chlorinated paraffins (MCCPs) with a content of more than 1% SCCPs will be restricted?[15]

- ☐ Yes
- ☐ No
- ☐ We have a guarantee that the MCCPs contain less than 1% SCCPs
- ☐ We do not know the SCCPs content of the MCCPs used
- ☐ We plan to measure the SCCPs content of the MCCPs used

3 Do you produce ☐ or import ☐ or use ☐ metal working fluids containing SCCPs or other chlorinated paraffins (CPs) listed in the table in question 5 which could contain SCCPs? If yes please list below the name of metal working fluids.

Section B (for producer): Metal working fluids produced in the country

4 What type of metal working fluid do you produce?

5 Do you use any of the following chemicals in the production of metal working fluids?

6 Do you use any of the following chemicals in the production process?

Chemical Abstracts Service (CAS) Numbers of SCCPs and other chlorinated paraffins which may contain SCCPs or which may be contaminated with SCCPs

85535-84-8 (SCCPs (C10-13))		71011-12-6 (Alkanes, C12-13, chloro) 108171-26-2 (Alkanes, C10-12, chloro)	
85536-22-7 (Alkanes, C12-14, chloro) 85681-73-8 (Alkanes, C10-14, chloro)		84082-38-2 (Alkanes, C10-21, chloro) 97659-46-6 (Alkanes, C10-26, chloro) 84776-06-7 (Alkanes, C10-32, chloro)	
68920-70-7 (Alkanes, C6-18, chloro)		61788-76-9 (Alkanes, chloro)[15] 63449-39-8 (Paraffin waxes and Hydrocarbon waxes, chloro) 97553-43-0 Paraffins, normal C>10, chloro)	
Other chlorinated paraffins (**CAS number?**_____)		85535-85-9 (MCCPs; C14-18, chloro)	

Please describe here if you have a guarantee for any of the chlorinated paraffins used that they contain less than 1% SCCPs.

[15] CP mixtures which contain SCCPs >1% (chlorine content >48%) as impurity are considered POPs

_____
_____

7 Which SCCP concentration limit is guaranteed?_____

8 What other chemicals and additives do you use in metal working fluids production?

_____
_____

9 Please list below* the amount of SCCPs and MCCPs (other chlorinated paraffin listed in question 2) used in the production of metal working fluids

Metal working fluid Product (name; type)	% of SCCPs in the metal working fluid	% MCCPs in the metal working fluid	CAS numbers	Country/company of origin of SCCPs/ MCCPs or other chlorinated paraffins if imported (and HS Code)	Company/Source of SCCPs/MCCPs/other chlorinated paraffins if locally purchased (and contact)	Use of the metal working fluid	Year	Quantity Produced (tonnes)
							2015	
							2016	
							2017	
							2018 (estimate)	
							2015	
							2016	
							2017	
							2018 (estimate)	
							2015	
							2016	
							2017	
							2018 (estimate)	

***Please feel free to provide more information on separate sheet**

Section C (Importers): Imported metal working fluids with SCCPs or other chlorinated paraffins

10 a) Please fill the table below* regarding the quantities of imported metal working fluids containing SCCPs

Year	Total quantity of imported metal working fluid containing SCCPs (tonnes per year)	% of SCCPs in metal working fluid	CAS numbers of SCCPs	Total quantity sold/used in country (tonnes)	Total quantity exported (tonnes)
2019 (estimate)					
2018					
2017					

***Please feel free to provide more information on separate sheet**

9 b) Please fill the table below regarding quantities of imported metal working fluids containing MCCPs or other chlorinated paraffins possibly contaminated by SCCPs

Year	Type and quantity of imported metal working fluid containing MCCPs or other chlorinated paraffins (tonnes per year)	% of MCCPs or other chlorinated paraffins in metal working fluid	CAS number of chlorinated paraffin	Total quantity sold/used locally (tonnes)	Total quantity exported (tonnes)
2019 (estimates)					
2018					
2017					

Section D: Alternatives to SCCPs in metal working fluids (MWF)

11 Are you aware of any alternatives to SCCPs?

- ☐ No
- ☐ Yes, please list known alternatives (which MWF use) _____
- ☐ Are you using alternatives? Please list_____

12 Are you interested and willing to switch to an SCCP alternative (please keep in mind that SCCPs will have to be phased out over time)?

- ☐ Yes
- ☐ No, not at the moment. If no, then please elaborate more on the reasons:

Economic Reasons:
Technical Reasons:

Other Reasons:

13 What are your requirements/needs to switch to an alternative to SCCP (please detail for individual MWF uses)?

Section E: Waste management and recycling

14 Please elaborate on your internal waste management procedure regarding the metal working fluids.

a) Empty containers of raw material and metal working fluid

b) Obsolete raw material

c) Obsolete metal working fluids stockpiles

15 Please elaborate on the waste management on the used metal working fluids

a) Recycling (please describe)

b) Final disposal (please describe)

c) Release during use (please describe)

16 Have you ever conducted an environmental audit? If yes, please elaborate more (date, internal, external, consultancy firm….)

17 Do you have ISO 14001? Yes___ No___ Or a similar certificate_____

Appendix 7. Questionnaire for compiling information on the use of SCCPs in the production, import or use of SCCPs in paints and coating

Persistent organic pollutants (POPs) are toxic chemicals that adversely affect human health and the environment. They persist for long periods of time in the environment and can accumulate in the food chain and finally contaminate people. The Stockholm Convention is a global treaty which supports the phase out of POPs. In 2017 Short-Chain Chlorinated Paraffins (SCCPs)[16] with a chain length of C10-13 and a chlorine content of >48% were listed as POPs in Annex A, with specific exemptions. Additionally, a limit for the presence of SCCPs in medium-chain chlorinated paraffins (MCCPs) and other chlorinated paraffin mixtures (CPs) was set at 1% by weight otherwise these are POPs.
SCCPs are used in specific paints and coatings (e.g. waterproofing paints/coating; corrosion protection; fire-retardant paints). The use of SCCPs in waterproofing and fire-retardant paints has been exempted in the Convention but will need to be phased out after a certain period.
Therefore the government is assessing the current production, import and use of SCCPs[16] and other chlorinated paraffin mixtures containing more than 1% SCCPs[17]. Based on the assessment of the current use and alternatives available for SCCPs in lubricants, the government will decide on further steps to restrict the use of SCCPs or to grand exemptions for continuing use and gradual phase out of SCCPs.
The following survey has been developed to gather relevant information that will support these activities.
This questionnaire can be used to gather information on adhesives/sealants by modification of “paints and coatings” to “adhesives and sealants”.

Name of establishment Registration number	
Address	
Name of respondent	
Position	
Telephone/Mobile	
Email	
Signature/date	

This questionnaire is divided in 4 sections:

- Section A: Paints/coatings produced in the country
- Section B: Imported paints/coatings
- Section C: Alternatives to SCCPs in paints/coatings
- Section D: Waste management

Please fill in the/those section(s) below which is/are relevant for your activity domain (e.g. manufacturer, importer, user, recycler, waste manager).

[16] SCCPs: Short Chain Chlorinated Paraffins (molecule: $C_xH_{(2x-y+2)}Cl_y$ where x = 10-13; y = 3-12; Cl >48%).

Section A: Paints/coatings produced in the country

1. What type of paints or coating do you produce?

2. Are you aware that short chain chlorinated paraffins (SCCPs) are listed as POPs and will be restricted?

- ☐ Yes ☐ No
- ☐ We have stopped the use of SCCPs in _____Year
- ☐ We are planning to stop the use of SCCPs in _____Year
- ☐ We plan to continue use of SCCPs and will ask for use exemption

3. Are you aware that medium chain chlorinated paraffins (MCCPs) with a content of more than 1% SCCP will be restricted?[17]

- ☐ Yes ☐ No
- ☐ We have a guarantee that the MCCPs contain less than 1% SCCPs
- ☐ We do not know the SCCPs content of the MCCPs used
- ☐ We plan to measure the SCCPs content of the MCCPs used

4. Do you use any of the following chlorinated paraffins in the production process?

Chemical Abstracts Service (CAS) Numbers of SCCPs and other chlorinated paraffins which may contain SCCPs or which may be contaminated with SCCPs

85535-84-8 (SCCPs (C10-13))		71011-12-6 (Alkanes, C12-13, chloro) 108171-26-2 (Alkanes, C10-12, chloro)	
85536-22-7 (Alkanes, C12-14, chloro) 85681-73-8 (Alkanes, C10-14, chloro)		84082-38-2 (Alkanes, C10-21, chloro) 97659-46-6 (Alkanes, C10-26, chloro) 84776-06-7 (Alkanes, C10-32, chloro)	
68920-70-7 (Alkanes, C6-18, chloro)		61788-76-9 (Alkanes, chloro)[15] 63449-39-8 (Paraffin waxes and Hydrocarbon waxes, chloro)[15] 97553-43-0 Paraffins, normal C>10, chloro)	
Other chlorinated paraffins[15] (**CAS number?**_____)		85535-85-9 (MCCPs; C14-18, chloro)	

Please describe here if you have a guarantee for any of the chlorinated paraffins used that they contain less than 1% SCCPs.

5. What function do the SCCPs have in the paint/coating?

a. Plasticizer
b. Flame retardant
c. Solvent
d. Other Please specify:_____

[17] CP mixtures which contain SCCPs >1% (chlorine content >48%) as impurity are considered POPs

6. Please list below* the amount of SCCPs and MCCPs (other chlorinated paraffin listed in question 2) used in the production of paints/coatings

Paint/coating Product (name; type)	% SCCPs in the paint/ coating	% MCCPs in the paint/ coating	CAS numbers	Country/company of imported SCCPs/ MCCPs/ other chlorinated paraffins (HS Code)	Source of SCCPs/MCCPs/other chlorinated paraffins if locally purchased (contact)	Use of the paint or coating	Year	Quantity Produced (tonnes)
							2015	
							2016	
							2017	
							2018 (estimate)	
							2015	
							2016	
							2017	
							2018 (estimate)	
							2015	
							2016	
							2017	
							2018 (estimate)	

***Please feel free to provide more information on separate sheet**

Section B: Imported paints or coatings

7. **a) Please fill the table on quantities of imported paints/coatings containing SCCPs**

Year	Total quantity of imported paint per year (tonnes) containing SCCPs	% of SCCPs in paint	CAS numbers of SCCPs	Total quantity sold/used locally (tonnes)	Total quantity exported (tonnes)
2020 (estimate)					
2019					
2018					
2017					

b) Please fill the table below regarding the quantities of imported paints/coatings containing MCCPs or other chlorinated paraffins possibly contaminated by SCCPs

Year	Total quantity of imported paint per year containing MCCPs or other chlorinated paraffins (tonnes)	% of MCCPs or other chlorinated paraffins in paint (% of SCCP if known)	CAS number of chlorinated paraffin	Total quantity sold/used locally (tonnes)	Total quantity exported (tonnes)
2020					
2019					
2018					
2017					

Section C: Alternatives to SCCPs in paints/coatings

8. **Are you aware of any alternatives to SCCPs?**

a. No
b. Yes, please list known alternatives_____
c. Are you using alternatives? Please list_____

9. **Are you interested and willing to switch to an SCCP alternative (please keep in mind that SCCPs will have to be phased out over time)?**

a. Yes
b. No, not at the moment. If no, then please elaborate more on the reasons:

Economic Reasons:
Technical Reasons:
Other Reasons:

10. **What are your requirements/needs to switch to an alternative to SCCPs or chlorinated paraffins contaminated by SCCPs?**

Section D: Waste Management

11. Please elaborate on your internal waste management procedure regarding the paints products.

Empty containers of raw material:
Obsolete raw material:
Obsolete paint stockpiles:

12. Please elaborate on the waste management on the painted objects in use.

a) How are painted objects managed when paints are renovated or renewed? Are there any procedures to prevent the release of the old paint when it is removed?

b) How is the end of life treatment of the painted objects (please describe for individual applications?

Appendix 8. Questionnaire for compiling information on products containing SCCPs in import, retail or sale

Persistent organic pollutants (POPs) are toxic chemicals that adversely affect human health and the environment. They persist for long periods of time in the environment and can accumulate in the food chain and finally contaminate people. The Stockholm Convention is a global treaty which supports the phase out of POPs. In 2017 Short-Chain Chlorinated Paraffins (SCCPs)[1] with a chain length of C10-13 and a chlorine content of >48% were listed as POPs in Annex A, with specific exemptions. Additionally, a limit for the presence of SCCPs in medium-chain chlorinated paraffins (MCCPs) and other chlorinated paraffin mixtures (CPs) was set at 1% by weight otherwise these are POPs.

SCCPs and other chlorinated paraffins containing SCCPs are used in following products:

(a) PVC in particular soft PVC (see UNEP, 2018b, annex II);

(b) Rubber products in particular conveyor and transmission belts;

(c) Fatliquoring of leather and related fatliquors and treated leather products;

(d) Specific paints and coatings in particular waterproofing paints/coating; fire-retardant paints;

(e) Adhesives and sealants;

(f) Metal working fluids and other lubricants.

The use of SCCPs has been exempted in the Stockholm Convention in these products but will need to be phased out after a certain period.

Therefore, the government is assessing the production, import and use of products containing SCCPs[1] and other chlorinated paraffin mixtures containing more than 1% SCCPs[2].

The following survey has been developed to gather relevant information that will support these activities. Please fill in the/those section(s) below which is/are relevant for your activity domain.

Name of establishment Registration number	
Address	
Name of respondent	
Position	
Telephone/Mobile	
Email	
Signature/date	

1. What is your main business:

a) Importer/wholesaler ☐
b) Importer/distributor ☐
c) Retailer ☐
e) Other trading/selling☐ Please describe_____

2. Do you import or sell any of the following products?

a) Products made of soft PVC Yes ☐ No ☐
b) Rubber products Yes ☐ No ☐
c) Metal working fluids Yes ☐ No ☐
d) Lubricants Yes ☐ No ☐
e) Paints/coatings Yes ☐ No ☐
f) Adhesives/sealants Yes ☐ No ☐
g) Fatliquors for leather Yes ☐ No ☐
i) Leather products Yes ☐ No ☐

[1] SCCPs: Short Chain Chlorinated Paraffins (molecule: $C_xH_{(2x-y+2)}Cl_y$ where x = 10-13; y = 3-12; Cl >48%).

[2] CP mixtures which contain SCCPs >1% (chlorine content >48%) as impurity are considered POPs.

3. To your knowledge do any of the products/articles you sell contain or has been treated with SCCPs or other chlorinated paraffins?

a) Contain SCCPs

Yes □ No □ Don't know □

b) Contain other chlorinated paraffins

If yes, please specify and detail the type of products:

Type of product	Type of chlorinated paraffin	SCCP content (wt %) (if available)	Trade name	CAS Nr (if available)	Sale per year

4. Do you take back wastes potentially containing SCCPs? What type of treatment?

Type of waste/products	**Waste treatment* (company/location)**

***(e.g. recycling, disposal to landfill; incineration, export, unknown)**

5. Do you have stockpiles of products treated with or containing SCCPs or other chlorinated paraffins possibly containing SCCPs?

Type of products	Name/type of chlorinated paraffins	CAS number (if available)	Quantity	Content of SCCP (wt %) (if available)	Storage conditions	Location

6. Supplier of the commercial products you sell or import containing SCCPs or other chlorinated paraffins:

Name of company	Product	Contact information

7. Remarks

www.pops.int

Secretariat of the Stockholm Convention

Office address:

United Nations Environment Programme (UNEP)
International Environment House 1
11-13 Chemin des Anémones
CH-1219 Châtelaine GE
Switzerland

Postal address :

Palais des Nations
Avenue de la Paix 8-14
CH-1211 Genève 10
Switzerland

Tel: +41 22 917 82 71
Fax: +41 22 917 80 98

Email: brs@brsmeas.org