

**Overview Report I:  
A Compilation of Lists of Chemicals Recognised as  
Endocrine Disrupting Chemicals (EDCs) or Suggested as  
Potential EDCs**

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**DISCLAIMER**

This is the first report within a series of five reports on EDCs that UNEP has commissioned the International Panel on Chemical Pollution (IPCP) to prepare, following the ICCM 3 resolution that had called for international cooperative actions to provide up-to-date information and scientific expert advice to relevant stakeholders, raise awareness and facilitate science-based information exchange.

The series of reports include the following: (1) compilation of lists of chemicals that have been recognised as EDCs based on the WHO/IPCS 2002 definition or have been suggested as potential EDCs by various stakeholders taking into account scientific considerations; (2) compilation of the current understanding on the life-cycle of EDCs and selected potential EDCs; (3) compilation of levels and trends in the environment exposure to EDCs and selected potential EDCs in different regions; (4) compilation of identified adverse impacts of EDCs and selected potential EDCs; and (5) compilation of existing regulatory frameworks and policy initiatives on EDCs.

The content of this draft report does not necessarily reflect the views or policies of UNEP. The designations employed and the presentations of material in this report do not imply the expression of any opinion whatsoever on the part of UNEP.

The draft of the first report was placed on UNEP's website for comments on 21 July 2016 with an initial deadline for stakeholders to submit comments by 19 August 2016. Given the interest in the topic and taking into account suggestions received from stakeholders, the deadline for providing comments has been extended until 20 September 2016.

## 1. Background, Aims and Scope

Endocrine disrupting chemicals (EDCs) are chemicals that may interfere with the endocrine system(s) and cause adverse effects.<sup>1</sup> Over the past three decades, international concern regarding endocrine disrupting chemicals and research efforts to better understand them have intensified. Numerous efforts by the global scientific and regulatory communities have revealed substantial evidence of increasing trends of endocrine-related disorders linking to exposure to EDCs in humans and related effects in wildlife and raised serious concern about EDCs (UNEP-WHO, 2013). In 2009, the second session of the International Conference on Chemicals Management (ICCM 2) recognised EDCs as an Emerging Policy Issue under the Strategic Approach to International Chemical Management (SAICM) (SAICM, 2016). The third ICCM session (ICCM 3) in 2012 (SAICM, 2012) and the fourth session (ICCM 4) in 2015 (SAICM, 2015) affirmed to support further research and develop cooperative actions regarding EDCs. The ICCM 4 Resolution further requested all interested stakeholders to support cooperative actions led by the Inter-Organization Programme for the Sound Management of Chemicals (IOMC), including generating and disseminating information on EDCs. As part of its commitment to the IOMC's work plan, the United Nations Environment Programme (UNEP) initiated the project "Provision of Information on EDCs" and commissioned the International Panel on Chemical Pollution (IPCP) to develop a set of overview reports that focus on existing scientific knowledge of environmental exposure, impact, legislation, measures and gaps regarding known and potential EDCs. This report is the first within the set of overview reports.

To date, substantial efforts have been made by a wide variety of organizations across numerous sectors worldwide in identifying and classifying EDCs. For example, government agencies from multiple countries have established their own priority chemical lists, screening programmes, and/or knowledge bases to assist with ongoing research to assess and identify EDCs. Several non-governmental organisations (NGOs) have been active in evaluating existing knowledge in peer-reviewed literature and suggesting lists of chemicals that might be EDCs. Some industry bodies have also reviewed the topic and published their own lists for self-regulation within the respective sector. The intended purpose of these lists, the selection criteria used to create them, and the details they include differ considerably among them. Currently, there is no overview of which chemicals are listed by whom and for which reasons, even though it is noted that some chemicals exist in several lists.

In this report, we aim to provide an overview of the global efforts being made to identify and classify EDCs and to establish which chemicals have received the most consensus and evidence for being EDCs or should potentially be prioritized for assessment in the foreseeable future. In brief, we have reviewed existing, publicly accessible lists created by various stakeholders (governments, industry, civil society and academia) and consolidated them into a single database. This consolidated database contains more than 1'000 chemicals compiled from over fifteen lists, and each chemical is identified and linked to its descriptive

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<sup>1</sup> According to the widely accepted World Health Organization/International Programme on Chemical Safety (WHO/IPCS) 2002 definition, EDCs are "*an exogenous substance or mixture that alters function(s) of the endocrine system and consequently causes adverse health effects in an intact organism, or its progeny, or (sub) populations. A potential endocrine disruptor is an exogenous substance or mixture that possesses properties that might be expected to lead to endocrine disruption in an intact organism, or its progeny, or (sub)populations*" (World Health Organization, 2002).

data using Chemical Abstracts Service (CAS) registry numbers. Many of the compiled lists include a brief description of a chemical's possible applications, and some have information on the toxicity to humans or wildlife with references to scientific literature. All of these original data from the lists were retained as best as possible, and data from the PubChem database (Kim et al., 2015) were used to fill data gaps.

In the following report, we further conduct a qualitative evaluation and comparison of the various lists based on their type, selection criteria and process details, and included information (see section 2. *List Comparison*). In section 3, we select a set of chemicals that have been recognised as EDCs, or suggested as EDCs from rigorous scientific assessment using the WHO/IPCS 2002 definition.<sup>1</sup> This selection of chemicals will form the basis for the subsequent three overview reports that focus on chemical life-cycle, levels and trends of environmental exposure, and adverse impacts on wildlife, respectively.

The WHO/IPCS 2002 definition of EDCs has been accepted by many stakeholders and has been used to identify EDCs on a case-by-case basis in the European Union. However, discussion is still ongoing regarding the specific criteria for identifying EDCs. Such varying criteria means that existing lists and databases may contain different sets of chemicals, even when the purpose of the lists may be the same. This report does not intend to create new criteria for identifying EDCs, nor to assess individual chemicals, but rather to gain a critical overview of existing efforts and gaps. In addition, we note that the existing testing of the *endocrine system*, for example, has primarily focused on the estrogen, androgen and thyroid hormone (EAT) pathways as well as on steroidogenesis, since testing guidelines have been developed and validated in these areas under the Organisation for Economic Co-operation and Development (OECD) frameworks (Munn & Goumenou, 2013). Currently, additional assays and endpoints are being developed by academics, and some of them are being validated and harmonised to be used to identify potential endocrine disruption beyond these traditional pathways by the global regulatory and scientific community (OECD, 2012). However, creation of such standards takes time for each relevant test, and the identification of EDCs are currently relying in part on research studies that include non-standard species, endpoints or exposure regimes (Beronius, Hanberg, Zilliacus, & Rudén, 2014). In turn, established lists will need to continue to be updated in the future as scientific knowledge on the topic evolves.

## 2. List Comparison

In total, 24 lists and databases are identified and considered in this study. According to the purpose and actual content, we categorised each of them into four groups that are presented in Tables 1, 2, 3 and 4 along with explanatory notes describing them. Lists in Table 1 reflect chemicals that are labelled as EDCs, or suggested as potential EDCs, by individual organisations. Table 2 includes lists of chemicals where evaluation is ongoing to identify whether or not they shall be labelled as EDCs or potential EDCs. Lists included in Table 3 are created to cover a wide range of chemicals and do not explicitly identify chemicals as EDCs or potential EDCs. They do, however, include chemicals that have been suggested as EDCs or potential EDCs by other organizations. Table 4 includes knowledge bases and databases with focus on endocrine disruption including details such as experimental results, modelling data, and completed studies on EDCs. The following sub-sections of this report provide some general observations of all lists followed by discussion of each table of lists.

## ***2.1 General observations***

- Significant resources have been and are being invested into identifying EDCs, as reflected by the number and diversity of the lists. Many have already been heavily developed and publicized, whereas others are planned or currently in early development stages.
- The purpose of individual lists varies considerably. For example, some intend to highlight identified (potential) EDCs by the respective stakeholder (Table 1), whereas some others intend to consolidate existing knowledge in relation to EDCs (Table 4).
- The selection criteria used to justify the inclusion of chemicals in a list vary considerably. For many lists, selection criteria have been clearly communicated, whereas others rely on some form of expert consultation, or did not disclose clear selection criteria. Multi-stakeholder consultation (through government, industry and/or civil society input) occurred during the development of some of the lists, especially those that have direct regulatory impacts.
- The pool of chemicals used to develop individual lists varies, and interlinkages exist between lists in some cases. For example, the List of Potential Endocrine Disruptors from The Endocrine Disruption Exchange (TEDX) contains all chemicals that have been shown to have endocrine activity in at least one experimental study in the literature, which could be any chemical in the chemical universe; whereas some lists (or part of the lists) have been based on chemicals contained in a previous version of the TEDX list, e.g. the second-round addition to the SIN list by ChemSec.
- Further differentiating factors include whether a list is static or changeable, homogenous or further sub-classified, and EDC-focused or more universal. For example, some lists contain EDCs as a subset of the included chemicals. Tables 1 and 2 contain such lists, and these entries are accompanied by (1) the total number of chemicals on the list and (2) the number of EDCs within this total. Some lists categorize the chemicals into sub-groups based on certain criteria and make recommendations for prioritisation.
- Depending on the listing purpose, selection criteria, pool of chemicals for selection, and other differentiating factors, the number and identity of chemicals included in each list varies. Some chemicals exist on different lists, whereas some others may be found on only one list.
- Comparing the lists highlights inconsistencies in methods being used, the lack of input from developing and transition countries, and the need for further clarification of the meaning and purposes of the lists.

## ***2.2 Table 1 – Overview of available lists of chemicals labelled as EDCs or potential EDCs generated by different stakeholders***

The nine lists in Table 1 specifically label some or all of the chemicals they include as known or potential EDCs. Five of the lists in this table are European based, including the European Commission (EC) Priority List of Chemicals, the REACH Substances of Very High Concern (SVHC) Candidate List for Authorisation under the European Chemicals Regulation (REACH), the Assessment of Danish Criteria for Identification of Endocrine Disruptors, the Substitute It Now (SIN) List from ChemSec, and the List of Potential Endocrine Disruptors from TEDX. Three are based in the United States (US), and one is the result of a government led pilot study in Australia. Most of these have a clear set of selection criteria such as rigorous assessment of existing scientific evidence, which can be retrieved either from the website or per request. Moreover, the REACH SVHC Candidate List (which creates immediate legal obligations for reporting by manufacturers and importers in the European Union) and the EC Priority List have had additional multi-stakeholder consultation as part of the listing procedure. Among the nine lists, the EC Priority List, the REACH SVHC Candidate List and the TEDX List of Potential Endocrine Disruptors select chemicals from the whole universe of chemicals, whereas the other lists often selected chemicals from the former three lists. The EC Priority List has also served as the starting point for a number of other lists below.

The REACH SVHC Candidate List, SIN List and List of Potential Endocrine Disruptors from TEDX are adaptable and are continuously updated through the addition or removal of chemicals. The Trade Union Priority list has also been regularly updated, and it includes identified Substances of Very High Concern (SVHC) recognised to be causes of occupational diseases in the European Union (EU). EDCs on this list are identified and scored to set priority for the trade union's recommendation to add the chemical to the REACH Authorisation List (European Trade Union Confederation, 2010).

The lists in this table consistently cite scientific publications as the sources of information for identifying a compound as an EDC or a potential EDC using their set methodologies. Some lists provide more citations or sources of evidence than others, and as noted in the general observations, some lists are based largely on the findings of other lists and do not conduct as much primary research.

**Table 1. Overview of available lists of chemicals labelled as EDCs or potential EDCs generated by different stakeholders**

List Name	Number of Chemicals / Groups Listed	Selection Criteria and Listing Procedure	Organisation Name and Related Information	Reference
<b>BY GOVERNMENTAL ORGANISATIONS</b>				
REACH Substances of Very High Concern (SVHC) Candidate List for Authorisation	168 (5 with endocrine disrupting properties)	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- May have serious effects on human health or the environment</li> </ul> <p><u>Listing procedure:</u></p> <ul style="list-style-type: none"> <li>- Proposed by an EU member state or the European Chemicals Agency as an SVHC and opened for comments or further information</li> <li>- Member State Committee reviews the proposal and comments and must unanimously agree to identify it as an SVHC. Otherwise, the matter is referred to the European Commission (European Chemicals Agency, 2016d)</li> </ul>	<p><u>European Chemicals Agency (ECHA)</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- Inclusion of a substance on this list initiates legal obligations for companies that manufacture or import the substance</li> </ul>	(European Chemicals Agency, 2016a)
Priority List of Chemicals	565 (194 categorized as chemicals showing strongest evidence of endocrine disrupting activity)	<p><u>Selection Criteria:</u></p> <ul style="list-style-type: none"> <li>- Highly persistent and/or high production volume substance</li> <li>- Scientific evidence of endocrine disruption (ED) related effects: <ul style="list-style-type: none"> <li>• For Category 1: At least one study showing evidence of ED in an intact organism</li> <li>• For Category 2: In vitro data showing potential for ED in intact organisms, or in-vivo effects that may or may not be ED-mediated</li> </ul> </li> </ul> <p><u>Listing procedure:</u></p> <ul style="list-style-type: none"> <li>- Working list of chemicals were compiled from suspected EDCs published by organizations and in scientific literature. They were then discussed in a stakeholder meeting with government, industry, and civil society.</li> <li>- Expert review placed the chemicals into Category 1, 2, or 3</li> <li>- Category 1 chemicals were then further categorised as having high, medium, or low exposure concern for humans and wildlife (Grosshart &amp; Okkerman, 2000; Johnson &amp; Harvey, 2002; Petersen, Rasmussen, &amp; Gustavson, 2007)</li> </ul>	<p><u>European Commission</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- First established in the year 2000</li> <li>- Additional studies completed in 2002 on 435 substances and on 12 substances</li> <li>- Additional study completed in 2007 reviewed low production volume chemicals</li> <li>- Current database file is: "EDS_2003_DHI2006.mdb"</li> </ul>	(European Commission, 2016a)

List Name	Number of Chemicals / Groups Listed	Selection Criteria and Listing Procedure	Organisation Name and Related Information	Reference
Assessment of Danish Criteria for Identification of Endocrine Disruptors	26	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- The 22 substances placed on the ChemSec SIN List 2.0 identified as substances of very high concern (SVHC) due to their endocrine disrupting properties (Hass, Christiansen, et al., 2012)</li> <li>- The 4 substances requested by the Danish EPA for review (Hass, Andersson, &amp; Holbech, 2012)</li> </ul> <p><u>Listing Procedure :</u></p> <ul style="list-style-type: none"> <li>- Selected chemicals were assessed according Denmark's proposed criteria for identifying EDCs</li> </ul>	<p><u>Danish Environmental Protection Agency (EPA)</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- Resulted in 25 of 26 assessed substances considered as known or suspected EDCs according to the Danish criteria (Hass et al., 2012)</li> <li>- Denmark submitted its proposal for EDC criteria to the European Commission in May 2011</li> <li>- Danish EPA contracted the Danish Centre for Endocrine Disruptors to do the assessments, and the reports were published in May 2012</li> </ul>	(Danish Environmental Protection Agency, 2012; Hass, Christiansen, et al., 2012)
Most Significant EDCs	8	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- Identified to be the most significant chemicals due to their relative potency to the steroidal hormone estradiol (E2) (taken as benchmark for estrogenic potential), concentrations detected in wastewater treatment plant effluent, and observed biological effects</li> </ul> <p><u>Listing Procedure :</u></p> <ul style="list-style-type: none"> <li>- Reviewed published literature for data detailing the relative potency of chemicals to E2, wastewater effluent concentrations, and reported in vivo effects</li> </ul>	<p><u>Land and Water Australia</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- Published in 2007 as part of a three year pilot study by the Australian Government</li> <li>- Found in Table 3.1 of the report and used to select chemicals for sampling in the Australian riverine environment</li> </ul>	(Williams et al., 2007)

**BY NON-GOVERNMENTAL ORGANISATIONS**

Substitute it Now! (SIN) List	844 (94 suggested as EDCs)	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- For the initial round, the set of chemicals listed as category 1 or 2 on the European Commission's priority list of potential endocrine disruptors; for the second round in 2014, the set of chemicals listed on the TEDX List</li> <li>- Have known uses relevant to EU REACH and not used only as intermediates</li> <li>- Have peer-reviewed, high quality, relevant, primary research literature showing endocrine related effect(s). In 2011, at least three studies required (two of which must be in-vivo) that pass an internal peer review by an internal research team. In 2014, the WHO/IPCS definition was used requiring studies that clearly showed endocrine mode-of-action linked to a probably adverse</li> </ul>	<p><u>International Chemical Secretariat (ChemSec):</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- First published in 2008. 14 substances having EDC properties were added to the list as "equivalent level of concern". Endocrine disruption was just one of several endpoints investigated for those substances.</li> <li>- Major update in 2011 adding 22 chemicals suggested as EDCs to the list based on EDC properties only.</li> <li>- Major update in 2014 adding 10 chemicals suggested as EDCs to the list based on EDC properties only.</li> </ul>	(ChemSec, 2016)
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List Name	Number of Chemicals / Groups Listed	Selection Criteria and Listing Procedure	Organisation Name and Related Information	Reference
		effect. - Identified as having sufficient evidence for being an equivalent level of concern SVHC following the REACH guidance document and external EDC experts (ChemSec, 2014a)		
List of Potential Endocrine Disruptors	1'038	<u>Selection criteria:</u> - At least one peer-reviewed study has been published demonstrating effects on the endocrine system	<u>The Endocrine Disruption Exchange (TEDX)</u>  <u>List Information:</u> - Established in 2011 and initially drew from two other published lists as a basis - Updated regularly, last in September 2015	(TEDX, 2016)
Widespread Pollutants with Endocrine-Disrupting Effects	86	<u>Selection criteria:</u> - Not clear - Each chemical listed is linked to at least one scientific publication, and a call for submissions of new chemicals and feedback exists	<u>Our Stolen Future:</u> - Website of the 1996 book of the same name written by Theo Colborn (founder of TEDX)	(Our Stolen Future, 2016)
Endocrine Toxicants	310	<u>Selection criteria:</u> - Not clear - Each chemical listed is linked to a reference source that is either a journal article or a report from a government agency or NGO	<u>Scorecard (sponsored by GoodGuide)</u>	(Scorecard, 2011)
Trade Union Priority List for REACH Authorisation	334 (70 identified as known or suggested EDCs)	<u>Selection criteria:</u> - Listed as category 1 or 2 on the European Commission's priority list of potential endocrine disruptors and therefore seen to meet the requirement of being an SVHC - High production volume chemical for which a substance information exchange forum (SIEF) was formed by March 19, 2010 and was expected to be registered by December 2010 - Having a known use and not already banned by other means, not a residue or intermediate, not only used as a pesticide or biocide (exempt from REACH), and not a complex hydrocarbon distillate  <u>Listing procedure:</u> - Prioritization criteria were set and scores were given for each chemical - Chemicals were ranked by score to set priority (Santos, Romano, & Gadea, 2010)	<u>European Trade Union Confederation (ETUC)</u>  <u>List Information:</u> - First established in 2009 - Updated with 29 new entries in 2010 - Chemicals selected have been identified as causative agents for recognised occupational diseases in the European Union - Objective is to reduce chemical-related occupational diseases and incentivise innovation and safer alternatives	(European Trade Union Confederation, 2010)

### ***2.3 Table 2 – Overview of available lists of chemicals undergoing review due to their suspected endocrine disrupting properties***

The four lists in Table 2 include screening programmes with chemicals to be evaluated and classified for their endocrine disruption potential by governmental agencies in the EU, US and Japan. It is unclear if developing countries and countries with economies in transition have also set up such screening programmes. The selection of chemicals for inclusion in these lists were often determined based on available data including chemical production and usage, environmental and bio-monitoring (i.e., levels in the environment) and toxicological information (e.g. dose-response) from scientific literature or other sources. For example, while compiling the list of Chemicals Suspected of Having Endocrine Disrupting Effects within the SPEED'98 framework, the Ministry for Environment in Japan conducted environmental surveys of potential EDCs in Japan and then used this information to determine test chemicals and doses for EDC hazard assessment (Ministry of the Environment Japan, 2010). The two-tiered Endocrine Disruptor Screening Program by the US Environmental Protection Agency (EPA) focuses on examining pesticide ingredients used in the US, and it was developed through public consultation and priority set based on examined exposure potential (United States Environmental Protection Agency, 2015c). Chemicals on the European Union's Community Rolling Action Plan (CoRAP) list of substances are scheduled to be reviewed by member states following their nomination, and the list focuses on industrial chemicals under REACH (European Chemicals Agency, 2016c).

The approaches taken by these programmes to evaluate EDCs differ from one another. For example, the European Commission's impact assessment is strictly on the screening level and based on existing knowledge, whereas the US EPA's screening program involves a second tier of experimental testing to establish a relationship between dose and effect. The target compounds for review are also set (or prioritized) differently based on an agency's focus or legal mandate, and the timeline for the review processes also vary.

**Table 2. Overview of available lists of chemicals undergoing review due to their suspected endocrine disrupting properties**

List Name	Number of Compounds / Compound Groups	Selection Criteria and Designated Procedure	Organisation Name and Related Information	Reference
<b>BY GOVERNMENTAL ORGANISATIONS</b>				
Endocrine Disruptor Screening Program (EDSP)	176 (for Tier 1 screening)	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- Pesticide active ingredient, high production volume pesticide inert ingredient, or chemical identified under the Safe Drinking Water Act</li> <li>- Selected at the agency's discretion and based on identified exposure potential</li> <li>- Priority given to chemicals present in all of four investigated exposure pathways</li> <li>- Produced or used in the United States (United States Environmental Protection Agency, 2015c)</li> </ul> <p><u>Designated procedure:</u></p> <ul style="list-style-type: none"> <li>- Two tiered approach created to screen pesticides, chemicals, and contaminants for potential effect on estrogen, androgen, and thyroid hormone systems</li> <li>- Substances found to exhibit potential to interact with any of these three hormone systems through experimental assays or other scientifically relevant information (including submissions) during Tier 1 will continue to Tier 2</li> <li>- Chemicals selected for Tier 2 are tested to identify adverse endocrine-related effects and to create a quantitative relationship between the dose and adverse effect</li> <li>- Public and stakeholder consultations have taken place during the establishment of the program</li> </ul>	<p><u>United States Environmental Protection Agency</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- Initial list of 67 chemicals for Tier 1 screening published in April 2009 (pesticide active ingredients and high production volume pesticide inert ingredients)</li> <li>- Second list of 109 chemicals for Tier 1 screening published in June 2014 (pesticide active ingredients and chemicals identified under the Safe Drinking Water Act)</li> <li>- Results for 52 chemicals that have completed Tier 1 screening have been published (last update September 2015)</li> </ul>	(United States Environmental Protection Agency, 2009, 2014, 2015a, 2015b)
CoRAP List of Substances	267 (47 suggested to be potential endocrine disruptors)	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- In need of evaluation based on risk-based criteria considering hazard information, exposure information, and tonnage (following REACH Regulation Article 44(1))</li> <li>- Examples include: suspected/known PBTs, vPvBs, CMRs, and sensitizers; having wide dispersive use, high aggregated tonnage, high risk characterization ratio, etc (European Chemicals Agency, 2011)</li> </ul>	<p><u>European Chemicals Agency (ECHA)</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- The first Community Rolling Action Plan (CoRAP) list was adopted in 2012 for a period of three years</li> <li>- Updated each year to define new substances to be reviewed</li> </ul>	(European Chemicals Agency, 2016c)

List Name	Number of Compounds / Compound Groups	Selection Criteria and Designated Procedure	Organisation Name and Related Information	Reference
		<p><u>Designated procedure:</u></p> <ul style="list-style-type: none"> <li>- Agency defines risk-based criteria and then select substances to be evaluated (or receives nominated substances from member states for evaluation)</li> <li>- A member state is designated to evaluate each substance</li> </ul>		
Chemicals Suspected of Having Endocrine Disrupting Effects	67	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- Not clear – ‘identified as those having the highest priority in the survey and research in order to clarify the presence, the strength, and the mechanisms of endocrine disrupting effects’</li> <li>- Later testing criteria was defined including: exists in the ‘Chemical Substances Control Law, PRTR Law, or other regulations and standards related to concentration in the environment or food’ and ‘suspected of having an effect on the endocrine system, an effect via the endocrine system, or an ecological effect in reports’ (Ministry of the Environment Japan, 2010)</li> </ul>	<p><u>Ministry of the Environment, Japan</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- Established in 1998 and later revised to 65 chemicals (from 67) in November of 2000</li> <li>- Completed under the framework of the SPEED’98 (Strategic Programs on Environmental Endocrine Disruptors)</li> <li>- Monitoring and measurements of additional chemicals continued in the ExTEND 2005 and EXTEND 2010 project frameworks</li> </ul>	(Ministry of the Environment Japan, 1998)
Impact Assessment on Criteria to Identify Endocrine Disruptors	>600	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- Regulated under the Plant Protection Products and Biocidal Products except: substances of no concern or capacity to cause endocrine disrupting effects, low risk substances, natural extracts/mixtures/repellents, and attractants/plant hormones</li> <li>- Regulated under REACH regulation and: were on the Candidate List as SVHCs for endocrine disruption (ED), had opinion available from Member State Committee regarding it as an SVHC due to ED, were on the Candidate List as an SVHC due to reprotoxicity 1A/1B, were listed in AnnexXVII due to ED concern as reprotoxic 1A/1B, or placed on CoRAP list due to ED concern</li> <li>- Regulated under the Cosmetic Products Regulation and: had opinion available from the Scientific Committee on Consumer Safety (SCCS) discussing ED potential, had SCCS opinion due to potential/classification as carcinogenic/mutagenic/toxic to reproduction (CMR 1A/1B, CMR2), had concern expressed by SCCS on toxicity endpoints, or had concern raised by stakeholders/Member States on potential ED properties</li> </ul>	<p><u>European Commission</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- Impact assessment launched in July 2013 on the criteria to identify endocrine disruptors</li> <li>- Goal is to assess which chemicals would fall under the different criteria options presented in the roadmap of the impact assessment (European Commission, 2014)</li> <li>- Results of the impact assessment were published in June 2016 (Arapaki et al., 2016)</li> </ul>	(European Commission, 2015)

List Name	Number of Compounds / Compound Groups	Selection Criteria and Designated Procedure	Organisation Name and Related Information	Reference
		<p>- Regulated under the Water Framework Directive: no specific selection criteria applied</p> <p><u>Designated procedure:</u></p> <p>- Screening of the substances followed a published, detailed methodology to identify which would be potentially categorised as endocrine disrupting under the four policy options set out in the EC Roadmap (European Commission, 2016b)</p> <p>- Methodology includes detail for identifying the data sources, completing data collection, and completing data analysis</p>		

### ***2.4 Table 3 – Overview of other available lists that contain EDCs or potential EDCs but do not label them specifically***

The five lists included in Table 3 were created for the identification, regulation, or self-regulation of a large number of chemicals posing various types of risks by various organisations. They do not specifically label any included chemicals as EDCs or potential EDCs, but they do contain chemicals that have been labelled as EDCs or potential EDCs by other organisations (see Tables 1 and 2).

The EU REACH Registration Dossiers contain chemicals that have been registered by companies in order to sell them on the European market, some of which have been suggested as EDCs or potential EDCs on other lists included in this report (European Chemicals Agency, 2016b). The same applies to the chemicals listed and regulated under the Stockholm and Rotterdam Conventions (Stockholm Convention, 2016).

Two lists on this table originate from industry and are specifically linked with the self-regulation of chemicals used in products or manufacturing by certain brands. A group of apparel and footwear brands used their related association to create a common list of chemicals restricted from intentional use during the manufacturing of their products across the supply chain (Zero Discharge of Hazardous Chemicals Programme, 2015). Apple Inc. has also published a set of substance specifications for its suppliers to follow detailing chemical restrictions in products, accessories, manufacturing products, and packaging (Apple Inc., 2014). Some of the chemicals listed on these two lists have also been suggested as EDCs or potential EDCs by other organisations (in Tables 1 and 2). Many of the substances included on these industry lists were also identified by other lists. However, without knowing all of the other substances used in the manufacturing supply chain for these products, it is difficult to comment on the quality of the coverage of these voluntary initiatives.

**Table 3. Overview of other available lists that contain EDCs or potential EDCs but do not label them specifically**

List Name	Number of Compounds / Compound Groups	Selection Criteria and Procedure Details	Organisation Name and Related Information	Reference
<b>BY GOVERNMENTAL ORGANISATIONS</b>				
REACH Registered Substances	>15'000	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- Depending on the tonnage being used/imported into the European Union, industrial chemicals on the European market have different deadlines for registration under REACH</li> </ul>	<p><u>European Chemicals Agency (ECHA)</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- A chemical regulation of the European Union</li> <li>- Entered into force in June of 2007</li> </ul>	(European Chemicals Agency, 2016b)
Toxic Substances List – Schedule 1	133	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- Found to be toxic according to section 64 of the Canadian Environmental Protection Act 1999 including: entering or may enter the environment in a quantity or concentration or under conditions that it has or may have an immediate or long-term harmful effect on the environment or its biological diversity</li> </ul> <p><u>Listing procedure:</u></p> <ul style="list-style-type: none"> <li>- Placed previously on Canada's Priority Substances List and to be assessed for toxicity within five years. Completed via assessment of the substance, a screening assessment, or the review of a decision by another jurisdiction (Environment Canada, 2016a)</li> <li>- Can also be determined as equivalently toxic by incorporating elements of assessments done by or for international organizations or appropriate scientific authorities</li> </ul>	<p><u>Environment Canada</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- Updated in June 2016</li> <li>- Once added to the list, preventive or control actions such as regulations, guidelines or codes of practice are then considered for any aspect of the substance's life cycle</li> </ul>	(Environment Canada, 2016b)

List Name	Number of Compounds / Compound Groups	Selection Criteria and Procedure Details	Organisation Name and Related Information	Reference
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**BY INTERGOVERNMENTAL ORGANISATIONS**

POPs in the Stockholm Convention	30	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- Classified as a Persistent Organic Pollutant (POP): An organic chemical substance that remains intact for many years, is widely distributed throughout the environment as a result of natural processes, can bioaccumulate and biomagnify, and is toxic to both humans and wildlife.</li> </ul> <p><u>Listing procedure:</u></p> <ul style="list-style-type: none"> <li>- Any party of the Convention can submit a proposal for listing a chemical</li> <li>- The POP Review Committee reviews proposal (Annex D), develops Risk Profile (Annex E) and Risk Management Evaluation (Annex F), and makes recommendation to the Conference of Parties for their consideration</li> <li>- Conference of Parties makes decisions to amend the chemical to Annexes (A or B, and C, if necessary) of the Convention</li> </ul>	<p><u>Stockholm Convention</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- Chemicals listed in the Convention shall be regulated by parties of the Convention (currently 180 members) through either elimination, restriction, or reduction of unintentional releases</li> <li>- The convention entered into force in May 2004 with 12 initial chemicals; it has since been updated and currently contains 26 individual or groups POPs</li> </ul>	(Stockholm Convention, 2016)
Annex III Chemicals in the Rotterdam Convention	47	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- Banned or severely restricted for health or environmental reasons by two or more Parties to the Rotterdam Convention</li> <li>- Approved by the Conference of the Parties to be subjected to the prior informed consent (PIC) procedure</li> </ul> <p><u>Listing procedure:</u></p> <ul style="list-style-type: none"> <li>- Two notifications received for a single chemical from two member regions that meet the information requirements of Annex I</li> <li>- Approval during review by the Chemical Review Committee</li> <li>- Approval by the Conference of Parties</li> </ul>	<p><u>Rotterdam Convention</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- The convention aims to promote shared responsibilities regarding the trade of hazardous chemicals (including creation of proper labeling, instructions, and information on bans and restrictions)</li> <li>- The convention entered into force in February 2004 and has 155 member parties</li> </ul>	(Rotterdam Convention, 2016)

List Name	Number of Compounds / Compound Groups	Selection Criteria and Procedure Details	Organisation Name and Related Information	Reference
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**BY INDUSTRY**

Manufacturing Restricted Substances List	>160	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- Not clear - 'relevant' chemicals selected from 11 priority chemical groups identified in a previous roadmap and additional substances selected through discussion with experts and signatory brands</li> </ul> <p><u>Listing procedure:</u></p> <ul style="list-style-type: none"> <li>- Chemicals were selected through review with experts from a technical advisory committee and signatory brands</li> <li>- Contents of the list were peer-reviewed where possible by 'independent third-party technical experts and industry associations'</li> </ul>	<p><u>Zero Discharge of Hazardous Chemicals Programme:</u></p> <ul style="list-style-type: none"> <li>- Multiple apparel and footwear manufactures and industry associations are signatories</li> </ul> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- First published in 2014 and updated in 2015</li> <li>- Serves as a list of priority chemicals with specified maximum concentration limits for commercial chemical formulations during raw material processing along the supply chain</li> <li>- Member brands have committed to following this set approach to chemicals management</li> </ul>	(Zero Discharge of Hazardous Chemicals Programme, 2015)
Apple Regulated Substances Specification	>400	<p><u>Selection criteria:</u></p> <ul style="list-style-type: none"> <li>- Inclusion in existing regulations from "international laws or directives, agency or eco-label requirements" in addition to inclusion in Apple policies, which are 'based on best industry practices or toxicological properties'</li> <li>- Examples of references to existing regulation in the list include: EU REACH amendments, Canadian law, California law, French environmental code, and others</li> </ul>	<p><u>Apple Inc.</u></p> <p><u>List Information:</u></p> <ul style="list-style-type: none"> <li>- Suppliers of Apple are required to adhere to the substance regulations outlined in the document</li> </ul>	(Apple Inc., 2014)

### ***2.5 Table 4 – Knowledge bases and databases focusing on endocrine disruption***

Table 4 includes five knowledge bases and/or databases with focus on EDCs and endocrine disruption. Some of them have already been extensively developed, while others are planned or currently being developed. Each database contains more than 1'000 chemicals or experimental results from existing empirical testing and computer simulations. They include datasets and sub-databases covering topics ranging from physicochemical properties and results from gene and cell proliferation assays to estrogenic and androgenic activity prediction models.

A knowledge base and a sub-database related to endocrine disruption from the US Food and Drug Administration are included (United States Food and Drug Administration, 2015a, 2015b), as well as a database created by the US EPA to provide data to assist with their Endocrine Disruption Screening Program (United States Environmental Protection Agency, 2016). Two entries in this table are from European programmes. The EC is establishing an adaptable database known as the Endocrine Active Substances Information System (EASIS). In comparison to the Commission's previous Priority List of Chemicals, which is static, EASIS is planned to allow new information to be introduced or out-dated details to be updated (European Commission Joint Research Center, 2016). The RISCTOX database was commissioned by the European Trade Union Institute and contains many substances with information regarding their health and environmental risks as well as regulatory details. A set of EDCs were identified within this database based on previously established lists and sources.

These knowledge- and databases differ regarding the content of information they provide and features accessible to users. Most significantly, the knowledge- and databases created by United States government agencies offer full sets of chemical and experimental data as well as useable prediction models as a resource for reducing dependence on animal testing and developing toxicology models. The European RISCTOX and EASIS databases focus rather on collating and presenting data regarding chemical uses, classifications, published studies on health and environmental effects, and related regulations.

**Table 4. Knowledgebases and databases containing focuses on endocrine disruption**

List/ Database Name	Number of Compounds / Compound Groups	Database Contents	Organisation Name and Related Information	List/ Database Reference
<b>BY GOVERNMENTAL ORGANISATIONS</b>				
The Endocrine Disruptor Knowledge Base (EDKB)	>3'000 experimental results	<ul style="list-style-type: none"> <li>- Contains a biological activity database, quantitative structure-activity relationship training sets, estrogen and androgen activity prediction models, experimental data (<i>in vitro</i> and <i>in vivo</i>), chemical structures, and literature references</li> <li>- Serves as a resource for development of toxicology models and to reduce dependency on animal experiments</li> </ul>	<u>United States Food and Drug Administration</u>	(United States Food and Drug Administration, 2015a)
Estrogenic Activity Database (EADB)	8'212	<ul style="list-style-type: none"> <li>- Set of estrogenic activity data from a variety of data sources</li> <li>- 18'114 estrogenic-activity data points collected for 8'212 chemicals tested in 1'284 binding assays, reporter-gene assays, cell-proliferation assays, and <i>in-vivo</i> assays in 11 different species</li> </ul>	<u>United States Food and Drug Administration</u> <u>Database Information:</u> - Is a part of the Endocrine Disrupter Knowledge Base (EDKB)	(United States Food and Drug Administration, 2015b)
Endocrine Disruption Screening Program for the 21 <sup>st</sup> Century (EDSP21) Dashboard	>1'800	<ul style="list-style-type: none"> <li>- Contains chemical screening data from the EPA's ToxCast and Tox21 projects, chemical exposure data and prediction models, chemical structures and annotations, and physical chemical properties database</li> <li>- Still under development to add functionality</li> </ul>	<u>United States Environmental Protection Agency</u> <u>Database Information:</u> - Part of the US EPA's Endocrine Disruptor Screening Program and created to help the program evaluate chemicals	(United States Environmental Protection Agency, 2016)
Endocrine Active Substances Information System (EASIS)	Development In Progress	<ul style="list-style-type: none"> <li>- Existing results from the 2000-2007 studies completed by DG Environment in creation of the EU Priority List of Chemicals within the EU-Strategy for Endocrine Disruptors</li> <li>- Goal is to develop the previous results and priority list further and into a web-based information system on endocrine active substances</li> </ul>	<u>European Commission DG Joint Research Centre</u> <u>Database Information:</u> - Mandate to start development received in 2010 - Progress communicated at DG Environment's conference on endocrine disruptors in June 2012	(European Commission Joint Research Center, 2016)

List/ Database Name	Number of Compounds / Compound Groups	Database Contents	Organisation Name and Related Information	List/ Database Reference
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*NON-GOVERNMENTAL*

RISCTOX	100'000	<ul style="list-style-type: none"> <li>- Contains toxic and hazardous substances and data regarding their health risks, environmental risks, and related regulations</li> <li>- 2'281 substances are categorised in a sub-database titled "endocrine disrupters", however, not all substances have entries or clear references. Those that do are referenced to a number of sources including the EU Priority List, the Scorecard list, the Our Stolen Future list, and others</li> </ul>	<p><u>ISTAS &amp; the European Trade Union Institute:</u></p> <p><u>Database Information:</u></p> <ul style="list-style-type: none"> <li>- Database commissioned by the European Trade Union Institute and developed by ISTAS</li> </ul>	(ISTAS, 2016)
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### 3. Recommended Chemicals for the Subsequent Overview Reports

From the comparison, it is noted that the following three lists have the most justified and robust selection criteria based on the WHO/IPCS definition of EDCs and have conducted rigorous assessment to review chemicals using referenced scientific evidence: [i] the REACH Substances of Very High Concern (SVHC) Candidate List for Authorisation by the European Chemicals Agency, [ii] the list of substances evaluated using the Danish criteria for identifying EDCs by the Danish EPA, and [iii] the SIN List by ChemSec. Each of these lists is well documented and each provides accessible information detailing the methodology, criteria, and sources used to recognise included chemicals as an EDC or potential EDC (ChemSec, 2014b; European Chemicals Agency, 2016a; Hass, Christiansen, et al., 2012). The REACH SVHC Candidate List also includes a multi-stakeholder consultation period in the listing procedure. We therefore consider the 77 chemicals listed under these three lists as identified EDCs or potential EDCs with high certainty, and they will form the basis for chemicals to be considered in the subsequent overview reports focusing on life-cycles, levels and trends of environmental exposure, and identified adverse impacts on wildlife.

Table 5 shows the five recognised EDCs on the REACH SVHC Candidate List, which are considered to be identified EDCs. All other chemicals are included in Table 6 and are considered to be potential EDCs with high certainty. The column “Basis for Recommendation” shows in which of these three lists each chemical is included. The other columns in the tables show in which of the other lists considered in this report each chemical is included (grouped by list type). This provides an overview regarding each chemical’s involvement in current regulations, ongoing evaluations, industry actions, or other categories.

The types of chemicals recommended cover a wide range of groups and uses. Some of the most commonly labelled EDCs or potential EDCs recommended include phthalates, bisphenols, benzophenones, parabens, organotin compounds, and alkylphenols.

**Table 5. List of recommended chemicals and groups of chemicals for inclusion in the subsequent overview reports – identified EDCs, basis for recommendation and their presence on the other lists**

Chemical Name	CAS Number	Basis Lists for Recommendation	Regulation Lists	Evaluation Lists	Industry Action Lists	Other Lists
Bis(2-ethylhexyl) phthalate; DEHP	117-81-7	EU REACH SVHC List, SIN*	EU: REACH registered	US EDSP	Apple Regulated Substances, Restricted Substances (Textile)	EU Impact Assessment, EU Priority List Category 1, Japan Speed 98, Our Stolen Future, ScoreCard, TEDX, Trade Union Priority
4-(1,1,3,3-tetramethylbutyl)phenol	140-66-9/ 27193-28-8**	EU REACH SVHC List, SIN	EU: REACH registered		Apple Regulated Substances, Restricted Substances (Textile)	EU Impact Assessment, EU Priority List Category 1, ScoreCard, TEDX, Trade Union Priority
4-(1,1,3,3-tetramethylbutyl)phenol, ethoxylated	2315-67-5/ 2315-61-9/ 9002-93-1/ 2497-59-8	EU REACH SVHC List, SIN			Restricted Substances (Textile)	ScoreCard
4-Nonylphenol, branched and linear	84852-15-3/ 26543-97-5/ 104-40-5/ 17404-66-9/ 30784-30-6/ 52427-13-1/ 186825-36-5/ 142731-63-3/ 90481-04-2**/ 25154-52-3**/ Others not identified	EU REACH SVHC List, SIN		EU CoRAP*	Restricted Substances (Textile)	EU Priority List Category 1, Most Significant EDCs Australia, ScoreCard, TEDX, Trade Union Priority
4-Nonylphenol, branched and linear, ethoxylated	104-35-8/7311-27-5/ 14409-72-4/ 20427-84-3/ 26027-38-3/ 27942-27-4/ 34166-38-6/ 37205-87-1/ 127087-87-0/ 156609-10-8/ 68412-54-4**/ 9016-45-9**/ Others not identified	EU REACH SVHC List, SIN		EU CoRAP	Restricted Substances (Textile)	EU Priority List Category 1, ScoreCard, TEDX

\* This list has chemicals included specifically due to their endocrine disrupting potentials, however, these chemicals were placed on the list for other reasons

\*\* Identified as additional CAS numbers by ChemSec for these compounds on the SIN List and are not originally on the EU REACH SVHC list

**Table 6. List of recommended chemicals and groups of chemicals for inclusion in the subsequent overview reports – potential EDCs with high certainty, basis for recommendation and their presence on the other lists**

Chemical Name	CAS Number	Basis Lists for Recommendation	Regulation Lists	Evaluation Lists	Industry Action Lists	Other Lists
<b>BENZOPHENONES</b>						
Benzophenone-2 (Bp-2); 2,2',4,4'-tetrahydroxybenzophenone	131-55-5	SIN, Danish Criteria				EU Priority List Category 1, TEDX
Benzophenone	119-61-9	SIN	EU REACH Registered	EU CoRAP*		Japan Speed 98, Our Stolen Future, ScoreCard, TEDX, Trade Union Priority
Benzophenone-3; Oxybenzone	131-57-7	SIN, Danish Criteria		EU CoRAP		EU Impact Assessment, TEDX
3-Benzylidene camphor (3-BC); 1,7,7-trimethyl-3-(phenylmethylene)bicyclo[2.2.1]heptan-2-one	15087-24-8	SIN, Danish Criteria				EU Impact Assessment, EU Priority List Category 1, TEDX
2,4-Dihydroxybenzophenone; Resbenzophenone	131-56-6	SIN, Danish Criteria	EU REACH Registered			EU Priority List Category 1, TEDX
4,4'-dihydroxybenzophenone	611-99-4	SIN, Danish Criteria				EU Priority List Category 1, TEDX
<b>BISPHENOLS</b>						
Bisphenol F	620-92-8	SIN				TEDX
Tetrabromobisphenol A (TBBPA)	79-94-7	SIN	EU REACH Registered	EU CoRAP	Apple Regulated Substances, Restricted Substances (Textile)	EU Impact Assessment, ScoreCard, TEDX
Bisphenol A	80-05-7	SIN	EU REACH Registered	EU CoRAP	Apple Regulated Substances	EU Impact Assessment, EU Priority List Category 1, Japan Speed 98, Most Significant EDCs Australia, Our Stolen Future, ScoreCard, TEDX, Trade Union Priority

Chemical Name	CAS Number	Basis Lists for Recommendation	Regulation Lists	Evaluation Lists	Industry Action Lists	Other Lists
Bisphenol S	80-09-1	SIN	EU REACH Registered	EU CoRAP		EU Impact Assessment, TEDX

**PARABENS**

Methylparaben	99-76-3	Danish Criteria	EU REACH Registered	EU CoRAP		EU Impact Assessment, EU Priority List Category 1, TEDX, Trade Union Priority
Ethylparaben	120-47-8	Danish Criteria	EU REACH Registered			EU Priority List Category 1, TEDX
Butylparaben; butyl 4-hydroxybenzoate	94-26-8	SIN, Danish Criteria				EU Priority List Category 1, TEDX
Propylparaben; propyl 4-hydroxybenzoate	94-13-3	SIN, Danish Criteria		EU CoRAP		EU Impact Assessment, EU Priority List Category 1, TEDX

**PFOS AND ITS SALTS**

PFOS (perfluorooctane sulfonic acid)	1763-23-1	SIN	Rotterdam Convention, Stockholm Convention	US EDSP	Apple Regulated Substances	Our Stolen Future
Diethanolamine salt of PFOS	70225-14-8	SIN	Rotterdam Convention, Stockholm Convention			
Potassium salt of PFOS	2795-39-3	SIN	Rotterdam Convention, Stockholm Convention			TEDX
Lithium salt of PFOS	29457-72-5	SIN	Rotterdam Convention, Stockholm Convention			
Ammonium salt of PFOS	29081-56-9	SIN	Rotterdam Convention, Stockholm Convention			

Chemical Name	CAS Number	Basis Lists for Recommendation	Regulation Lists	Evaluation Lists	Industry Action Lists	Other Lists
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**PHTHALATES**

Diundecyl phthalate (DuDP), branched and linear	3648-20-2	SIN				
Dihexyl phthalate (DHP)	84-75-3	SIN, Danish Criteria	EU SVHC Candidate for Authorisation*		Apple Regulated Substances, Restricted Substances (Textile)	EU Impact Assessment, Japan Speed 98, ScoreCard, TEDX
Diethyl phthalate (DEP)	84-66-2	SIN, Danish Criteria	EU REACH Registered	EU CoRAP <sup>‡</sup> , US EDSP	Apple Regulated Substances, Restricted Substances (Textile)	EU Impact Assessment, EU Priority List Category 1, Japan Speed 98, Our Stolen Future, ScoreCard, TEDX, Trade Union Priority
1,2-benzenedicarboxylic acid, di-C8-10-nbranched alkyl esters, C9-rich	68515-48-0	SIN	EU REACH Registered		Apple Regulated Substances	
Dicyclohexyl phthalate (DCHP)	84-61-7	SIN, Danish Criteria	EU REACH Registered		Restricted Substances (Textile)	EU Priority List Category 1, Japan Speed 98, ScoreCard, TEDX, Trade Union Priority
Diocetyl phthalate	117-84-0	SIN			Apple Regulated Substances, Restricted Substances (Textile)	ScoreCard, TEDX
Diisononyl phthalate	28553-12-0	SIN	EU REACH Registered		Apple Regulated Substances, Restricted Substances (Textile)	ScoreCard, TEDX, Trade Union Priority
Diisodecyl phthalate (DiDP)	68515-49-1 / 26761-40-0	SIN	EU REACH Registered		Apple Regulated Substances, Restricted Substances (Textile)	ScoreCard, TEDX, Trade Union Priority

**PESTICIDES / FUNGICIDES**

Sulfluramid (EtFOSA)	4151-50-2	SIN	Rotterdam Convention			
Tebuconazole	107534-96-3	Danish Criteria	EU REACH Registered	US EDSP <sup>‡</sup>		EU Impact Assessment, TEDX

Chemical Name	CAS Number	Basis Lists for Recommendation	Regulation Lists	Evaluation Lists	Industry Action Lists	Other Lists
Zineb	12122-67-7	SIN, Danish Criteria				EU Impact Assessment, EU Priority List Category 1, Japan Speed 98, Our Stolen Future, ScoreCard, TEDX
Ziram	137-30-4	SIN	EU REACH Registered	EU CoRAP, US EDSP		EU Impact Assessment, Japan Speed 98, Our Stolen Future, ScoreCard, TEDX, Trade Union Priority
Thiram	137-26-8	SIN, Danish Criteria	EU REACH Registered, Rotterdam Convention	EU CoRAP <sup>‡</sup>		EU Impact Assessment, EU Priority List Category 1, Our Stolen Future, ScoreCard, TEDX, Trade Union Priority

**ORGANOTINS**

Dibutyltin (DBT)	1002-53-5	SIN				TEDX
Dibutyltin dichloride	683-18-1	SIN	EU REACH Registered, EU SVHC Candidate for Authorisation*		Apple Regulated Substances	EU Impact Assessment, TEDX, Trade Union Priority
Triphenyltin (TPhT)	668-34-8	SIN				ScoreCard
Triphenyltin chloride	639-58-7	SIN				TEDX
Tributyltin hydride	688-73-3	SIN	EU REACH Registered			EU Priority List Category 1, Japan Speed 98, Our Stolen Future, ScoreCard, TEDX
Tributyltin	56573-85-4	SIN	EU REACH Registered			
Triphenyltin hydroxide	76-87-9	SIN		US EDSP		
Triphenyltin acetate	900-95-8	SIN				EU Priority List Category 1, ScoreCard, TEDX
Dibutyltin (dilaurate)	77-58-7	SIN	EU REACH Registered			
Tripropyltin hydride	761-44-4	SIN				

Chemical Name	CAS Number	Basis Lists for Recommendation	Regulation Lists	Evaluation Lists	Industry Action Lists	Other Lists
Tripropyltin chloride	2279-76-7	SIN				EU Priority List Category 1, ScoreCard
Tributyltin chloride	1461-22-9	SIN	Rotterdam Convention			TEDX, Trade Union Priority
Bis(triisopropyltin) oxide	1067-29-4	SIN				

**MISCELLANEOUS**

Tonalide	1506-02-1 / 21145-77-7	SIN	EU REACH Registered			TEDX
Tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	1634-04-4	SIN, Danish Criteria		EU CoRAP, US EDSP		EU Impact Assessment, EU Priority List Category 1, TEDX, Trade Union Priority
4-Tert-Butylphenol	98-54-4	SIN	EU REACH Registered	EU CoRAP		EU Impact Assessment, ScoreCard, TEDX, Trade Union Priority
Tert.-Butylhydroxyanisole (BHA); tert-butyl-4-methoxyphenol	25013-16-5	SIN, Danish Criteria		EU CoRAP, US EDSP		EU Impact Assessment, EU Priority List Category 1, Our Stolen Future, ScoreCard, TEDX
Pentachlorophenol (PCP)	87-86-5	SIN, Danish Criteria	Rotterdam Convention	US EDSP	Restricted Substances (Textile)	EU Priority List Category 1, Japan Speed 98, Our Stolen Future, ScoreCard, TEDX
4-nitrophenol	100-02-7	SIN, Danish Criteria	EU REACH Registered			TEDX, Trade Union Priority
2,4,6-tribromophenol	118-79-6	SIN	EU REACH Registered	EU CoRAP*		TEDX
Poly(oxy-1,2-ethanediyl), alpha-(octylphenyl)-omega-hydroxy-branched	68987-90-6	SIN			Restricted Substances (Textile)	
Quadrosilan; 2,6-cis-Diphenylhexamethylcyclotetrasiloxane	33204-76-1	SIN, Danish Criteria				EU Priority List Category 1, TEDX
Octamethylcyclotetrasiloxane	556-67-2	SIN				EU Impact Assessment, EU Priority List Category 1, TEDX, Trade Union Priority
Resorcinol	108-46-3	SIN, Danish Criteria	EU REACH Registered	EU CoRAP		EU Impact Assessment, EU Priority List Category 1, Our Stolen Future, ScoreCard,

Chemical Name	CAS Number	Basis Lists for Recommendation	Regulation Lists	Evaluation Lists	Industry Action Lists	Other Lists
						TEDX, Trade Union Priority
Perchloroethylene; tetrachloroethylene	127-18-4	SIN, Danish Criteria		EU CoRAP*†, US EDSP	Apple Regulated Substances, Restricted Substances (Textile)	TEDX, Trade Union Priority
Perfluorooctanoic acid (PFOA)	335-67-1	SIN	EU SVHC Candidate for Authorisation*	US EDSP	Apple Regulated Substances	EU Impact Assessment, TEDX
Butylated Hydroxytoluene	128-37-0	SIN	EU REACH Registered	EU CoRAP		TEDX
Carbon disulphide	75-15-0	SIN	EU REACH Registered	EU CoRAP		EU Impact Assessment, ScoreCard, TEDX, Trade Union Priority
Chlorinated paraffins (CPs)	63449-39-8	SIN	EU REACH Registered			
Deca-BDE	1163-19-5	SIN	EU REACH Registered, EU SVHC Candidate for Authorisation*		Apple Regulated Substances, Restricted Substances (Textile)	TEDX, Trade Union Priority
2-ethylhexyl 4- methoxycinnamate	5466-77-3	SIN, Danish Criteria				EU Impact Assessment, EU Priority List Category 1, TEDX, Trade Union Priority
Galaxolide	1222-05-5	SIN	EU REACH Registered			TEDX, Trade Union Priority
Glycols, polyethylene, mono((1,1,3,3-tet = Poly(oxy-1,2-ethanediyl), .alpha.-[(1,1,3,3- tetramethylbutyl) phenyl]- .omega.-hydroxy-	9036-19-5	SIN			Restricted Substances (Textile)	ScoreCard, TEDX
Hexane	110-54-3	SIN	EU REACH Registered	EU CoRAP*, US EDSP		TEDX
Metam-sodium	137-42-8	SIN, Danish Criteria				EU Priority List Category 1, ScoreCard, TEDX, Trade Union Priority

<b>Chemical Name</b>	<b>CAS Number</b>	<b>Basis Lists for Recommendation</b>	<b>Regulation Lists</b>	<b>Evaluation Lists</b>	<b>Industry Action Lists</b>	<b>Other Lists</b>
3-(4-Methylbenzylidene) camphor; 1,7,7-trimethyl-3-[(4-methylphenyl)methylene]bicyclo[2.2.1]heptan-2-one	36861-47-9	SIN, Danish Criteria				EU Priority List Category 1, TEDX
Naphthalene	91-20-3	SIN	EU REACH Registered	EU CoRAP*	Apple Regulated Substances, Restricted Substances (Textile)	TEDX
Styrene	100-42-5	SIN	EU REACH Registered	US EDSP		EU Priority List Category 1, Japan Speed 98, ScoreCard, TEDX, Trade Union Priority
Triclosan	3380-34-5	SIN, Danish Criteria		EU CoRAP		EU Impact Assessment, TEDX
Triphenyl phosphate	115-86-6	SIN	EU REACH Registered	EU CoRAP		EU Impact Assessment, TEDX

\* This list has chemicals included specifically due to their endocrine disrupting potentials, however, these chemicals were placed on the list for other reasons.

‡ A conclusion for this chemical has been reached for this list's evaluation processes.

## References

- Apple Inc. (2014). *Apple Regulated Substances Specification*. Retrieved from [https://www.apple.com/environment/reports/docs/apple\\_regulated\\_substances\\_specification\\_sept2014.pdf](https://www.apple.com/environment/reports/docs/apple_regulated_substances_specification_sept2014.pdf)
- Arapaki, N., Charistou, A., Katsanou, E., Konstantinidou, P., Kyriakopoulou, K., Laskari, V., ... Spyropoulou, A. (2016). *Screening of available evidence on chemical substances for the identification of endocrine disruptors according to different options in the context of an Impact Assessment*. Retrieved from [http://ec.europa.eu/health/endocrine\\_disruptors/docs/2016\\_impact\\_assessment\\_study\\_en.pdf](http://ec.europa.eu/health/endocrine_disruptors/docs/2016_impact_assessment_study_en.pdf)
- Beronius, A., Hanberg, A., Zilliacus, J., & Rudén, C. (2014). Bridging the gap between academic research and regulatory health risk assessment of Endocrine Disrupting Chemicals. *Current Opinion in Pharmacology*, 19, 99–104. <http://doi.org/10.1016/j.coph.2014.08.005>
- ChemSec. (2014a). Comprehensive methodology for substance inclusion on the SIN List. Retrieved from [http://chemsec.org/images/stories/2014/Full\\_SIN\\_Methodology\\_October\\_2014.pdf](http://chemsec.org/images/stories/2014/Full_SIN_Methodology_October_2014.pdf)
- ChemSec. (2014b). *Endocrine disrupting chemicals (EDCs) on the SIN List*. Retrieved from [http://chemsec.org/images/stories/2014/EDC\\_factsheet\\_October\\_2014.pdf](http://chemsec.org/images/stories/2014/EDC_factsheet_October_2014.pdf)
- ChemSec. (2016). SIN List. Retrieved March 23, 2016, from <http://sinlist.chemsec.org/>
- Danish Environmental Protection Agency. (2012). Danish Criteria are effective for the identification of Endocrine Disruptors. Retrieved March 23, 2016, from <http://eng.mst.dk/about-the-danish-epa/news/news-archives/2012/jun/danish-criteria-are-effective-for-the-identification-of-endocrine-disruptors/>
- Environment Canada. (2016a). Toxic Substances List. Retrieved July 13, 2016, from <https://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=0DA2924D-1>
- Environment Canada. (2016b). Toxic Substances List - Schedule 1. Retrieved July 13, 2016, from <https://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=0DA2924D-1&wsdoc=4ABEFFC8-5BEC-B57A-F4BF-11069545E434>
- European Chemicals Agency. (2011). *Selection criteria to prioritise substances for Substance Evaluation (2011 CoRAP selection criteria)*. Retrieved from [http://echa.europa.eu/documents/10162/13628/background\\_doc\\_criteria\\_ed\\_32\\_2011\\_en.pdf](http://echa.europa.eu/documents/10162/13628/background_doc_criteria_ed_32_2011_en.pdf)
- European Chemicals Agency. (2016a). Candidate List of substances of very high concern for Authorisation. Retrieved March 23, 2016, from <http://echa.europa.eu/candidate-list-table>
- European Chemicals Agency. (2016b). Registered substances. Retrieved March 23, 2016, from <http://echa.europa.eu/information-on-chemicals/registered-substances>
- European Chemicals Agency. (2016c). Substance evaluation - CoRAP. Retrieved March 23, 2016, from <https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-list-of-substances>
- European Chemicals Agency. (2016d). The Candidate List. Retrieved March 30, 2016, from <http://echa.europa.eu/regulations/reach/authorisation/the-candidate-list>
- European Commission. (2014). Roadmap: Defining criteria for identifying Endocrine Disruptors in the context of the implementation of the Plant Protection Product

- Regulation and Biocidal Products Regulation, 19(4).
- European Commission. (2015). Selection of chemical substances to be screened in the context of the impact assessment on criteria to identify endocrine disruptors.
- European Commission. (2016a). Priority List. Retrieved March 23, 2016, from [http://ec.europa.eu/environment/chemicals/endocrine/strategy/substances\\_en.htm](http://ec.europa.eu/environment/chemicals/endocrine/strategy/substances_en.htm)
- European Commission. (2016b). *Screening methodology to identify potential endocrine disruptors according to different options in the context of an impact assessment*. Retrieved from [http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101950/jrc\\_screening\\_methodology\\_for\\_ed\\_impact\\_assessment%28online%29.pdf](http://publications.jrc.ec.europa.eu/repository/bitstream/JRC101950/jrc_screening_methodology_for_ed_impact_assessment%28online%29.pdf)
- European Commission Joint Research Center. (2016). Endocrine Active Substances Information System (EASIS). Retrieved March 23, 2016, from [https://eurl-ecvam.jrc.ec.europa.eu/databases/eas\\_database](https://eurl-ecvam.jrc.ec.europa.eu/databases/eas_database)
- European Trade Union Confederation. (2010). Trade Union Priority List. Retrieved March 23, 2016, from <https://www.etuc.org/trade-union-priority-list>
- Grosshart, C., & Okkerman, P. C. (2000). *Towards the establishment of a priority list of substances for further evaluation of their role in endocrine disruption*.
- Hass, U., Andersson, A.-M., & Holbech, H. (2012). *Evaluation of tebuconazole, triclosan, methylparaben and ethylparaben according to the Danish proposal for criteria for endocrine disrupters*.
- Hass, U., Christiansen, S., Axelstad, M., Boberg, J., Andersson, A., Skakkebaek, N. E., ... Bjerregaard, P. (2012). Evaluation of 22 SIN List 2.0 substances according to the Danish proposal on criteria for endocrine disrupters, (May), 1–141. Retrieved from <http://www.mst.dk/NR/rdonlyres/CDA4EB4F-1554-4754-A0F9-77D73BCA0228/0/SINreportandAnnex.pdf>
- ISTAS. (2016). RISCTOX. Retrieved April 18, 2016, from <http://risctox.istas.net/en/index.asp>
- Johnson, I., & Harvey, P. (2002). *Study on the scientific evaluation of 12 substances in the context of endocrine disrupter priority list of actions*.
- Kim, S., Thiessen, P. A., Bolton, E. E., Chen, J., Fu, G., Gindulyte, A., ... Bryant, S. H. (2015). PubChem Substance and Compound databases. *Nucleic Acids Research*, 44(D1), D1202-1213. <http://doi.org/10.1093/nar/gkv951>
- Ministry of the Environment Japan. (1998). Chemicals Suspected of Having Endocrine Disrupting Effects. Retrieved March 23, 2016, from <https://www.env.go.jp/en/chemi/ed/speed98/sp98t3.html>
- Ministry of the Environment Japan. (2010). *Further Actions to Endocrine Disrupting Effects of Chemical Substances - EXTEND 2010*.
- Munn, S., & Goumenou, M. (2013). *Key scientific issues relevant to the identification and characterisation of endocrine disrupting substances: Report of the Endocrine Disrupters Expert Advisory Group*. Retrieved from <http://publications.jrc.ec.europa.eu/repository/handle/111111111/28127>
- OECD. (2012). *Detailed Review Paper on the State of the Science on Novel In Vitro and In Vivo Screening and Testing Methods And Endpoints for Evaluating Endocrine Disruptors*. Retrieved from [http://www.oecd.org/officialdocuments/displaydocumentpdf?cote=env/jm/mono\(2010\)46&doclanguage=en](http://www.oecd.org/officialdocuments/displaydocumentpdf?cote=env/jm/mono(2010)46&doclanguage=en)

- Our Stolen Future. (2016). Widespread Pollutants with Endocrine-disrupting Effects. Retrieved March 23, 2016, from <http://www.ourstolenfuture.org/basics/chemlist.htm>
- Petersen, G., Rasmussen, D., & Gustavson, K. (2007). *Study on enhancing the Endocrine Disrupter priority list with a focus on low production volume chemicals Study on enhancing the Endocrine*.
- Rotterdam Convention. (2016). Annex III Chemicals. Retrieved March 23, 2016, from <http://www.pic.int/theconvention/chemicals/annexiiichemicals/tabid/1132/language/en-us/default.aspx>
- SAICM. (2012). *Report of the International Conference on Chemicals Management on the work in its third session*.
- SAICM. Report of the International Conference on Chemicals Management on the work of its fourth session (2015).
- SAICM. (2016). ICCM2 Outcomes and follow-up. Retrieved March 31, 2016, from [http://www.saicm.org/index.php?option=com\\_content&view=article&id=218:iccm2-outcomes-and-follow-up&catid=89:iccm-2](http://www.saicm.org/index.php?option=com_content&view=article&id=218:iccm2-outcomes-and-follow-up&catid=89:iccm-2)
- Santos, T., Romano, D., & Gadea, R. (2010). *Trade Union Priority List for REACH Authorisation*.
- Scorecard. (2011). Endocrine Toxicants. Retrieved March 23, 2016, from [http://scorecard.goodguide.com/health-effects/chemicals-2.tcl?short\\_hazard\\_name=endo](http://scorecard.goodguide.com/health-effects/chemicals-2.tcl?short_hazard_name=endo)
- Stockholm Convention. (2016). Listing of POPs in the Stockholm Convention. Retrieved March 23, 2016, from <http://chm.pops.int/TheConvention/ThePOPs/ListingofPOPs/tabid/2509/Default.aspx>
- TEDX. (2016). TEDX List of Potential Endocrine Disruptors. Retrieved March 23, 2016, from <http://www.endocrinedisruption.org/endocrine-disruption/tedx-list-of-potential-endocrine-disruptors/overview>
- United States Environmental Protection Agency. (2009). *Final List of Initial Pesticide Active Ingredients and Pesticide Inert Ingredients to be Screened Under the Federal Food, Drug, and Cosmetic Act*. Retrieved from <https://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPPT-2004-0109-0080>
- United States Environmental Protection Agency. (2014). *Final Second List of Chemicals for Tier 1 Screening*. Retrieved from <https://www.epa.gov/sites/production/files/2015-08/documents/1.pdf>
- United States Environmental Protection Agency. (2015a). Endocrine Disruptor Screening Program (EDSP) Overview. Retrieved March 23, 2016, from <https://www.epa.gov/endocrine-disruption/endocrine-disruptor-screening-program-edsp-overview>
- United States Environmental Protection Agency. (2015b). Endocrine Disruptor Screening Program Tier 1 Screening Results and Associated Data Evaluation Records. Retrieved March 23, 2016, from <https://www.epa.gov/endocrine-disruption/endocrine-disruptor-screening-program-tier-1-screening-results-and-associated>
- United States Environmental Protection Agency. (2015c). Overview of the First List of Chemicals for Tier 1 Screening under the Endocrine Disruptor Screening Program. Retrieved April 13, 2016, from <https://www.epa.gov/endocrine-disruption/overview-first-list-chemicals-tier-1-screening-under-endocrine-disruptor>
- United States Environmental Protection Agency. (2016). EDSP21 Dashboard. Retrieved April

18, 2016, from <http://actor.epa.gov/edsp21/>

United States Food and Drug Administration. (2015a). Endocrine Disruptor Knowledge Base.

United States Food and Drug Administration. (2015b). Estrogenic Activity Database (EADB).

Retrieved March 23, 2016, from

<http://www.fda.gov/ScienceResearch/BioinformaticsTools/EstrogenicActivityDatabaseEADB/default.htm>

Williams, M., Woods, M., Kumar, A., Ying, G., Shareef, A., Karkkainen, M., & Kookana, R. (2007). *Endocrine Disrupting Chemicals in the Australian Riverine Environment*.

Retrieved from [https://online.uts.edu.au/bbcswebdav/pid-1094741-dt-content-rid-5498618\\_1/courses/91145/Land Water Australia 2007b\(1\).pdf](https://online.uts.edu.au/bbcswebdav/pid-1094741-dt-content-rid-5498618_1/courses/91145/Land Water Australia 2007b(1).pdf)

World Health Organization. (2002). *Global Assessment of the State-of-the-Science of Endocrine Disruptors*. (T. Damstra, S. Barlow, A. Bergman, R. Kavlock, & G. Van Der Kraak, Eds.).

Zero Discharge of Hazardous Chemicals Programme. (2015). *2015 Manufacturing Restricted Substances List*.