Sustainable Procurement of Electronics: A Progressive Approach to Chemicals of Concern
Acknowledgements

This publication was prepared by ICLEI - Local Governments for Sustainability and Sustainable Global Resources under the SAICM GEF 9771 project Global best practices on emerging chemical policy issues of concern under the Strategic Approach to International Chemicals Management (SAICM) funded by the Global Environment Facility (GEF). This project is implemented by the United Nations Environment Programme (UNEP) and executed by the SAICM Secretariat. ICLEI acknowledges the financial contribution of the GEF to the development, editing and design of the publication.

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Reviewers
The authors would like to acknowledge the following reviewers for their comments and insights:

Eva Ahlner (Swedish Environmental Protection Agency); Joon Sung Ahn (Korea Environmental Industry and Technology Institute); Pamela Brody-Heine (Clean Electronics Production Network); Anna Christiansson (Swedish Environmental Protection Agency); Kim Claes (Catapa, Belgium); Barton Finn (TCO Development, Belgium); Cuno van Geet (Ministry of Infrastructure and Water Management, Netherlands); Nancy Gillis (Global Electronics Council, USA); Tim Hopper (Microsoft, USA); Lars Johannsen (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany); Alison Kinn Bennett (Environmental Protection Agency, USA); Hiroyuki Kobayashi (Eco Mark Office of the Japan Environment Association); Sanjay Kumar (Indian Railways, India); Guy Ladovocat (ABNT, Brazil); Erica Logan (Global Electronics Council, USA); Anja Mager (Federal Ministry for the Environment, Nature Conservation and Nuclear Safety,
Design and Layout
Piquant

The guidance is produced as a contribution to the SPP Programme of the One Planet Network.

Citation
SAICM Secretariat (2022): Sustainable Procurement of Electronics: A Progressive Approach to Chemicals of Concern

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<td>AMR</td>
<td>Antimicrobial resistance</td>
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<td>BFR</td>
<td>Brominated Flame Retardants</td>
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<td>BoM</td>
<td>Bill of Materials</td>
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<td>BEP</td>
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<td>BEST</td>
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<td>CFIT</td>
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<td>CMD</td>
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<td>CMR</td>
<td>Carcinogenic, mutagenic and reprotoxic</td>
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<td>CO2</td>
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<td>CO2-eq</td>
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<td>DDT</td>
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<td>GEF</td>
<td>Global Environment Facility Project on Global Best Practices on Emerging Policy Issues of Concern</td>
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<td>GHG</td>
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<td>GHS</td>
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<td>Inter-Governmental Organization</td>
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<td>International Labour Organization</td>
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<td>International Lead and Zinc Study Group</td>
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<td>International Materials Data System</td>
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<td>International Standard Industrial Classification</td>
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<td>International Organization for Standardization</td>
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<td>ISWA</td>
<td>International Solid Waste Association</td>
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<td>Swedish Chemicals Agency</td>
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<td>Life Cycle Assessment</td>
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<td>Life Cycle Costing</td>
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<td>Material Safety Data Sheet</td>
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<td>Original Design Manufacturers</td>
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<td>ODS</td>
<td>Ozone-Depleting Substance</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
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<td>OEM</td>
<td>Original Equipment Manufacturer</td>
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<td>OHS</td>
<td>Occupational Health and Safety</td>
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<td>OPN</td>
<td>UN One Planet Network</td>
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<td>PAHs</td>
<td>Polycyclic Aromatic Hydrocarbons</td>
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<td>PAN</td>
<td>Pesticide Action Network</td>
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<td>PBDEs</td>
<td>Polybrominated diphenyl ethers</td>
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<td>PBDFS</td>
<td>Polybrominated dibenzofurans</td>
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<td>PCBs</td>
<td>Polychlorinated biphenyls</td>
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<tr>
<td>PCDDs</td>
<td>Polychlorinated dibenzo-p-dioxins</td>
</tr>
<tr>
<td>PCDFS</td>
<td>Polychlorinated dibenzofurans</td>
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<td>PE</td>
<td>Polyethylene</td>
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<td>PET</td>
<td>Polyethylene terephthalate</td>
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<td>PFASs</td>
<td>Per- and polyfluoroalkyl substances</td>
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<td>PFCs</td>
<td>Perfluorinated chemicals</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>PFDA</td>
<td>Nonadecafluorodecanoic acid</td>
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<td>PFHxS</td>
<td>Perfluorohexanesulfonic acid</td>
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<tr>
<td>PFNA</td>
<td>Perflurononanoic acid</td>
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<td>PFOA</td>
<td>Perfluorooctanoic acid</td>
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<td>PFOS</td>
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<td>PFRs</td>
<td>Organophosphate-based flame retardants</td>
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<td>PHAs</td>
<td>Polyhydroxyalkanoates</td>
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<td>PLA</td>
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<td>POPs</td>
<td>Persistent organic pollutants</td>
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<td>PPE</td>
<td>Personal protective equipment</td>
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<td>PPI</td>
<td>Public Procurement of Innovation</td>
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<td>PTFE</td>
<td>Polytetrafluoroethylene</td>
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<td>PV</td>
<td>Photovoltaic</td>
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<tr>
<td>PVC</td>
<td>Polyvinyl chloride</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
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<tr>
<td>REACH</td>
<td>Registration, Evaluation, Authorization and Restriction of Chemicals</td>
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<td>ROHS</td>
<td>Restriction of Hazardous Substances (EU Directive)</td>
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<td>Rio+20</td>
<td>United Nations Conference on Sustainable Development</td>
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<td>SAICM</td>
<td>Strategic Approach to International Chemicals Management</td>
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<td>SDS</td>
<td>Safety Data Sheet(s)</td>
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<td>SEI</td>
<td>Stockholm Environment Institute</td>
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<td>SIN</td>
<td>SIN (Substitute It Now!) List</td>
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<td>SMEs</td>
<td>Small and Medium-sized Enterprises</td>
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<td>SPP</td>
<td>Sustainable Public Procurement</td>
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<td>SRLs</td>
<td>Substance Restriction Lists</td>
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<td>SVHC</td>
<td>Substances of Very High Concern</td>
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<td>TCE</td>
<td>Trichloroethylene</td>
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<td>TF</td>
<td>(Waste) Treatment facilities</td>
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<td>TV</td>
<td>Television</td>
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<td>UN</td>
<td>United Nations</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<td>UNSPSC</td>
<td>United Nations Standard Products and Services Code</td>
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<td>United States Food and Drug Administration</td>
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<td>VOCs</td>
<td>Volatile Organic Compounds</td>
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<td>WEEE</td>
<td>Waste Electrical and Electronic Equipment</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>WMC</td>
<td>Waste Management Contractor</td>
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## Guidelines for the Management of chemicals of concern in Procurement

1. **Role of procurement and management of chemicals of concern**

2. **Procurement categories with EEE**

3. **Five steps for chemicals of concern management in electronics procurement**
   3.1 **Step 1**: Identify priorities and objectives for chemicals of concern in policies
   3.2 **Step 2**: Define priority product and service groups
   3.3 **Step 3**: Determine proportionate sustainability specifications
   3.4 **Step 4**: Develop verification criteria and evaluation methodology
   3.5 **Step 5**: Implement controls and monitoring in contracts

4. **Summarising chemicals of concern in procurement**

## Toolbox for Procurers

### How to navigate the chapter

1. **Level 1 - Guidelines for general practice**
   1.1 Compliance with national legislation and multilateral agreements
   1.2 Supplier selection
   1.3 Criteria and verification for general practice
1.4 Model Wording for chemicals of concern
1.5 Summary of general practice

2. Level 2 – Adopting good practice
2.1 Role of Type 1 Ecolabels
2.2 Other procurement tools
2.3 Encouraging substitution
2.4 Reuse and using e-products longer
2.5 Criteria for good practice

3. Level 3 – Going beyond good practice
3.1 Criteria
3.2 Managing information on Chemicals in Products (CIP)
3.3 Design shifts in electronic equipment
3.4 Cleaner Production
3.5 Extended Producer Responsibility
3.6 Procurement approaches
3.7 Preferring safer chemicals

Recommendations

Product Profiles

1. Information & Communications Technology (ICT)
2. Electrical Equipment
3. Large and small appliances
4. Lighting
A.

Introduction & Key Issues

Sustainable Procurement of Electronics: A Progressive Approach to Chemicals of Concern
## INTRODUCTION & KEY ISSUES

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Like other products, electronic and electrical equipment (EEE) are made out of many different materials and components, each containing a wide variety of chemicals by type and by concentration. Additional chemicals may also have been used in the manufacturing and assembly stages. While all of these chemicals provide a specific function, some of them are, or may be of concern to human health, social impacts and the environment. The range of products and chemicals of concern provides a significant challenge for procurers, especially when identifying the upstream (production and sourcing of products) and downstream (use and disposal of electronic products). Health impacts may be related to exposure of workers to toxic substances; unsafe and unhealthy working conditions; and, unhealthy living conditions for local communities. Social impacts can be caused by the use of conflict minerals, illegal working activities such as and child and/or forced labour and low wages/long working hours and temporary contracts during mining, manufacturing and recycling; and, illegal dumping. Environmental impacts may include biodiversity loss and destruction of fragile ecosystems; excessive water use; and, pollution of water, soil and air with toxic substances including heavy metals, metalloids, halogenated hydrocarbons.

There is often a lack of transparency around the lifecycle environmental, social and human health impacts of Chemicals of Concern (CoCs) in e-products, a fact which is highlighted by the focus on compliance with existing chemicals regulation and labour rights within sustainable public procurement. Regulatory compliance is however a minimum requirement and, by extension, best practice aims to incentivise full material inventory and disclosure of chemicals in products, conduct alternative assessments of chemicals of concern, and shift to safer chemicals to mitigate issues at end of life. This level of management of CoCs however does not commonly form a part of many procurement strategies even where they seek to encourage shifts towards the production and consumption of greener e-products. Even sustainable procurement strategies that go beyond compliance, for example on labour rights and Health & Safety, rarely consider impacts at the repair and refurbishment stages or issues around formal and informal recycling of e-waste. This lack of a lifecycle approach to chemicals in products means that procurement is not being used as effectively as it could be in proactively managing CoCs in e-products.

Procurers need sustainable procurement to be as clear and simple as possible. Ideally, this means a single set of holistic criteria addressing all the hot spots of a product across its lifecycle. The aim of the guidance is to inform better specification of chemicals management in tenders for electronics products and provides recommendations on how best to integrate chemicals management into sustainable procurement at a global level.

1 Circular Flanders (2020). Impacts of the ICT Supply Chain: Make ICT Fair, Fair ICT Flanders, Catapa
It forms a deliverable of the Strategic Approach to International Chemicals Management (SAICM)\(^2\) Global Environment Facility Project on Global Best Practices on Emerging Policy Issues of Concern (GEF) project\(^3\).

This document addresses the role that sustainable procurement can play in managing chemicals of concern in electronics and electrical equipment procured across the public (and private) sector, during their entire lifecycle. It recognises the importance of managing chemicals of concern by demonstrating a clear pathway from initial compliance with existing regulations and multilateral environmental agreements (MEAs) towards a more proactively managed approach to selecting electronic products with lower impacts and shifting towards more sustainable patterns of consumption and production in line with the UN Sustainable development Goal 12 – ensure sustainable consumption and production patterns.

The guidance is produced by the Sustainable Public Procurement (SPP) Programme of the One Planet Network. The SPP Programme is a voluntary global multi-stakeholder partnership of governmental, non-governmental, public and private sector organisations who work together in a systematically with the aim to promote and accelerate the implementation of sustainable public procurement globally.

SAICM was developed by a multi-stakeholder and multi-sectoral Preparatory Committee and supports the achievement of the goal agreed at the 2002 Johannesburg World Summit on Sustainable Development of ensuring that, by the year 2020, chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health. Work on electronic products under SAICM is addressing two Emerging Policy issues: Chemicals in Products (which focuses on the electronics sector amongst others), and, Hazardous Substances within the Life Cycle of Electrical and Electronic Products. The latter is guided by the outcomes of the International Workshop on Hazardous Substances within the Life Cycle of Electrical and Electronic Products held in 2011\(^4\). This identified 13 recommendations for action on upstream, midstream and downstream issues identified. Many of these are of relevance to public sector procurement policy and implementation and a number are directly influenced by procurement practices, for example:

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2 United Nations Environment Programme. Strategic Approach to International Chemicals Management (SAICM)
3 UN SAICM. Global Environment Facility Project on Global Best Practices on Emerging Policy Issues of Concern
The life-cycle approach in the sound management of chemicals found in electrical and electronic products is of key importance. An increased pace to implement green design and the phase-out of hazardous substances contained in electrical and electronic products is required. The improvement of transparency with respect to the information on hazardous substances used in electrical and electronic products for all stakeholders involved in the life-cycle, including consumers, workers, and in communities around manufacturing and disposal sites is necessary.

The report also notes that solutions are most efficiently and effectively accomplished upstream and addressing problems upstream can significantly and positively impact other parts of the electronic product's lifecycle. Sustainable procurement can play an important influencing role here, through demand-pull, by adopting a more strategic, lifecycle and circular approach to procurement policy setting and practice. The continued growth in the electrical and electronic sector and the need for its long-term sustainability requires making parallel and proportional improvements in environmental, health and safety, and social justice attributes within public procurement.

The guidance has both primary and secondary audiences. It is primarily addressed to both public procurers, i.e. practitioners involved in purchasing decisions as well as those responsible for the procurement of waste management solutions at end-of-life for electronics equipment. More broadly, it is of direct relevance to those within the procurement cycle who act as enablers and facilitators. These include policymakers, project commissioners and users. These stakeholders are influential in terms of setting technical requirements on the procurement of electronics goods and services, and in the case of policymakers are responsible for ensuring that chemicals of concern (CoCs) are not only explicitly covered within wider sustainable procurement policies, but also for ensuring that sustainable procurement policies play an active role in reducing the dependency on CoCs over a clearly defined timeframe and plan of action. The guidance is therefore structured around these two groups. Box 1 sets out the guidance structure and how to use the guidance depending on the users own context.
The guidance document provides information, guidelines and recommendations on when where and how to address Chemicals of Concern (CoCs) in the context of sustainable public procurement of electronic and electrical equipment (EEE) using ICT as the guiding focus when addressing the broad range of electrical products and equipment that contain CoCs.

The format recognises that there are many roles within the procurement cycle, from commissioning, category management, through tender preparation and evaluation, to contract management.

→ **Part A** provides an overview of the guidance, scope and procurement context, and background information to CoCs and their impacts. This includes a layman’s view of where they arise within Electronic & Electrical Equipment (EEE) and the existing regulatory landscape that covers their registration and use within EEE products commonly procured within the public sector. It is not intended to be a definitive encyclopaedia of information regarding chemicals of concern in ICT but aims to signpost and complement more detailed and authoritative guidance on chemicals in electronic products.

→ **Part B** provides guidelines for adopting a life cycle approach to the procurement of EEE and identifying and addressing CoCs within the procurement cycle of EEE through a 5 step approach.

→ The guidance in **Part C** covers three levels; general, good practice and moving beyond good practice. These different levels recognise that there is likely to be significant variance in the starting point and ambitions for addressing chemicals of concern from procurers in public sector organisations across global regions.

→ **Recommendations** focus on identifying and implementing performance improvement over time. This recognises that procurement is a dynamic process and the market for EEE is constantly and rapidly evolving.

→ Finally **Product Profiles** provide guidance for specific product examples for procurers.
3. Definitions

There is no one generally accepted definition of ‘electronics’. It is therefore important to understand some distinctions when defining the categories to be covered by this guidance document.

Industries within electronics include telecommunications, equipment, electronic components, industrial electronics, and consumer electronics. The electronics sector produces electronic equipment for industries and consumer electronic products, such as mobile devices, televisions, assemblies (e.g. circuit boards) and components. Some companies within some electronics sectors may manufacture electrical components as well as produce electrical equipment.

Electrical and Electronic Equipment (EEE) is defined as equipment that is dependent on electric currents or electromagnetic fields to work properly and equipment for the generation, transfer and measurement of such currents and fields. Electrical devices convert electrical energy into other forms of energy, for example, heat, light or sound. Electronic devices control the flow of electrons to perform a task. As a general rule, if it has a battery or needs a power supply to work properly, it is probably EEE.

Products that have several functions, of which only one needs an electrical current, may still be EEE. However, not all products containing electronic components are routinely defined as EEE. For example, the current EU Waste Electronic & Electrical Equipment Directive excludes, inter alia, means of transport for persons or goods (i.e. vehicles; rail, air and sea transport). Based on these definitions, EEE products arise in a wide variety of procurement categories and spend areas.

In North America, industries in this sector fall under North American Industrial Classification System (NAICS) 334 code (Computer and Electronic Product Manufacturing). This includes radio and television broadcasting and wireless communications equipment, and component manufacturing such as printed circuit boards, electronic components etc. A further NAICS code (335) covers Electrical Equipment, Appliance, and Component Manufacturing which includes lighting and appliances as well as other electrical equipment.

The term Information & communications technology (ICT) is also often used interchangeably with electronics within literature. ICT distinguishes devices from appliances and other electrical equipment. Although there is no single, universal definition of ICT, the UN defines ICT economic activities as “the production (goods and services) of a candidate industry [that] must primarily be intended to fulfil or enable the function of information

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7 The NAICS system is a consolidation of the original Standard Industrial Classification (SIC) system for classifying industries by a four-digit code. It consolidates electronics within a single category code (334)
processing and communication by electronic means, including transmission and display\(^8\).

The activities in the ICT sector can be grouped into ICT manufacturing, ICT trade and ICT services. These are the classifications that, along with consumer electronics, are most commonly reported on an international scale.

However, procurement coding and taxonomies are different to production taxonomies like NAICS, NACE, Prodcom, ANZSIC and ISIC classifications of economic activities and production\(^9\). Furthermore, categories used to describe the composition and nature of Waste Electronic and Electrical Equipment (WEEE) also differ. These, along with procurement taxonomies and coding are described in Part B.1.

**Public procurement of EEE typically involves the purchase of the product as defined by procurement codes** (see Table 2 for main product types). In some sectors (e.g. health, education, construction etc), it may also include the purchase components and assemblies. Procurement of EEE will also include services that provide, amongst other things, print management, wholesaling of machinery, equipment and supplies, renting of office machinery and equipment (including computers), telecommunications, and computer and related activities. Service and service provision are therefore important aspects to include when considering the impacts of CoCs and the influencing role of public procurement on CoCs in electronic equipment.

Finally, electrical components common to EEE products are routinely found in transportation, e.g. in vehicles, marine and air transport. Although these products do not typically fall within the definitions of EEE products, the guidance set out below is also applicable to transport-related products (see Part B.1). Transport will therefore be referenced elsewhere within the guidance.

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\(^9\) c.f. Chapter 4 NACE Rev2 Statistical classification of economic activities in the European Community for relationship between production classification codes
4. Approach

4.1 Context

The approach taken by the guidance addresses a number of important factors relating to the management of chemicals of concern in the procurement of electronic products:

- Electronics and electrical equipment are typically complex global products with extended, often unclear, global supply chains.
- The approach to chemical management policies and their integration within sustainable procurement varies significantly from global region to region.
- The management of chemicals of concern is governed strongly by adherence to national regulations and international treaties and efforts related to the restriction of chemicals of concern and the management of hazardous waste.
- Although of critical importance, chemicals of concern are just one part of a much wider sustainable procurement landscape that has to be covered within procurement policies and tenders.
- Due to the complexities and global nature of the supply chain and the size of the EEE markets, public procurement in many organisations and countries does not have the scope to influence the whole product lifecycle in the way it can in other sectors such as furniture.
- The development of chemistries and materials and their application in electronics is part of a dynamic and constantly evolving global chemicals sector.
- The development of electronics products is a rapidly evolving marketplace within which public procurement and chemicals management have to keep pace to avoid gaps in knowledge.

To illustrate the relationship, and complexity, of the sustainable procurement landscape, Sustainable Development Goal (SDG) targets reference, chemicals of concern under SDG3 (Good Health & Wellbeing) and SDG12 (Sustainable Consumption and Production):

**Target 3.9:** By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.

**Target 12.4:** By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.
The SDGs provide an opportunity to mainstream chemicals and waste management in policymaking\textsuperscript{10}. However, in the context of sustainable procurement, there are a further 7 targets in SDG12 - one of which specifically relates to sustainable public procurement (Target 12.7: Promote public procurement practices that are sustainable, in accordance with national policies and priorities). Different public sector bodies will take a different perspective on the relevant priorities within the SDG goals. Therefore, the challenge is to ensure that the management of chemicals of concern in electronic products is proactive, visible and actionable within the context of sustainable procurement implementation.

This context is often complicated further by limited knowledge at the procurement stage about where CoCs arise as an issue within electronic products, and when within the procurement and product lifecycle. This lack of transparency is a function of long, complicated supply chains for chemicals, materials, and components within electronic products as well as a lack of knowledge by procurers of the potential impacts upstream and downstream of their procurements. As well as environmental and carbon impacts, the impact of CoCs in electronic products on labour (workforce), user and community health & safety, needs to be factored into developing and implementing socially responsible procurement policies. The Norwegian Division for Public Procurement provides guidance on public procurement and human rights through risk assessments of key sectors like IT and products\textsuperscript{11}, as do many other governments and international organisations like the Global Electronics Council and Electronics Watch (see Part A.7.2).

Sustainable public procurement practice aims to actively mitigate and manage a transition towards more sustainable e-products and less dependency on CoCs. This is best achieved by adopting an integrated and holistic approach to sustainable procurement.

\textsuperscript{10} United Nations Environment Programme (2019). Global Chemicals Outlook II: From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development
\textsuperscript{11} Socially Responsible Public Procurement and Human Rights. Norwegian Division for Public Procurement
4.2 Three Levels of Action

The guidance seeks to address the complex relationship between procurement of a wide variety of electronic products across many spend areas; and, the relationship between CoCs and other sustainability issues. It aims to achieve this by promoting a lifecycle approach to e-products and adopting a holistic view that balances both social and environmental issues arising from COCs from sourcing to end-of-life management.

The guidance takes the approach that public procurers in different organisations and countries will be starting from very different perspectives. For example, geographic, regulatory frameworks, national and organisational ambitions, and, requirements (such as health, education, ICT, transport, catering etc).

The guidelines have been developed from a combination of desk research and inputs from stakeholders representing procurers, public sector bodies, suppliers and the members of the Multi-Stakeholder Advisory Committee of the Sustainable Public Procurement programme of the One Planet Network. These have included assessment of current practices, case studies, existing guidance around sustainable procurement and chemicals of concern, lessons learned, and recommendations, from experts, stakeholders in CoC and the SPP MAC members obtained from discussions, feedback and review of the preparatory documentation and drafts. Crucially the guidance offers examples of existing procurement criteria being used in current practice identified and publicly available. Examples of over 300 criteria relating to CoCs relating to different components and lifecycle phases of electronic products (e-products) have been identified and examined from 73 sources around the world as part of the development of the guidance.

01. General Practice (Part C.1) – achieving compliance and by extension reducing instances of non-compliance with national regulations and international agreements covering chemicals of concern and management of hazardous waste within procurement exercises.

02. Good practice (Part C.2) – i.e. moving beyond compliance a more proactive approach of using procurement approaches to encourage a shift towards safer substitutes for CoCs within procurement exercises.

03. Beyond good practice (Part C.3) – moving towards a strategic approach to addressing CoCs in electronics integrated within broader sustainable procurement policies. This emphasises a shift towards encouraging the design, production and procurement of greener products by preferring only products with permitted chemicals.
This guidance is focussed on procurement aspects and is not intended to be a comprehensive review of chemicals in e-products, but rather to provide an introduction on how procurement can be leveraged to better track and manage chemicals in products. For more comprehensive information, the reader is referred to existing chemicals and IT guidance referenced in the footnotes.

Electronic products are highly complex and consist of a variety of chemistries, materials and components. The automotive sector’s International Materials Data System (IMDS) refers to a ‘tree-like’ structure in the production of electronic products (Figure 1). This highlights the complexity of the products and materials used to manufacture them. It includes the basic chemical substances extracted from primary resources, for example, oil for plastics (materials) that go to make the casing for wiring components which may be assembled into wiring harnesses that form part of the final products like a computer or a server.

**Figure 1**  Simplified generic make-up of electronic products

Source: adapted from the IMDS User Manual 12.2 hierarchy

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There are multiple stages in the lifecycle and value chain of electronic products (Figure 2). The following list provides a simplified description of stakeholder functions and interactions within the chain:

- The chemical producers create the basic chemicals, blends of chemicals, and materials (e.g. plastics and polymers for product casings, plating chemicals, solvents, paints and coatings, and metal finishes) that form the basis of mobile phones and PCs.

- The above materials are supplied to the large web of components manufacturers, who make everything from moulded plastic casings to disc drives and circuit boards. There are commonly several tiers of suppliers in between the chemical producers and the brand owners.

- Components are assembled into finished products for brand owner companies who then sell the final products to other businesses and/or consumers.

- Procurers then purchase or lease electronic & electrical equipment from the market on behalf of users;

- These items might be purchased directly (e.g. ICT) or indirectly e.g. as part of refurbishment and/or building (or transport) management services, facilities management etc.

- Users (within the public sector) will then use the products either directly (e.g. mobile phones, laptops, e-vehicles etc) or indirectly e.g. telecommunications technology hardware etc.

- NGOs and consumer interest groups are active along this chain, for instance in informing brand owners about an appropriate and safe selection of chemicals, and in helping consumers obtain the information they need to safely use or dispose of the final product.

- Finally, e-management services (collection, accredited recyclers or combined services like data wiping and recycling) are then procured to deal with end-of-life EEE (Waste Electronic & Electrical Equipment).
From a human health and environmental perspective, **public sector bodies need to consider the impacts of their e-purchases throughout the entire life cycle of the product, which includes impacts caused by chemicals of concern.** However, the combination of the complex nature and wide variety of components, materials and associated chemical compounds as well as, the diversity and volume of e-products, the knowledge of the sub-suppliers and the rapid pace of product evolution provides a singular challenge for procurers.

Understanding the product lifecycle and considering lifecycle impacts within the early stages of procurement can help to address this challenge.
According to a UN study the production of a single computer uses up about 240 kilograms of fossil fuel, 1,500 litres of water, and 22 kilograms of chemical products. In addition to extraction, a variety of chemicals are used during production, some of which remain incorporated in the final product. Such substances include, for example, solvents and hydrochlorofluorocarbon (HCFCs) used during manufacture, brominated flame retardants in printed circuit boards, or the use of certain ortho-phthalates and other additives (e.g. short-chain chlorinated paraffin) in plastic parts and casings for EEE.

Some of these chemicals have hazardous properties and can have long-lasting adverse impacts on human health and the environment at various stages of a product’s life cycle, from manufacturing to disassembly and disposal. Box 2 provides some examples of such hazardous properties and adverse impacts. More detailed information can be found in a wide variety of sources on chemicals and their impacts including, inter alia, the recent UNEP 2020 Assessment Report on Chemicals and Waste.

To better understand the environmental and human health impacts of chemicals of concern in e-products, it is worth understanding the different stages of the electronics product life cycle from extraction of minerals; through various stages of production, assembly and packaging; actual use; and finally, recycling and disposal at the end of life. At each of these stages, there is a potential for adverse effects on ecosystems and human health due to the hazardous properties of chemicals.

Examples of hazardous properties of chemicals

1. **Carcinogen:** a substance that is capable of causing cancer in living tissue.

2. **Mutagen:** a substance that is capable of causing permanent changes in genetic material (i.e., mutations), which could lead to adverse health effects like cancer.

3. **Reproductive Toxicant:** a substance that is harmful or toxic to the reproductive system, normal reproduction, and fertility.

4. **Developmental Toxicant:** a substance that causes adverse health effects to a developing child.

5. **Endocrine Activity:** substances that can interfere with the endocrine system, which includes the function of the hormones in the body and the organs that produce them.

6. **Systemic Toxicity and Organ Effects:** the ability to cause serious, but non-lethal, adverse effects on one or more organs that may not be near the location in the body where exposure to the substance occurred.

7. **Neurotoxicity:** the ability of a substance to produce adverse health effects to the structure or function of the nervous system, including the brain.

8. **Skin Irritation:** when the skin becomes irritated or experiences reversible damage following contact with the substance for up to four hours.

9. **Eye Irritation:** when the eyes become irritated or experience serious (but reversible) damage following contact with a substance.

*Source: Electronics Watch, 2020, How Public Buyers can protect workers against chemical hazards in electronic supply chains*

Examples of impacts on the environment

1. **Climate change:** change in global or regional climate patterns through anthropogenic forcing.

2. **Ozone depletion:** gradual thinning of Earth’s ozone layer in the upper atmosphere caused by the release of chemical compounds containing gaseous chlorine or bromine from industry and other human activities.

3. **Acidification – terrestrial, marine & freshwater:** ongoing decrease in the pH of marine and terrestrial environments caused by the uptake of carbon dioxide (CO2) from the atmosphere. The main cause of ocean acidification is the burning of fossil fuels.

4. **Eutrophication - marine & freshwater:** a gradual increase in the concentration of phosphorus, nitrogen, and other plant nutrients in an aquatic ecosystem.

5. **Ecotoxicity – terrestrial, marine & freshwater:** toxic effects on an aquatic or terrestrial organism caused by a chemical

6. **Formation of photochemical oxidants:** formation of secondary pollutants through photochemical reactions of organic compounds with gases in the atmosphere

7. **Particulate matter formation:** Direct emission of particles, for instance through the burning of fuel, or indirect formation through the transformation of gaseous pollutants to particulate matter.

8. **Resource depletion – mineral & fossil:** consumption of a resource faster than it can be replenished.

*See for instance: Environmental Impacts of ICT: Present and Future (Arushanyan, Y. 2016)*
Due to the variety of EEE and a lack of data, it is a challenge to map or link all adverse impacts to all Chemicals of Concern (CoC) used in the complex electronics supply chain. The following sections provide a basic overview of where CoCs in the product lifecycle can create an impact.

6.1 Extraction of raw materials

The extraction of metals including copper, platinum, tin and rare earth metals often results in severe environmental damage as well as violations of labour laws. Some of the largest sources of release of hazardous chemicals are mining, alongside agriculture, wastewater treatment, energy generation, chemical production, and product manufacturing, use and disposal. Although some mining waste can be inert and does not give rise to major environmental problems, some waste can be prone to the leakage of hazardous substances, including heavy metals like mercury, arsenic, lead, zinc and cadmium. Hazardous chemicals can be released to the soil during mining activities or as solid and hazardous wastes deposited in dumps and landfills. Further contamination of water and soils with metals like copper, nickel, and lead also takes place during the processing of these metals, for example in computer component production. In addition to extraction, a variety of chemicals are often used during production processes.

6.2 Manufacturing and assembly

In general, the risk for an adverse effect of a chemical depends on a combination of the intrinsic hazardous properties of a chemical and exposure of humans or the environment to the chemical. This is true for the manufacturing phase the same as for extraction, use and disposal.

During manufacturing and assembly of components and products, workers may come into contact with hazardous chemicals and be at risk for adverse impacts on their health. For example, some solvents used for cleaning, stripping or degreasing have been linked to the occurrence of cancer. Other chemicals that may be used in electronics manufacturing,

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16 Buy IT Fair (2009). World Economy, Ecology and Development
20 Communication Workers of America. High Tech Toxics and the Workplace.
such as lead, nickel arsenic and arsenical compounds, as well as certain organic solvents, can be toxic to reproduction\textsuperscript{21}. Recent studies have suggested increased risks for spontaneous abortions, birth defects and reduced fertility for female workers in fabrication jobs and organic solvents have been reported as serious occupational hazards in the electronics industry\textsuperscript{22,23}. \textbf{While data on individual chemical use and direct causal relations are still limited, NGOs have called for discontinuing the use of a number of chemicals during electronics manufacturing}\textsuperscript{24}. For example, a recent report by Electronics Watch lists the different types of impacts that might occur\textsuperscript{25}. The Clean Electronics Production Network (CEPN), a multi-stakeholder network with the goal to move toward zero exposure of workers to toxic chemicals in electronics manufacturing, also has identified nine process chemicals to be prioritized for elimination or substitution in electronics manufacturing\textsuperscript{26}.

\textbf{Beyond individual workers’ health, CoC are a risk to the health of communities that live in proximity to manufacturing plants.} For example, if the industrial sites are situated between agricultural lands, some of these contaminants do likely enter the human food chain\textsuperscript{27}. The UN Global Chemicals Outlook II report (2019) notes that industrial facilities represent a major point source of releases. For example, 80-90 per cent of PFOS/PFOA contamination in the Chinese environment has been estimated as originating from manufacturing and industrial facilities, primarily via wastewater discharges\textsuperscript{28}.

From an environmental perspective, based on the results of a Life-Cycle Assessment for desktop PCs, the emissions of copper, selenium, mercury, fluoranthene and nickel in the production of electronic parts are the most problematic. The production of printed circuit board material may also result in oil emissions. In the manufacturing of PVC parts, wastewater can be polluted with cadmium\textsuperscript{29}.

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\textsuperscript{24} Electronics Watch (2020). How to Protect Workers from Chemical Hazards in Electronics Supply Chains: Guidance for Public Buyers V. 1.0.

\textsuperscript{25} Ibid.

\textsuperscript{26} http://www.centerforsustainabilitysolutions.org/priority-chemicals

\textsuperscript{27} A. Manhart (2007). Key Social Impacts of Electronics Production and WEEE-Recycling in China

\textsuperscript{28} United Nations Environment Programme (2019). Global Chemicals Outlook II: From Legacies to Innovative Solutions: Implementing the 2030 Agenda for Sustainable Development

\textsuperscript{29} A. Manhart (2007). Key Social Impacts of Electronics Production and WEEE-Recycling in China
Electronics Watch has identified 12 chemicals of concern that it recommends should be immediately discontinued and replaced with safer alternatives (Table 1)\(^30\). Except for Hexabromocyclododecane (flame retardant that may be present in plastic parts in, for example, small servers) these are all solvents. The GS (Green Screen) Score is based on a four-step benchmark system with Benchmark 1 indicating a Chemical of High Concern and Benchmark 4 indicating an ideal Chemical of Low Concern. LT-1 refers to Likely Benchmark 1 score and is based on clear agreement among authoritative lists that the substance is a Chemical of High Concern. LT-P1 Possible Benchmark 1 refers to the fact the chemical appears on a list that does not translate directly to a single Benchmark score but includes BM1 within the possible range\(^30\).
<table>
<thead>
<tr>
<th>CASRN</th>
<th>Chemical Name</th>
<th>Recommendation</th>
<th>GS Score</th>
<th>REACH</th>
<th>Application</th>
<th>Battery</th>
<th>Printed Circuit Board Assembly</th>
<th>Displays and Related</th>
<th>HDD/Storage</th>
<th>Notebook</th>
<th>Desktop/AIO</th>
<th>Smartphone</th>
<th>Tablet</th>
<th>Small Server</th>
<th>Printer/MFD</th>
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<tbody>
<tr>
<td>127-18-4</td>
<td>Tetrachloroethylene</td>
<td>Discontinue use and replace with safer alternative</td>
<td>BM-1</td>
<td>Yes</td>
<td>Solvent</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>Hexabromocyclododecane</td>
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<td>LT-1</td>
<td>Yes</td>
<td>Ingredient in resins and plastics</td>
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<td>n-methyl Pyrrolidone</td>
<td>Use only as photoresist developer where alternatives not feasible. Use with proper IH and environmental controls</td>
<td>BM-1</td>
<td>Yes</td>
<td>Photoresist developer and solvent</td>
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</tbody>
</table>

6.3

Utilisation

Evidence is growing that exposure to (hazardous) chemicals also occurs during the use phase of electronics. **Chemicals in products may be released into the environment during use.** For example, some ortho-phthalate plasticisers are semi-volatile compounds that are not chemically bound to the product. Therefore, products containing such phthalate plasticizers can continuously release them during use and disposal resulting in routine contamination of indoor air, dust, and the environment.\(^{31}\)

A sampling of household dust indicates that levels of dioxins and furans in indoor environments are increasing. Studies looking at house dust and office dust in Japan found high levels of polybrominated dibenzofurans (PBDFs) in these environments and concluded the connection to electronics present in these environments cannot be ruled out. In high-impact polystyrene, HIPS, containing DecaBDE, the PBDF concentration increased by about 40 times after 1 week of exposure. Also, in TV casings with DecaBDE, PBDF concentrations increased continuously and the research concluded that more attention should be paid to the fact that PBDFs are formed by sunlight exposure during normal use as well as disposal/recycling processes of flame-retarded consumer products.\(^{32}\)

A Danish study also measured emissions of Volatile Organic Compounds (VOCs) from a range of consumer electricals including ICT and converters. It notes for instance that the largest emissions from TV sets measured consist of phenol and toluene.\(^{33}\)

---

\(^{31}\) BSR Interreg, (2020). Module 1.1 How chemicals escape from products. NonHazCity


\(^{33}\) Danish Technological Institute and the Technical University of Denmark (2003). Emission and evaluation of chemical substances from selected electrical and electronic products. Survey of chemical substances in consumer products Survey no. 32
Disposal - WEEE

End-of-life electrical and electronic products ("e-waste") constitute the fastest growing waste stream in the world, and their recycling rates remain low in many countries. A record 53.6 million metric tonnes (Mt) of electronic waste was generated worldwide in 2019, up 21 per cent in just five years, according to the UN’s Global E-waste Monitor 2020\textsuperscript{34}. The report also predicts global e-waste will reach 74 Mt by 2030, almost a doubling of e-waste in just 16 years. This is around 7.3 kilograms per capita globally.

E-waste in 2019 was mainly comprised of small equipment (17.4 Mt), large equipment (13.1 Mt), and temperature exchange equipment (10.8 Mt). Screens and monitors, lamps, small IT, and telecommunication equipment represented 6.7 Mt, 4.7 Mt, and 0.9 Mt respectively\textsuperscript{35}.

Many components in electronic devices contain lead (for example, many legacy computer monitors used cathode ray tubes, contain significant amounts of lead), cadmium, mercury, polyvinyl chloride (PVC), brominated flame retardants (BFRs), chromium, beryllium etc. The long-term exposure to these substances through unregulated recycling can damage the nervous system, kidneys and bones and the reproductive and endocrine systems and some of them are carcinogenic\textsuperscript{36}. Specific examples of hazardous substances in EEE also include, but are not limited to, polychlorinated biphenyls (PCBs) in capacitors, polybrominated diphenyl ethers (PBDEs) in plastics and mercury and indium in flat-panel displays (see Part A.6), which have recycling implications for the end-of-life equipment.

E-waste can have long-lasting effects on the environment when improperly disposed of (incinerated/landfilled instead of recycling) with domestic waste, without any controls, can contaminate the soil, water and air. For instance, hazardous substances in e-waste can leach out from the landfills into groundwater and streams, and if the plastic components are burned, certain persistent organic pollutants such as dioxins can be formed and emitted into the air\textsuperscript{37}. Alongside informal and rudimentary recycling methods, these practices create concerns for human health and the environment. Improper and unregulated treatment of WEEE includes, but is not limited to, de-soldering and acid leaching, lead recycling, and cable and plastic waste burning. The global trade in used EEE and E-waste also means that often the consequences of these poor practices are extra-territorial.

\textsuperscript{34} The International Telecommunication Union (ITU) and the International Solid Waste Association (ISWA) in collaboration with the UN Environment Programme (UNEP). Global E-waste Statistics Partnership (GESP). UN University (UNU)


\textsuperscript{37} Ibid.
Persistent organic pollutants (POPs) are also of concern in relation to ICT equipment. These include the following five groups: certain brominated flame-retardants (PBDE, HBCDD & HBBS); perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOS-F); PFOA and PFOA-related substances; short-chain chlorinated paraffins; and, polychlorinated dioxins and furans. The latter group are among the most toxic chemicals known, and cause cancer in humans\textsuperscript{38}. These persistent organic pollutants have been listed under the Stockholm Convention for which (unintentional) production, use, import, and export is to be phased out by those countries who are Parties to the Convention. However, from an e-waste perspective, there may still be legacy equipment and potential risk.

POPs have been extensively used in components of ICT equipment made of plastic (e.g. computer and television casings made of acrylonitrile-butadiene-styrene), in circuit boards, instrument casings and in casings for EEE, wire and cable and small electric components, including high-impact polystyrene casings (e.g. for televisions) The production of listed PBDEs has ceased in the developed countries but may still occur in other parts of the world. The Stockholm Convention (see Part A.7.1) does not allow for recovery, recycling, reclamation, direct reuse or alternative uses of POPs.

The regulatory landscape relevant for the use of CoC in electronics is complex and varies significantly globally (Figure 3). At the international level, several chemicals and chemical groups with documented uses in electrical and electronic equipment have been designated for global elimination by Multilateral Environmental Agreements (MEAs). At the national level, several different types of laws or regulations may be relevant for the use of CoC in electronics. The most apparent are laws and regulations that stipulate explicit chemicals-related provisions that are specific for electrical and electronic products, such as the EU directive on the restriction of certain hazardous substances in electrical and electronic products (RoHS)\textsuperscript{39}

The Annex to the 2020 UNEP Review of Legislative and Regulatory Approaches\textsuperscript{39} contains a comprehensive but not exhaustive overview of existing instruments and actions related to hazardous substances in EEE (Table A4)\textsuperscript{40}. The main instruments include:

<table>
<thead>
<tr>
<th>Legally binding instruments</th>
<th>Soft law instruments</th>
<th>Voluntary initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. restrictions, bans and labelling of specific chemicals in EEE;</td>
<td>e.g. resolutions and recommendations; codes of conduct; guidelines; communications; fiscal policies; and,</td>
<td>e.g. voluntary phase-out; awareness-raising; capacity building; industry standards; labelling; partnerships.</td>
</tr>
</tbody>
</table>

\textsuperscript{38} International Telecommunication Union (2012). End-of-life management for ICT equipment.
\textsuperscript{39} United Nations Environment Programme (2020). Chemicals of Concern in Electronics: Review of Legislative and Regulatory Approaches
The sustainable procurement of electronics (and all other goods, services and works) should ensure compliance with both aspects of the environmental and social regulatory framework and maintain a balance between both aspects. The following sections pick out specific aspects of regulation relating to both the environmental and social impacts relating to chemicals of concern. However, the broader regulatory landscape around public procurement and sustainable consumption and production also has an influencing factor. To avoid duplication and maintain focus, this guidance limits its scope to the most directly relevant regulations and compliance.

### Figure 3 Regulatory landscape of relevance to chemicals of concern in electronic products

#### International Level

<table>
<thead>
<tr>
<th>Multilateral Environmental Agreements (MEAs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global Agreements on elimination or restriction of chemicals or groups of chemicals</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stockholm Convention: global elimination of decabromodiphenyl ether</td>
</tr>
<tr>
<td>Minamata Convention: global elimination of mercury</td>
</tr>
</tbody>
</table>

#### National Level

<table>
<thead>
<tr>
<th>Framework laws &amp; regulations on chemicals or products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stipulate provisions for chemicals or products that overach multiple sectors, chemicals and/or product groups.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU REACH Regulation: Information requirements on Substance of Very High Concern in all products</td>
</tr>
<tr>
<td>US Consumer Product Safety Act: Restriction of led content in children’s products incl. electronics</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>EEE-specific laws &amp; regulations incl. product standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stipulate chemicals-related provisions that are specific for all or certain sub-groups of EEE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU Directive on the restriction of certain hazardous substances in electrical and electronic products</td>
</tr>
<tr>
<td>Administrative measures for the restriction of the use of hazardous subsaces in EE products in China</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chemical-specific laws &amp; regulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stipulate provisions that are specific for certain chemicals or groups independent of their use.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU POPs-regulation: prohibiting the use of substances listed in Annex A of the Stockholm convention, including their uses in electronics.</td>
</tr>
</tbody>
</table>

(Source: UNEP, 2020)

---

7. Regulatory landscape for the use of CoC in electronics

7.1 Environmental and social protection

Regulation of chemicals of concern can be broadly divided into regulation addressing the assessment and use of chemicals and substances in the manufacturing of electronic products and regulation dealing with the consequences of e-waste (or Waste Electronic and Electrical Equipment – WEEE). This section is summarising the broad landscape rather than focussing on specifics.

Globally there are a variety of multilateral agreements covering the production, use, import and end of life management of hazardous substances and chemicals of concern (See Box 3).

Box 3 Examples of Multilateral Environmental Agreements on Chemicals

The Minamata Convention on Mercury

The Minamata Convention on Mercury came into force in 2017. It is a global treaty to protect human health and the environment from the adverse effects of mercury.

The Stockholm Convention on Persistent Organic Pollutants (POPs)

The Stockholm Convention is a global treaty and came into force in 2004. It was introduced to protect human health from harmful POPs that have the potential for transport over long distances. Amongst others, it lists certain chemicals whose production, use, import, and export are to be phased out by countries who are Party to the Convention.

The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

Commonly known as the Rotterdam Convention it came into force in 2004. It aims to promote shared responsibility and cooperative efforts in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm, and to contribute to the environmentally sound use of those hazardous chemicals.
There is different legislation in different countries and regions on how to identify the hazardous properties of chemicals (called ‘classification’) and how information about these hazards is then passed through the value chain. Classification and labelling identify hazardous chemicals and inform users about their hazards through standard symbols and phrases. They ensure good worldwide understanding and facilitate the free flow of goods. This can lead to confusion as the same chemical can have different hazard descriptions in different countries. For example, a chemical could be labelled as ‘toxic’ in one country but not in another. This can act as a barrier in procurement, e.g. in verification and information transfer, and has been recognised for decades as an important global issue.

The United Nations has therefore developed a Globally Harmonized System of Classification and Labelling of Chemicals (GHS). The GHS is a single worldwide system for classifying and communicating the hazardous properties of industrial and consumer chemicals. The UN GHS is a non-legally binding internationally harmonised approach. Therefore countries, or trading blocks, transpose the requirements into local

Box 3 (cont.d) Examples of Multilateral Environmental Agreements on Chemicals

The Basel Convention on the Control of Transboundary Movements on Hazardous Wastes and their Disposal

Commonly known as the Basel Convention it came into force in 1992. The objective is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as “hazardous wastes” based on their origin and/or composition and their characteristics, as well as two types of wastes defined as “other wastes” - household waste and incinerator ash.

Other MEAs include, but are not limited, to the Ramako Convention (1998) which prohibits the import into Africa of any hazardous (including radioactive) waste. There are also various MEAs relating to marine pollution that include chemicals, for example, the 1995 Barcelona Convention (Africa, Europe) and the 1986 Cartagena Convention (Latin America).

Strategic Approach to International Chemicals Management

SAICM a voluntary, multistakeholder global policy framework to promote chemical safety around the world, was adopted in 2006. Its objective is to achieve the sound management of chemicals throughout their life cycle.

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or national legislation to implement the GHS. The GHS implementation, and those of other MEAs, contributes directly to the Sustainable Development Goal (SDG) target 12.4 to achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment. In Europe for example, transposition is done through the EU’s 2008 Classification, Labelling and Packaging of Substances and Mixtures regulation (CLP)\textsuperscript{44}. The CLP regulation deals with the classification, labelling and packaging regulations of chemical products. The CLP regulation forms part of a raft of chemical legislation alongside REACH - addressing the registration, evaluation, authorization and restriction of chemicals; and, the RoHS (Restriction of Hazardous Substances) directive whose sole purpose is to address the issue of chemicals of concern in electronics.

The key provisions of the RoHS Directive 2011/65/EU (RoHS 2)\textsuperscript{45} can be found in Article 4(1), requiring European Union Member States to ensure that electrical and electronic equipment (EEE) placed on the market, including cables and spare parts, does not contain the restricted substances listed, in excess of the specified maximum tolerated values. The directive initially listed the following substances: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls and polybrominated diphenyl ethers but since 2019 also includes four phthalates (DEHP, DBP, BBP and DIBP). The concept of the RoHS directive has become global with a number of countries and regions having implemented their regulatory approaches for chemicals of concern in electronics.

Further detail on regional legislative and regulatory approaches for chemicals of concern in electronics can be found in the 2020 UNEP report (see for reference Table 3 of the UNEP report on approaches outside of Europe that explicitly impose a restriction to the use of CoC in EEE)\textsuperscript{46}.

In many regions, specific regulations and waste legislation exist for electronic and electrical devices. Separate regulations typically also exist for the disposal of batteries (either removed or bound into electronic products). Selected examples can be seen in Box 4. Where directly applicable, these should always be specifically referenced in tender requirements for waste management, and enforced within contract management clauses, particularly where e-waste crosses national boundaries. Part C.1.4 provides examples of model wording for criteria and verification.

\textsuperscript{44} European Commission (2008). Regulation (EC) No 1272/2008 Classification, Labelling and Packaging of Substances and Mixtures


\textsuperscript{46} SAICM (2020). Chemicals of Concern in Electronics: Review of Legislative and Regulatory Approaches
**Africa**

Although most countries do not have specific e-waste regulations in place, e-waste is covered under waste management regulations and, more specifically, under Hazardous Waste. In 2016, Ghana adopted the "Hazardous and Electronic Waste Control and Management Act 2016 (Act 917) and started the enforcement in 2018 of the provisions related to the financing of e-waste management described in Act 917: Electrical and Electronic Equipment (EEE) including batteries as well as tires imported to Ghana. More information is available through the [Energy and Environment Partnership Trust Fund](#) (EEP Africa).

**China**

In 2012 set up the Measures for the Collection and Administration of the Funds for the Recovery and Disposal of Waste Electronic and Electrical Products also known as the [Chinese e-waste disposal fund](#). It promotes the collection and disposal of e-waste, push forward the comprehensive utilisation of resources, protect the environment and safeguard human health as well as building a resource-saving and environment-friendly society.

**Europe**

WEEE Directive - [Directive 2012/19/EU](#) on waste electrical and electronic equipment (WEEE)* to contribute to sustainable production and consumption by, as a first priority, the prevention of WEEE and, in addition, by the re-use, recycling and other forms of recovery of WEEE to reduce the disposal of waste and to contribute to the efficient use of resources and the retrieval of valuable secondary raw materials.

Batteries Directive – [Directive 2006/66/EC](#) on batteries and accumulators and waste batteries and accumulators to prevent waste batteries and accumulators from being discarded in such a way as to pollute the environment, and to avoid end-user confusion about the different waste management requirements for different batteries and accumulators.

**WEELABEX** – ‘WEEE label of excellence’ is a multi-stakeholder organisation representing 27 compliance schemes and other interested parties within Europe. It provides certification for operators involved in the collection, sorting, storage, transportation, preparation for re-use of WEEE.
India

India combines the requirements for WEEE and restriction of hazardous substances into a single legislation, India E-waste (Management and Handling) Rules 2016. This restricts the same substances as the EU RoHS 2 directive (2011/65/EU). Like other WEEE regulations, it addresses the generation, collection, storage, transportation, import and export of electronic and electrical equipment (EEE) to ensure environmentally sound recycling, treatment and disposal of electronic waste.

USA

The USA does not have an official federal e-waste regulation system. Individual states set e-waste regulations at a State level. The US Environmental Protection Agency and partners have established the National Strategy for Electronics Stewardship (NSES). This aims to improve the design of greener electronic products and Reduce harm from U.S. exports of electronics waste (e-waste) and improve the handling of used electronics in developing countries.

There are currently two standards for electronics recyclers in the U.S., with certification programs attached. One is the e-Stewards Standard for Responsible Recycling and Reuse of Electronic Equipment, (e-Stewards), and the other is Responsible Recycling (R2) Practices. Recyclers can be certified to show their conformance to these standards.

7.2 Occupational environment, labour and human rights

The impacts of chemicals of concern are manifested in both environmental and human terms. These are inter-related rather than mutually exclusive. Even when only looking at the manufacturing and assembly phases of electronics hardware, this industry is one of the largest industries currently in the world, with approximately 18 million workers who produce 20% of global imports. The global market for electronics reached 4.22 trillion euros in 2017.

Electronics Watch notes that e-products contain minerals, such as lithium, gold, tungsten and cobalt, mined in conditions that may violate workers’ fundamental labour rights and human rights, destroy ecosystems, and undermine the livelihood of surrounding communities.

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47 Your Right to Know: Beyond corporate transparency. 2020 Good Electronics Network, SOMO, BHRE
communities\textsuperscript{48}. They also note that the lack of supply chain transparency from the end product upstream to extraction and obscures corporate responsibility from purchasers for the impacts on workers, communities and ecosystems.

The ILO Chemicals Convention (ILO C.170) addresses safety in the use of chemicals in the workplace\textsuperscript{49}. The ILO Convention 170 covers, inter alia:

- The identity and hazardous properties of chemicals used at work.
- Precautionary measures.
- Education and training.
- Information contained in labels and markings.
- Chemical safety data sheets (CSDS).
- How to obtain and use the information provided on labels and CSDS.
- Records of the monitoring of the working environment and of the exposure of workers using hazardous chemicals.
- Record of hazardous chemicals used at work, cross-referenced to the appropriate chemical safety data sheets.
- Practices and procedures to be followed for safety.

ILO C.170 is not yet widely adopted\textsuperscript{50}, but those who have include countries with a big electronic manufacturing production such as Mexico, China, Brazil and Korea.

Also potentially relevant is the International Covenant on Economic, Social and Cultural Rights (ICESCR), an international treaty with 170 parties. It is considered universal and part of the International Bill of Human Rights. The ICESCR is monitored by the UN Committee on Economic, Social and Cultural Rights (CESCR). According to the ICESCR, safe and healthy working conditions are a key element of just and favourable conditions at work\textsuperscript{51}.

\textsuperscript{48} Strategic Plan 2018-20, Electronics Watch
\textsuperscript{49} International Labor Organisation (1990), ILO Chemicals Convention (C 170)
\textsuperscript{51} International Covenant on Economic, Social and Cultural Rights, Art. 7(b), and UN Committee on Economic, Social and Cultural Rights (CESCR) (2016), General Comment No. 23 on the right to just and favourable conditions of work (article 7 of the International Covenant on Economic, Social and Cultural Rights), 7 April 2016, E/C.12/GC/23, (n 2), Para. 6.
<table>
<thead>
<tr>
<th>Box 5</th>
<th>Summary of impacts across product lifecycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure to chemicals during production</td>
<td>Studies have demonstrated high exposure to carcinogens and reproductive toxicants during production, including solvents, heavy metals and epoxy resins among electronics workers, and increased rates of spontaneous abortion and birth defects among women working in semiconductor fabrication.</td>
</tr>
<tr>
<td>Exposure to chemicals in the use phase</td>
<td>There is growing evidence that exposure to (hazardous) chemicals also occurs during the use-phase of electronics and that levels of dioxins (e.g. polybrominated dibenzodioxins) and furans (e.g. polybrominated dibenzofurans) contained within flame retardants in indoor environments is increasing.</td>
</tr>
<tr>
<td>Formal and informal recycling</td>
<td>At end of life, e-waste management and the recycling of electronics can roughly be divided into formal and informal handling. These terms can mean different things in different contexts. Informal activities are basically carried out by unregistered small-scale businesses, groups of people or individuals. The extent of organisation varies greatly. In some countries, such business activities are prohibited, while in others they are allowed by the public authorities. In some cases, they operate in a legal grey zone where they are illegal in principle but accepted in practice.</td>
</tr>
</tbody>
</table>
B.

Chemicals of Concern Management Guidelines for Procurement

Sustainable Procurement of Electronics:
A Progressive Approach to Chemicals of Concern
B. COC MANAGEMENT GUIDELINES FOR PROCUREMENT

1. Role of procurement and management of chemicals of concern 34
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3. Five steps for chemicals of concern management in electronics procurement 37
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   3.2 Step 2: Define priority product and service groups 41
   3.3 Step 3: Determine proportionate sustainability specifications 43
   3.4 Step 4: Develop verification criteria and evaluation methodology 44
   3.5 Step 5: Implement controls and monitoring in contracts 44
4. Summarising chemicals of concern in procurement 45
The social and environmental impacts (see Part A.6) of Chemicals of Concern (CoC) in electronic products are most significant during the production phase. This involves impacts from extraction, processing, manufacturing and assembly (Figure 1) - and at end of life in the disposal and recycling phase, where e-products are disassembled and CoCs potentially released from a different form of treatment (e.g. incineration). This is not to ignore that impacts from CoCs can also arise if products are not properly repaired or refurbished in the use phase. Procurement has a role to play across all 3 phases as it is cyclical (Figure 2), although typically, the disposal (e-waste) contract is contracted separately to the purchasing of products.

As well as considering how products are made and where they come from, consideration needs to be extended to how they will be used and what happens to them at end of life. These can be addressed by procurers considering some very basic questions when purchasing electrical and electronics products (Figure 4).

Answering these basic questions will create a raft of supplementary questions around the social and environmental impacts of the purchase decisions. The main point of the additional questions on how e-products will be used, optimised and disposed of at end-of-life are key to ensuring CoCs, and broader, lifecycle issues are considered and mitigated at the outset rather than sequentially.

The producers of chemicals, mixtures, and materials are at the upstream end of the supply chain. The emphasis from a procurement perspective is how producers at each stage of the electronic product manufacturing process generate information on chemicals used in producing the end product and how this is made available across the whole value chain from producers to procurers and users and into the disposal. With long and complex value chains for most electronic products, it raises potential issues around verification from the procurer’s perspective.
As mentioned in Part A.3, procurement coding and taxonomies are different to production taxonomies, and the categories used describe WEEE. Table 2 provides an overview of the principle procurement and production taxonomies and main categories covering e-products. The United Nations Standard Products and Services Code (UNSPSC) and the EU Common Procurement Values (CPV) are examples of a procurement coding system for goods and services. The ISIC (International Standard Industrial Classification, by comparison, is an example of an international reference classification of production activities. This is not an exhaustive comparison, but it illustrates the differences in classifying consumption compared to production. The categories shown represent high procurement spend areas based on analysis of EU tenders by value from 2018\(^5\) and are therefore areas for potential targeting and action.

---

Figure 4  Simplified Product and Procurement lifecycle phases

### Sourcing
- Materials
- Design & Manufacturing

### Use
- Transport & Distribution
- Use, Maintain, Repair & Reuse

### Disposal
- Collection
- Reuse & Recycle
- Waste

---

2. **Procurement categories with EEE**

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<table>
<thead>
<tr>
<th>Spend categories</th>
<th>CPV Codes</th>
<th>UNSPSC Codes</th>
<th>Main ISIC Codes</th>
<th>Example descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office &amp; computing</td>
<td>30X</td>
<td>43X</td>
<td>2620</td>
<td>Computers and peripheral equipment incl monitors, MFDs, ATM terminals</td>
</tr>
<tr>
<td>Tele-communications</td>
<td>31X</td>
<td>43X; 45X</td>
<td>2630</td>
<td>Communication equipment incl. mobile phones</td>
</tr>
<tr>
<td>Consumer electronic items</td>
<td>30X</td>
<td>43X</td>
<td>2640</td>
<td>TVs, television monitors and displays, CD &amp; DVDs, headphones</td>
</tr>
<tr>
<td>Electrical Equipment</td>
<td>31X</td>
<td>32X; 39X; 56X</td>
<td>2710</td>
<td>Electric motors, generators, transformers and electricity distribution</td>
</tr>
<tr>
<td>Medical Equipment</td>
<td>331X</td>
<td>42X</td>
<td>2660</td>
<td>Irradiation, electromedical and electrotherapeutic equipment and control apparatus</td>
</tr>
<tr>
<td>Laboratory Equipment</td>
<td>38X</td>
<td>41X</td>
<td>2651</td>
<td>Measuring, testing, navigating and control equipment</td>
</tr>
<tr>
<td>Security &amp; controls</td>
<td>351X</td>
<td>32X; 461615X</td>
<td>2610; 2670; 2680; 2733; 2790; 2930</td>
<td>Security surveillance and detection; Public safety and control</td>
</tr>
<tr>
<td>Vehicles &amp; controls</td>
<td>34X</td>
<td>25X; 32X</td>
<td>2710; 2610; 2733; 2790; 2930</td>
<td>Passenger motor vehicles; Product and material transport vehicles; Safety and rescue vehicles</td>
</tr>
<tr>
<td>Lighting</td>
<td></td>
<td>3150X, 3151X</td>
<td>2740</td>
<td>Electric lighting equipment &amp; lamps</td>
</tr>
<tr>
<td>In all the above</td>
<td>317121X</td>
<td>32X</td>
<td>2610</td>
<td>Electronic components, assemblies and boards</td>
</tr>
<tr>
<td></td>
<td>3161X, 4531</td>
<td>26120X</td>
<td>273</td>
<td>Wiring and wiring devices</td>
</tr>
<tr>
<td>In some of the above</td>
<td>31158X, 31140X</td>
<td>31158X, 3140X</td>
<td>2720</td>
<td>Batteries and accumulators</td>
</tr>
</tbody>
</table>
EEE products and services can be found in a broad range of spend categories but are found predominantly in the following procurement categories in Table 2:

- Office & Computing;
- Lighting & EE;
- Medical (and laboratory) Equipment; and,
- Telecommunications.

Office & computing along with telecommunications is typically referred to as Information & Communications Technology (ICT). This accounts for the majority of tender awards by value and a significant amount of existing guidance on sustainability and impacts of e-products relates directly to ICT. These products are also likely to contain components and sub-assemblies containing CoC that are found in most of the other product groups.

Therefore, by focussing the guidance and sustainable procurement actions on these frequently procured product categories a (cost-effective and proportionate) cascade will trickle down benefits through to other electronic products (e.g. in transport, construction and buildings management, or in more niche spend areas like security and controls) containing the same components.

The principles behind managing Chemicals of Concern (CoC) align with good procurement practices relating to all forms of public sector procurement of goods, services and works. They adopt a lifecycle approach to procurement (see Box 6) and should be considered as part of a wider range of sustainability and performance improvement actions that underpin the delivery of public services. A whole life procurement approach requires consideration of all 3 phases of the product lifecycle:

- **Sourcing:** Encouraging performance improvement suppliers;
- **Utilisation:** encouraging users to optimise lifetimes and reduce impacts by, for example, reuse and repair where practical; and,
- **Disposal:** improving outcomes at end of life, for example, enabling closed-loop product reuse and refurbishment or closed-loop recycling through procurement of products designed for recyclability.

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**3. Five steps for CoC management in electronics procurement**

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This guide reflects the dynamic nature of both public sector procurement and the rapidly evolving electronics sector by presenting a progressive approach that addresses specific themes within a clear transition pathway for performance improvement:

**Avoid**  
Avoid focusing on compliance, for example, control of banned (MEAs, RoHS, REACH) substances, exclusion of specific chemicals and/or compounds.

**Substitute**  
Substitute work towards safer substitutes through good practice based on choices of existing products.

**Encourage**  
Encourage a reduction in the use of CoCs through design and production in procured products.

**Prefer**  
Prefer only procure products with permitted chemicals.

The United Nations Environment Programme defines sustainable public procurement as:

“a process whereby public organizations meet their needs for goods, services, works and utilities in a way that achieves value for money on a whole lifecycle basis in terms of generating benefits not only to the organization, but also to society and the economy, whilst significantly reducing negative impacts on the environment”.

This lifecycle definition of sustainable procurement fits well with circular economy principles of closing material loops and retaining value. It also fits well with definitions and guidance on using procurement as a lever for the circular economy, often called circular procurement (see Box 6).

The **key to maximising the benefits and minimising the impacts of procurement is adopting a whole-life view of the organisational need** (Figure 4). This covers not just the initial purchase but also the operational services like repair and maintenance, as well as disposal services like collections and e-waste management.

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**Box 6  Lifecycle and circular approach to ICT procurement**

The life cycle of an EEE product follows the same pathway as the procurement cycle: production (sourcing); utilisation (including repair and maintenance, and reuse); and, end-of-life management (including remanufacture, recycling and e-waste disposal). Impacts occur predominantly at the front end due to the extended value chain for production, and at the end of life due to the variety of recycling and disposal options. It follows that procurement plays a significant role alongside the extended producer responsibility (EPR) process that suppliers have to adhere to. The procurement cycle and product lifecycle, therefore, need to be actively linked so that lifecycle benefits and impact reduction can be maximised.

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One of the big conceptual shifts in policy over the last decade has been to consider ways of moving from the traditional linear – ‘take, make, use and dispose’ – towards a circular economy where the value of resources is retained by closing product and material loops. There is a wealth of published information available on the transition to a circular economy and the associated benefits, for example, the broad body of resources from the Ellen MacArthur Foundation. Many international bodies, governments and NGOs also have their own Circular economy resources and UNEP has developed its circularity approach, which outlines the different value retention processes supporting a transition to a circular economy. Additional resources are available from the UNEP circularity platform which provides an understanding of the circularity concept, its scope and how it contributes to promoting sustainable consumption and production patterns. Encouraging a shift towards the use of safer chemicals in IT and all products can help to facilitate increased circularity and would help overcome some of the lifecycle issues and barriers relating to CoCs in e-products.


Figure 5 provides a framework for addressing chemicals of concern in EEE and highlights the importance of an integrated approach. These five steps will be familiar to many people involved in procurement, and those responsible for implementing sustainability within public entities.
Figure 5  Five-Step procurement approach to chemicals of concern in electronics

3.1 Step 1: Identify priorities and objectives for chemicals of concern in policies

There is a significant variation in national public sector spending on goods and services, including electronic equipment across a variety of spend areas (e.g. ICT, transport, health, education, office supplies, etc.). The influence of individual organisations and countries on global ICT supply chains will therefore vary. For example, an analysis of EU tender awards found that office equipment and computing (CPV 30X) accounted for half the awarded values for EEE. Electrical equipment, lighting and installation accounted for 22.4%, Vehicles and controls accounted for 12.8%, Medical & Laboratory equipment accounted for 8.8% and Telecommunications for 5.7%. Procurement of many services will also include EEE products and components. Recognising service provision is an important aspect when considering the influencing role of public procurement on CoC in electronic equipment.

Aims and ambitions need to take account of national policies, what EEE is procured by the organisation, how much and therefore whether influence can best be utilised individually or collectively across government spending on ICT. For example, collaboration in initiatives like the Circular and Fair ICT Pact and the development of criteria that form the basis for many Type 1 ecolabels (see Part C.2.1) can help to aggregate individual procurement power and send a stronger demand signal to the marketplace. Identifying key areas within the organisation’s own procurement spend will also help inform the organisational priorities by identifying spend and product groups that are likely to be of significant importance regarding chemicals of concern.

Note that these are award values for one year (2018) and do not account for actual spend which maybe over subsequent years.
### Step 2: Define priority product and service groups

Defining priority areas for action comprises two main elements:

1. Developing a baseline on current spending on products containing chemicals of concern to identify areas where they are potentially an issue; and,

2. Prioritising the product and spending hotspots and areas for action.

**Baseline assessment**

Baseline assessments should aim to identify where CoCs are of relevance and what actions to take. This will vary from a public entity to entity even within the same national government framework. Potential resources that could serve as a starting point for this include the UNEP List of Lists\(^59\) and the IEC Standard 62474 Declarable Substances List (DSL). Undertaking a baseline assessment will create an accurate picture of the full procurement process, including the purchasing and use of electronic devices, and provide an initial step in identifying how environmental and health considerations can best be integrated. It will also ensure there is full compliance with existing regulations and organisation sustainability policies.

Developing a baseline will ensure that priorities and actions are specific to the procuring organisation’s priorities and needs across departments such as health, education, offices etc. Collecting data will support prioritisation and provide compelling arguments to inform the decision-making process. Such data can include asset management databases of procured devices, manufacturers /suppliers datasheets, risks, existing criteria used, purchasing and maintenance costs, and information on the usage and disposal routes of electronic devices. Benchmarking requires internal collaboration between ICT managers and the procurement function and broader consultation with all the internal stakeholders involved in the product lifecycles. It may be appropriate to consider working with similar organisations to develop the baseline. Where sectoral or national baselines are already in place the action will be in relating the ICT and electronics spend to that existing baseline. If it is not possible to consult solely on CoCs then consider combining with a broader review of sustainable procurement within relevant goods and services categories.

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\(^59\) United Nations Environment Programme (2020). *List of Lists and Regulatory Frameworks*
Prioritisation

Spending, utilisation and disposal data from the baseline assessment can be cross-referenced with information available on product data sheets as well as socially responsible manufacturing requirements, to create a procurement matrix of EEE products across spend areas. This approach can help identify problematic products where potential substitution of CoCs can be prioritised based on environmental and social criteria.

The next step in prioritising actions is to align the organisation’s baseline assessment with national or sub-national governments or third-party organisations lists of CoCs. Public procurement strategies and programmes play an important role in prioritisation including providing a mandate to help identify what action to take, e.g. restrict, avoid or eliminate, and when.

Actions may be supported by a complementary list of labels and certifications that will help in verification. These should be easily accessible for consultation by both initiators (e.g. budget holders, users etc) and procurers. Actions should be embedded within the wider framework of sustainable procurement strategies and apply a precautionary approach as guided by the Rio Declaration on Environment and Development\(^\text{60}\) and the 2030 Sustainable Development Agenda\(^\text{61}\). The precautionary approach also has a role in MEAs such as the Stockholm Convention on Persistent Organic Pollutants and in national/regional law (see Box 3). For example, the application of the precautionary approach has been made a statutory requirement within the European Union.

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3.3 Step 3: Determine proportionate sustainability specifications

Once priority products are identified for action, information on safer and more sustainable alternatives should be gathered, evaluated and specifications set accordingly. Although this can be challenging, there are a number of frameworks, toolboxes that use a chemical hazard assessment method that can be used to support alternative assessment\textsuperscript{62}. Additional procurement approaches can assist in this process, for example:

- **Raising awareness and building capacity internally and externally.** Implementing any approach to CoCs should be part of a holistic sustainable procurement strategy that requires leadership, commitment and support from within the organisation. The lifecycle impacts of CoCs from production to end-of-life disposal will involve the engagement and commitment of the relevant technical departments, users and waste managers as well as the procurement function to ensure the specifications are effective in mitigating impacts at all stages, not just sourcing, of the product lifecycle.

- **Reducing costs and increasing demand-pull through partnering with other organisations** using the same supplier (or suppliers), can avoid duplication of work, time-consuming market analysis exercises, increase influence with the market and enable feedback or corrective actions to be shared. It also benefits suppliers who are then able to respond more effectively to consistent specifications from purchasing organisations.

- **Externally supply chains need to be informed and consulted where relevant.** On aims, targets etc so they can offer the most appropriate options and alternatives. Market engagement tools can help communicate policy aims, performance requirements and expectations to the market for products containing CoCs. These could either be:
  - on a sectoral basis ICT, buildings and facilities management etc) linking in with other aspects of market engagement (e.g. in the U.S. these discussions take place either as part of Industry Days held by the General Services Administration and/or via standards development) targeting those sectors and supply chains; or,
  - on an issue-basis e.g. seeking to identify any products with lower CoC impacts (short term quick wins), and to signal future requirements for reduction or substitution of CoCs moving forward across different product groups.

Requirements are the specifications that are placed on the offer and are either design- or performance-based. Addressing CoCs is likely to include a combination of design and performance specifications. Examples are provided in Part C (Toolbox). Performance specifications may be addressed through functional questions which describe the need, desired outcome or intended use. Functional questions enable end-users to benefit from

\textsuperscript{62} See for example, Frameworks using the Green Screen Alternatives Assessment methodology. [https://www.greenscreenchemicals.org/learn/gs-in-alternatives-assessment](https://www.greenscreenchemicals.org/learn/gs-in-alternatives-assessment)
the latest products and technologies and alternatives with lower CoC impacts; enable opportunities for innovation; allow bidders to offer unique solutions to defined needs; and, enable corrective action to be applied if service levels are not achieved.

3.4 Step 4: Develop verification criteria and evaluation methodology

The type of procurement criteria relating to CoCs used will depend on the organisational goals and the requirements for products and/or services (Step 1). These should relate, and be proportionate, to the subject matter of the tender. For example, CoCs may be addressed through a combination of:

1. Health & safety criteria
   - reducing unnecessary hazards;
   - occupational risk assessment; and,
   - waste management.

2. Exclusion criteria avoiding substances that are included in a specified ‘authoritative list’.
   (see Part C.2.2 for examples)

3. Compliance specifications
   - meeting the requirements of ecolabelling, certification standards or other mandatory or voluntary standards; and,
   - Specific technical requirements of the product or service being tendered.

Verification is critical with all criteria to ensure transparency and consistency in the evaluation of any tender, especially having the necessary information needed for compliance with legislation e.g.; MEAs, REACH, RoHS, consumer information, etc. This is particularly true when setting criteria for CoCs and is explained in more detail later in the guide (Part C.1.3).

3.5 Step 5: Implement controls and monitoring in contracts

Addressing CoCs, and sustainability more broadly, doesn’t stop with awarding the contract. Market responses may require mitigating actions as part of the contract. For example, identifying alternative products with lower CoC impacts. Contracts should, where timescales allow, include performance improvement (and associated incentives) over the contract lifetime – such as an extension on the life of a contract if the vendor is able
to add additional IT products to their offerings that meet specified requirements such as an ecolabel or standard\textsuperscript{63}. (see Part C.2.1).

Identifying and embedding the relevant key performance indicators (KPIs), metrics and reporting requirements will ensure that performance improvement can be linked to policy goals and measurable impact reduction over time.

Addressing chemicals of concern within electronic products should be underpinned by robust sustainability and sustainable procurement policies within the public sector. These policies should recognise, and seek to mitigate, the lifecycle impacts of electronics and electrical equipment alongside other products that are purchased by public sector organisations. This requires the adoption of a lifecycle approach to procurement that includes consideration, at the time of purchase, of how (electronic) products (and services) will be used and disposed of after use.

Implementing the steps set out in Part B.3 requires continuous improvement over time. This is only possible if benchmarking of current performance has been undertaken and monitoring and reporting through a chemicals management plan ensures the outcomes delivered are transparent and clearly communicated (see Part C.3.2).

Public procurement represents a complex interaction of factors, including, inter alia, transparency, accountability, risk management, value for money, efficiency, evaluation etc. For sustainable procurement to be effective, the interrelationships between these factors need to be acknowledged and addressed. Building capacity and skills of the procurement workforce around impacts from CoCs and options to address will help sustain actions to address CoCs. This includes not only procurement teams but also those responsible for monitoring the procedures and contract performance.

The ISO 20400:2017 Sustainable procurement — Guidance\textsuperscript{64} states that in terms of accountability:

\textit{“An organization should be accountable for its own impacts on society, the economy and the environment. In the context of procurement, this specifically includes accountability for impacts and for those on the organization’s supply chains, with a life cycle perspective on goods or services.”}

Among other principles for sustainable procurement, it also states with regard to continual improvement:

\textit{“An organization should work towards continually improving its sustainability practices and outcomes, and encouraging organizations in its supply chains to do the same.”}

\textsuperscript{63} US Environmental Protection Agency
Public sector organisations can manage CoCs through due diligence, for example:

- When potential adverse sustainability impacts are identified in the products they are procuring, such as violation of health and safety standards in production, procuring organisations should seek to prevent or control them; and,

- When procuring organisations identify actual adverse sustainability impacts in their supply chains, they should seek to treat, remediate or control them.

The procuring organisation should implement a due diligence process to identify and address adverse impacts of CoCs and be accountable for it. In doing so, this will incorporate risk management in the context of sustainable procurement by identifying, prioritising and managing the internal and external risks (including opportunities) related to procurement activities. This should also consider how suppliers throughout the supply chains are capable of meeting sustainability requirements such as those associated with monitoring and auditing.

The actions identified in Figure 6 can be applied to improving performance in the procurement and management of CoC in electronic products. Continual improvement also includes three further important considerations:

1. **Performance management** – incorporating broader sustainable procurement and, where relevant, specific CoC objectives and targets into performance management through collective and/or individual performance objectives, staff development and incentivisation and recognition arrangements.

2. **Learning through collaboration** - maintains an awareness of chemicals management issues and good practices, which can change rapidly within the electronics industry and sectors. This can be peer-2-peer with other public sector bodies, with relevant certification and standards bodies, and with the respective supply chains to share knowledge and develop better practice.

3. **Additional guidance** - appropriate tools and guidelines will assist procurement professionals (and other stakeholders involved in the use, maintenance and ultimately disposal across the product lifecycle. Awareness of additional guidance will enable more detailed examination and management of specific aspects, e.g. reuse and disposal options, certifications and labelling etc relating to CoCs.

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Figure 6  Improving performance in managing CoCs

Adapted from the European Chemicals Agency values statement.

Setting clear and achievable steps for performance improvement

Understanding one's own performance – benchmarking

Encouraging performance improvement within others:

- Internally, e.g. with users to optimise functional product lifetime and close materials loop in disposal
- Externally with the supply chain, ensuring transparency and traceability within scope of influence in sourcing and disposing of electronic products

Ensure compliance as a minimum standard

4. Summarising chemicals of concern in procurement

Sustainable Procurement of Electronics: A Progressive Approach to Chemicals of Concern

Introduction
CoC Management Guidelines
Procurement Toolbox

A B C
Toolbox for Procurers

Sustainable Procurement of Electronics:
A Progressive Approach to Chemicals of Concern
### C. TOOLBOX FOR PROCURERS

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Part C of the guidance document addresses specific actions around Chemicals of Concern (CoC) in the main groups of e-products. Part C provides specific guidance on actions to mitigate impacts from CoCs in e-products within the procurement process. This is divided across three levels:

**Level 1**
**General practice**
These actions focus on standard practices that ensure basic compliance with existing regulations, MEAs and international agreements on chemicals management in tendering for e-products.

**Level 2**
**Good practice**
These actions go beyond basic compliance in managing CoCs in e-products within the tender process.

**Level 3**
**Beyond good practice**
These actions are geared toward recommendations for developing and implementing a chemicals management plan as part of a wider sustainable procurement policy.

The toolbox is not intended to replace any existing purchasing criteria but to complement them with criteria relevant to chemicals of concern that ensure a continuous environmental sustainability improvement.

‘Good’ practice and ‘best’ practice are subjective terms, especially when considering the variation in procurement regulations and approaches used in different countries, the use of e-products in different spend categories and the pace of development with the electronics manufacturing sector. Therefore, the guide refers to ‘going beyond good practice’ for Level 3.

Users should therefore start by focusing initially on the level of most initial interest but also review options at all levels and use the actions as the basis for moving through the levels towards the implantation of a proactive chemicals management plan within their procurement practices.
Procurement Process Timeline

Visualising at which stage of the Procurement process the recommended action takes place:

**Pre-Tender**
- Procurement Policy
- Develop Strategy
- Planning
- Market Dialogue

**Tender**
- Specification
- Evaluation
- Award

**Contract**
- Servicing
- Monitoring Performance
- Disposal

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Sustainable Procurement of Electronics: A Progressive Approach to Chemicals of Concern

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1.1 Compliance with national legislation and multilateral agreements

Background

The regulatory landscape around chemicals of concern impacting the procurement of e-products is presented in Part A.7. This section focuses on guidelines that aim to ensure a basic, and consistent, level of compliance across different procurement spend areas within organisations, and more broadly across different public sector bodies and between regions.

Reference to substances listed in MEAs accounted for 28% of the publicly available criteria examined. In the context of national legislation, REACH was specifically referenced in 9% and RoHS in 7%. Reference to MEAs is most common in general criteria whilst references to authoritative substance lists, e.g. RoHS (Directive 2011/65/EU), REACH (EC Regulation No 1907/2006), Classification, labelling and packaging of substances and mixtures (EC1272/2008) etc., or to industry lists, such as IEC 62474 (Material Declaration for Products of and for the Electrotechnical Industry) are most common in ICT criteria.

One area for action is to ensure that where CoCs are referenced in technical criteria, this is followed through in evaluation and award scoring as well. Within the publicly available criteria reviewed, CoCs were only referenced as award criteria in 19%. CoCs as award criteria are only featured in ICT and production-related criteria. Even in these categories, CoCs as award criteria only account for 38% (ICT) and 20% (Production) of the criteria reviewed.

Compliance

Basic criteria within tenders for electronic products should explicitly address the relevant provisions within the harmonised procurement policies across national legislation and relevant multilateral agreements as well as with organisational objectives regarding chemicals management. For example, according to Article 33 of the EU chemicals legislation REACH, each supplier is required to inform the receiver of the product if the product contains substances of very high concern (SVHC) as defined by the so-called Candidate list.
The confidentiality of proprietary information, e.g. to protect a chemical formulation or material, can sometimes be a barrier to transparency and verification in procurement. Some suppliers may argue that it sometimes takes years to develop a chemical formulation or material, and revealing the whole formulation would allow competitors to simply copy their work without expending any resources on R&D. Downstream users, and customers may accept the fact that they will not get certain information from their suppliers, while others may sign Non-Disclosure Agreements (NDAs) with willing suppliers to get as much information as they can about product hazards and/or content. Another strategy is to require suppliers to verify that they are not using any of the chemicals on the downstream user’s specification or restricted substance list (RSL), which may include thousands of chemicals.

**Recommended Actions for Procurers**

Check what other agreements (e.g. international MEAs) are also applicable locally (see Box 3) and ensure that these are covered in tenders.

Where Type 1 ecolabels and relevant standards are not specified, tenders should require information, for example within product data sheets, about the presence of chemicals of concern in the procurement of all ICT and electrical goods and services.

Consider making compliance with relevant multilateral environmental agreements a supplier selection criterion for consideration – this could include providing evidence of corrective action if suppliers fail to comply with relevant requirements on CoCs over the lifetime of the contract.

Compliance with, and enforcement of, existing regulation is crucial for an effective reduction of hazardous chemicals in products. Enforcement can include, for example:

- Vendors demonstrating that their products are registered to appropriate standards and Type 1 ecolabels with products being removed from the registry for significant non-conformances, or reclassified, e.g. no longer a ‘green’ product.

- On-site inspection of companies that manufacture, import or sell products, to monitor their chemicals management system.

- Labelling and documentation can be followed-up and also be complemented by analyses of the products, if necessary.

- Networks of inspectors and various reporting systems can be created to make enforcement more efficient.
1.2 Supplier selection

Selection criteria stipulate minimum standards, capacities, and experience a potential contractor must have to be considered in a procurement. Procurers should carefully consider the criteria to not limit the market too far. If procurers are unsure whether the market can meet selection criteria, they can consider using non-mandatory selection criteria.

Supplier (including manufacturers and resellers) selection is especially important where verification of criteria is required through self-declarations or submission of materials data sheets on CoCs. **Selection includes a level of trust in verifying supporting evidence either when selecting suppliers of products or selecting manufacturers.** This is a partnership on which performance improvement can be agreed, implemented and monitored. **Working with suppliers is particularly relevant where the public sector body is seeking to encourage shifts within the relevant electronics sector towards greener products with lower dependency on CoCs within their production.** Box 7 sets out some example questions, adapted from those used by the Global Electronics Council\(^{67}\), that may be used as part of supplier selection.

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**Box 7 Examples of supplier selection questions**

1. **Does your organisation have a written Supplier Code of Conduct/Supplier policy that addresses chemicals of concern with the manufacturing supply chain, product use and disposal of the products?**

   This evaluates whether a company is explicitly addressing CoCs across the full lifecycle of the products they produce or supply as part of their corporate social responsibility.

2. **Has your organisation developed a process to identify risks in your supply chain associated with chemicals of concern?**

   This evaluates to what degree companies are actively seeking to identify risks in their supply chain associated with CoCs.

3. **How is your company evaluating your suppliers’ performance against your Supplier Code of Conduct or Supplier Policy on CoC impacts?**

   This evaluates how companies assess whether suppliers are implementing Code of Conduct or Supplier Policies for CoCs.

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\(^{67}\) Adapted from the GEC Labor and Human Right’s Purchaser Guide, 2018.
4. How does the performance of suppliers, with regard to CoCs, integrate into the direct spend sourcing decisions of your organization?

This will help purchasers to understand the actions companies are taking to integrate due diligence processes around CoCs into decisions to source from a particular supplier.

5. How is your company using the outcomes of the assessment process to ensure suppliers are implementing corrective actions in a timely manner?

This assesses how companies use supplier risk screening and assessment outcomes to engage suppliers when corrective action is needed to address CoC impacts.

6. How is your company engaging with suppliers to ensure continuous improvement in supplier performance against your Code of Conduct or Supplier Policy?

This assesses how companies engage with suppliers to support continuous improvement to meet or exceed, the Company Code of Conduct or Supplier Policy.

7. How is your company engaging with suppliers to build their capacity for addressing CoC impacts?

This evaluates how companies engage with suppliers to build capacity to continually comply with the Supplier Policies and/or Codes of Conduct and create a reduction in CoC across the supply chain.

Suppliers tend to propose more innovative solutions when tenders do not include prescriptive specifications and are rather based on performance specifications. Reaching out to suppliers at an early stage helps to best stimulate innovation. Engaging a wide range of stakeholders, including public and private buyers, suppliers, manufacturers, distributors, retailers, as well as consumers, contribute to building their buy-in and fostering new habits and processes.

In addition, engaging private sector actors in the process is of utmost importance, not only because they will have to react to the public sector’s demand for more circular solutions, but also because they can influence the market through their procurement practices. It will take a large cooperative effort to transform supply chains and consumption patterns on a global scale.

(Source: extract from Building Circularity into our Economies through Sustainable Procurement, 2018, UN Environment Programme)
Recommended Actions for Procurers

Ensure suppliers are complying fully with all legal requirements for managing chemicals of concern as part of the tender evaluation process.

Consider asking supplier selection questions that require evidence of potential suppliers approach to managing:

- chemicals of concern within their e-products, services and supply chains. This should include evidence of their assessment and remediation process.
- the chemical management information flow within their supply chains

1.3 Criteria and verification for general practice

Criteria

Analysis of over 73 different sources has identified a suite of over 310 different criteria examples relating to chemicals of concern across a range of e-products. Around 53% of these were either minimum requirements or basic, i.e. standard levels of practice. What was apparent was the range in approaches to addressing different aspects, e.g. phthalates, flame retardants, heavy metals etc. Where ILO labour conventions were referenced these typically did not include the C.170 Chemicals Convention.

Criteria addressing impacts in production e.g. solvents, curing, discharge, emissions etc were less frequently referenced (7% of all criteria identified) but should be considered as equally important with the other criteria relating to the e-product.

To comply with the Stockholm Convention addressing POPs (see Part A.7.1) and with the Basel Convention, all recycling of electronic and electrical equipment should be carried out in an environmentally sound manner.

To that end, best available techniques (BAT) and best environmental practices (BEP) should be specified in tenders and implemented in contracts. However, in developing countries, a major challenge can be the lack of treatment facilities (TF) that are compliant with international standards and a lack of collection infrastructure that channels e-waste to these sites. It is therefore important when procuring e-waste services to ensure full transparency in the fate of e-waste arising from procurement.

Some of the common themes from the sources and criteria examples relating to chemicals of concern are presented as recommended actions below.

**Recommended Actions for Procurers**

The e-product procurement procedure should ensure standard sustainable public procurement criteria meet or exceed the main areas identified below.

1. **Ensure ILO compliance is included in tender criteria and includes specific references to the ILO Chemicals Convention (C.170).** The analysis of criteria highlighted that where referenced, compliance with labour conventions typically referred to the 8 core conventions which do not include the Chemicals Convention (C.170) where e-products are part of the subject matter.

   Consider exclusion of, or corrective actions for, bidders for violation of international conventions, e.g. ILO Chemical Convention (C. 170), Vienna Convention, Basel Convention, Stockholm Convention alongside other exclusion criteria.

2. **Ensure that compliance with chemicals of concern criteria is included in the evaluation of bids.** Criteria should aim to:
   
   → Mitigate impacts of CoCs in production e.g. solvents, curing, discharge, emissions etc.,
   
   → Comply with relevant restrictions for chemicals in e-products. Such restrictions can include provisions on heavy metals, certain phthalates or flame retardants.

   The UN Environment Programme Review of Legislative and Regulatory Approaches provides an overview of global regulatory approaches to chemicals of concern in electronics as a starting point. Some countries provide more ambitious policies (e.g. Norden, 2014) relating to CoC. These policies could be used as inspiration when going beyond minimum requirements.

   → Minimise the adverse effects that result from the end of life of the e-product, i.e. waste, with a strong emphasis on reduction, reuse, and recycling. This should include consideration of disposal options with the initial (purchasing) tender.

   Best available techniques (BAT) and best environmental practices (BEP) should be specified for the collection and recycling of all waste electronic and electrical equipment.

3. **Ensure that where restrictions apply, in addition to the main product, cables, wiring and accessories (e.g. charging cables, keyboards etc associated with computers) are included in the scope of CoC requirements** (for further information see Product Profiles).
Verification

Verification is principally obtained through one or more of the following routes:

1. Self-declaration by bidders and contractors; Self-declaration is the most commonly observed form in the sources analysed. This can range from the production of Safety Data Sheets (SDS) and Materials Declaration Data Sheets (MDDS) to signed declarations of conformity by the manufacturer/supplier. Obtaining signed affidavits or declarations by senior management within the bidding organisation is one way of strengthening the validity of self-declared conformance, as is required in criteria from Good Environmental Choice Australia.

2. Third-party auditing certification; and/or, Third-party certification, e.g. through Type 1 ecolabels and direct auditing are likely to be more robust but also likely to incur additional costs.

3. Direct auditing by the contracting body either pre-tender or as part of contract management (the most commonly observed form).

1.4 Model wording for chemicals of concern

Where electronic products are not already covered by existing criteria relating to chemicals of concern, for example in Type 1 ecolabels and standards, the following model wording provides two general clauses addressing environmental and human impacts of chemicals of concern in electronics.

The model wording has annotations in brackets, bold and italics to highlight where the wording may need either review and/or adaption, depending on the particular project circumstances, as follows:

→ (where applicable) - text that should be deleted if not applicable; and,

→ [text that may need amending to suit the project].

External references (e.g. to regulations and international agreements) should be made available or linked as appropriate.

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69 Health & Safety Agency, Ireland (2021) Information Safety Data Sheets
Procurement advertising

Chemicals of concern should form a core sustainability requirement in the procurement of all electronics and hence, a key element of the subject matter of the contract. Highlighting this through the wording of the contract title, for example, ‘Sustainable ICT’ will alert suppliers to look at the contract performance requirements during the procurement advertisement, and hence, they can take an early view on whether they can satisfy the requirements. Wording for example may include:

‘The Contracting Authority has included obligations within the specification and contract conditions relating to social and environmental outcomes with respect to chemicals of concern, which are relevant to [the product and/or service to be delivered].’

It is also good practice to notify suppliers early in the process of particular conditions of the contract and as such, obligations should also be included in the procurement advertising, e.g. Contract Notice, as well as in the specification. For example:

‘A requirement of this contract is that impacts related to chemicals of concern within the product lifecycle will be mitigated to the maximum degree feasible.’

Specification

Sustainability requirements should be incorporated into the specification and must be relevant to the particular products or services being procured. In order to ensure that suppliers provide the intended outcomes of the contracting authority, it may be appropriate to include the following in the tender:

'[XYZ public body] is committed to procuring sustainable products and services which facilitate the delivery of national policies, legislation and wider priorities, including:

...[list relevant documents relating to chemicals of concern]

...[list other relevant documents]

In the context of this specification, reducing the impact of various issues such as chemicals of concern, Greenhouse Gas emissions, single-use and problematic plastics etc. are of particular importance. Further information on chemicals of concern can be found at:

UNEP Global Chemicals Outlook II (2019)

[......other national sources]

Bidders are required to demonstrate in a method statement how they will deliver the relevant goods and services in a manner that mitigates lifecycle environmental and social impacts relating to chemicals of concern, and in accordance with the principles of the Waste Hierarchy, with waste prevention and avoidance, reuse and recycling as particular priorities. This should include how you would seek to ensure cost-effective and practical sustainable outcomes are delivered.’
**Selection Criterion**

Ability to submit the relevant technical documentation to demonstrate compliance with the relevant regulation

Ability to supply the relevant technical documentation required to demonstrate compliance with […Insert regulation(s)…] for all electronic products prior to purchase.

Also consider extending eligibility criterion to include relevant technical documentation for substances on relevant declarable substance lists, e.g. Substances of Very High Concern (SVHC) list.

**Verification**

- Evidence of documentation of the process for collecting the information requested in accordance with this criterion.

- Example of Safety Data Sheets (SDS), Materials Declaration Data Sheet (MDDS) or relevant technical documentation submitted for the presence of substances on the relevant list(s).

**Technical Criterion**

Submission of relevant SDS, MDDS or appropriate Product Data Sheets for all chemicals and material declarations for e-products prior to purchase.

(Where relevant) Consider extending the selection criterion to include relevant technical documentation for substances on the Substances of Very High Concern (SVHC) list.

**Verification**

- Safety data sheet, Material Declaration Data Sheet or Product Data Sheet.

  OR

- Declaration that all chemicals used within products do not contain classifiable or hazardous substances that would trigger the issuing of an SDS.

**Award Criterion**

Additional marks to be awarded for e-products without substances on the [relevant authoritative list(s)].

Also consider extending award criteria to include SDS and MDDS on candidate lists.

**Verification**

- Safety data sheet and/or Material Declaration Data Sheet.
Upon any changes or additions to [relevant authoritative list(s)], the supplier to submit a renewed version of SDS or new SDS to the client for any product supplied within 2 years. Also consider:

1. Perform random sample checks on technical documentation from manufacturers and suppliers of materials. If necessary, perform analytical testing.

2. Supplier liability for the damage caused to the recipient and downstream recipients due to the improperly communicated hazard information or in compliance with quality/legal requirements.

→ A process to manage, maintain, and update all data received on declarable substances.

The model wording has annotations in brackets, bold and italics to highlight where the wording may need either review and/or adaptation, depending on the particular project circumstances, as follows:

→ (where applicable) - text that should be deleted if not applicable; and,

→ [text that may need amending to suit the project].

External references (e.g. to regulations and international agreements) should be made available or linked as appropriate.

Manufacturers and suppliers shall meet or exceed the provisions of the ILO Chemical Convention 1990 (C. 170) in all areas of the subject matter related to the tender. Also consider:

1. Broader CSR labour rights e.g.

→ Freedom of association and collective bargaining (C. 87 and C. 98),

→ Forced labour (C. 29 and C. 105),

→ Child labour and the worst forms of child labour (C. 138 and C. 182),

→ Discrimination (employment and occupation) (C. 111).
2. **Compliance with relevant domestic law in the legal jurisdiction regulating:**

   - Minimum wages,
   - Working hours,
   - Overtime compensation,
   - Employment contractual relationships

**Verification**

Provision of publicly available supplier requirements document(s) (e.g., manufacturer or Responsible Business Alliance Supplier Code of Conduct [B14]) outlining supplier requirements

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**Performance Criterion #1**

Throughout the entire contract period, the supplier shall apply the contract terms [relating to ILO c.170].

Also consider:

Extending to broader CSR terms e.g. The eight core conventions of ILO regarding forced labour, child labour, discrimination, freedom of association, and the right to collective bargaining (no. 29, 87, 98, 100, 105, 111, 138, and 182).

**Verification**

The contract shall be fulfilled in accordance with the following:

- In the event of the core conventions of the ILO are in conflict with national law, the supplier shall take reasonable measures to ensure compliance with the international regulations.
- The obligations concern workers when they perform work within the frame of the contract.

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**Performance Criterion #2**

The [operator] shall implement or participate in a program that audits suppliers and have a process in place for evaluating the risk for negative environmental and social impacts and a methodology for determining which (“at risk”) suppliers must undergo onsite audits based on agreed environmental and social criteria. “At risk” suppliers shall undergo onsite audits at least every three years[70].

**Verification**

A program that audits all facilities of “at risk” suppliers, at a minimum, against internationally recognized standards, including but not limited to, the ILO Declaration on Fundamental Principles and Rights at Work and the UN Universal Declaration of Human Rights.

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[70] Adapted from NSF/ANSI Sustainability Leadership Standard e.g. NSF/ANSI 457 – 2019
1.5 Summary of general practice

Compliance with existing regulations may seem an obvious statement but ensuring that CoCs are identified and appropriately addressed should not be assumed and requires verification in tender responses. This means chemical management compliance has to be explicitly asked for either directly in criteria or through the requirement for an appropriate Type 1 Ecolabel.

Certification is a proven way to ensure that conformity and compliance are being achieved through an independent and auditable process. Certification can however add cost (e.g. Type I labels) and so a balance needs to be struck based on the products being procured and the relevant CoC risk (see Product Profiles). Specifying labels and certification is also dependent on national laws particularly in interpreting restriction of competition. However, Yi (2020) noted that "when there are three firms competing in the product market, label competition can lead to strictly higher environmental benefit and social welfare than a single [eco]label"71.

The alternative to the third party certified (Type 1) ecolabels is relying on manufacturers or suppliers declarations (e.g. Type II or III ecolabels) which are more difficult, and costly, to directly verify with any degree of robustness. If Type 1 labels are not used, supplier selection (see Part C.1.2) becomes an important tool in order to ensure trust and veracity of claims made.

Basic compliance also focuses on what is currently available within the marketplace and so does not utilise the purchasing power of the public sector to encourage a shift in the market towards greener, less toxic products, and safer working conditions. Using public spending to encourage better chemicals management in the production, consumption and disposal of e-products is good practice.

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Good practice moves beyond compliance and standard practice by requiring active management CoC in products and supply chains throughout the procurement process.

2.1 Role of Type 1 Ecolabels

Certification, standards and labels can play a very significant role in the management of CoCs within electronic products. They do this in two main ways:

1. By providing a well-established process to help buyers make decisions without being experts in the evolving detail of the industry.

2. By providing consistency within chemicals management through organisations asking the market for the same thing. This increases purchasing power and creates a stronger demand-pull for specific positive changes. Manufacturers and supply chains are also able to respond more consistently and transparently so reducing risk to both themselves (e.g. additional costs) and their customers, e.g. through confusing information.

Transform Together have identified a number of benefits from using Type 1 (third party certified) ecolabels as part of the procurement process:

- Third-party, independently verified audits of manufacturing sites and products.
- Scientifically based criteria comprehensive across social and environmental matters.
- Continuous revision of criteria to stay abreast of changes.
- Eco-labels allow procurers to efficiently combine their demand for change.
- Eco-labels can allow brands to combine their leverage for change in complex component supply chains.

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72 Transform Together (2019). Eco-labels: how to demand comprehensive change with a single procurement choice
The International Standards Organisation (ISO) have developed standards for three types of environmental product claims, termed ISO Type I, II and III:

- Type I (ISO 14024) claims are based on criteria set by a third party and are multi-issue, being based on the product's life cycle impacts. The awarding body may be either a governmental organisation or a private non-commercial entity (See Box 8).
- Type II (ISO 14021) claims are based on self-declarations by manufacturers or retailers. There are numerous examples of such claims e.g. 'contains no mercury'.
- Type III (ISO/TR 14025) claims consist of quantified product information based on life cycle impacts.

CoCs form part of the subject matter of a variety of multi-criteria schemes. A non-exhaustive list is presented in Box 7. However, the treatment of CoCs does vary from scheme to scheme and so it is important to ensure that any ecolabels specified - or referred to by suppliers in their tender responses – meet the requirements of national, local and organisational agreements and policies.

Adopting ecolabels or certification schemes can form part of performance improvement and the transition pathway for managing CoCs. The EPEAT system for example is flexible. It contains 23 mandatory criteria for entry-level product registration (Bronze), and 28 optional criteria which qualify products for higher registration tiers (Silver and Gold).

There are numerous Type I ecolabels (third-party certified) that address ICT and include reference to Chemicals of Concern (CoC). Note that CoCs are not always addressed consistently within a given scheme or between labelling schemes - you should check each scheme for details.

### Blue Angel

The Blue Angel has been the ecolabel of the federal government of Germany since 1978 but also operates internationally. It covers a range of electrical household, office and ICT devices among other product groups.

### China Environmental Labelling

China Environmental Labelling is a Type I ‘leadership certification’ aiming to promote the green purchase and hence green manufacturing in China. It specifies requirements for environmental protection during production, utilisation and disposal, and promotes low toxicity, less harm and resource efficiency.
Box 8 (cont.d)
Ecolabel Examples

**Cradle to Cradle Certification**

is a third-party sustainability label that requires achievement across multiple attributes including Materials Health, which includes a comprehensive Restricted Substances List (RSL) based on a number of MEA and international sources.

**ECOLOGO**

This is a North American Type I (ISO14024) eco-label standard, covering various types of electrical products including, inter alia, phones, control panels, printers, and tablets. It focuses on reduced environmental impact based on the lifecycle stages of the product.

**EcoMark Japan**

The Eco Mark program serves to promote environment-friendly lifestyles (ecological lifestyles) through wise product choices. It is managed by the Japanese Environment Association and covers a range of electronic and ICT devices.

**EPEAT**

The Global Electronics Council (formerly Green Electronics Council) developed EPEAT to address the unique characteristics of the electronic products marketplace. It provides independent verification of manufacturers’ claims and uses a “declare and verify” system to govern the addition of products to EPEAT.

**Good Environmental Choice Australia (GECA)**

GECA (Good Environmental Choice Australia) is an ISO 14024 Type I, not for profit scheme that includes certification for lighting, office equipment, copiers and printers etc.

**Nordic Swan**

The Nordic Swan Ecolabel sets strict environmental requirements in all relevant phases of a product’s life cycle and also sets strict requirements for chemicals used in over 60 product groups. Electronic products covered include computers, audiovisual, imaging and charging devices.

**TCO Certified**

TCO Certified is an independent sustainability certification for ICT. Its criteria cover environmental and social responsibility from a whole life cycle perspective. TCO updates the criteria every three years.

Further information on Ecolabels can be found at the Global Ecolabelling Network (GEN)
There is a growing number of different ecolabels on national, international and global levels. The procurement unit can choose which ecolabel to require from tenderers. A reliable ecolabel should ideally have the following characteristics:

- they only concern criteria that are linked to the subject matter of the contract;
- the criteria for the label are verifiable and non-discriminatory;
- they are established using an open and transparent procedure in which all relevant stakeholders, including government bodies, consumers, social partners, manufacturers, distributors and non-governmental organisations, may participate;
- they are accessible to all interested parties; and,
- they are set by a third party over which the economic operator applying for the label cannot exercise a decisive influence.

In order not to restrict competition, e.g. if bidders cannot obtain the relevant label within a time limit, criteria cannot exclude a bidder if they can prove equivalency. Criteria should therefore enable them to:

- obtain equivalent means of verification, e.g. provision of a verifiable technical dossier will be accepted; or,
- accept other labels which meet equivalent label requirements – this will require the evaluation team to ensure that alternatives meet the same specific conditions required for chemicals of concern as the label referred to in the tender.

In many regions and countries, eco-labels are a commonly used procurement tool within public procurement, for example in the EPEAT ecolabel in the USA and the China Environment Labelling Program in China.

There are a number of ways of introducing ecolabels into tenders:

1. Specifying the ecolabel as a minimum requirement in the description of the object of procurement – verification can be done by bidders demonstrating their compliance with the ecolabel requirement. For example, through a copy of the valid licence.

2. Using an ecolabel as part of the evaluation criteria by comparing quality if a mandatory ecolabel is not considered appropriate but the procurement function wants to encourage potential suppliers to take environmental concerns into account in their products and services. Tenderers may earn more quality points by offering eco-labelled products or services.

Note that some ecolabels have different levels and these can be also used to differentiate quality. For example, EPEAT has Gold, Silver or Bronze levels depending upon the number of environmental criteria they meet. Where this is the case, ensure that the chemicals of concern are covered within the levels and ecolabels being offered. This may be covered by the following examples quoted from the Guide for Chemical Smart Public Procurement:

The tendered products/services have the x ecolabel = yy points.

The tendered products meet the requirements of ecolabel x (document [no]) = yy points.

The tendered products/services will have the x ecolabel by the start of the contract period = yy points.

The tendered products/services will have the x ecolabel at the latest six months after the start of the contract period = yy points.

There are a number of factors identified for integrating ecolabels into public procurement.

1. Organize a market dialogue with companies to determine whether an ecolabel should be used as a minimum requirement or a qualitative comparison criterion.

2. The procurement unit should always make sure that there are more than one ecolabelled product or service available on the market. This can be checked, for example, on the websites of both companies and specific ecolabels. The purpose of this is to enable competition and avoid narrowing down the market.

3. Inform potential companies of any procurement that might include ecolabels at an early stage.

4. Remember to include the ecolabel requirement also in the contract.

5. When preparing the procurement documents, always include a link to the required ecolabel or the criteria documentation. You can also append these to the procurement documents.

As a minimum, the following questions should be considered when determining what Type 1 ecolabels are appropriate:

1. Does the label specify and address prohibited chemicals? or,
2. Does the label provide general categories of prohibited chemicals (e.g. no substances classified as carcinogenic 1A/1B)?
3. Does the label provide criteria related to chemicals of concern that describe specific materials or components (e.g. for plastic casings)?
4. Does the label impose information requirements related to chemicals that are used?
5. Does the label provide criteria for chemicals that are allowed for use under the label?
6. Do requirements regarding H&S and the working conditions of workers include reference to chemicals of concern, (e.g. exposure and emissions)?

Set improvement over time as a performance criterion in supply contracts, for example:

- Moving from achieving certification standards or moving up through tiers within relevant certification schemes.
- Internal performance improvement can be demonstrated by moving from core criteria on CoCs to good and beyond good practice levels (see Part C.2 & C.3).
2.2 Other procurement tools

In addition to certification and standards (Part C.2.1) there are a wide variety of tools available to procurers for assessing the management of CoCs. For example, these include, but are not limited to:

1. UNEP has produced a ‘list of lists’ which provides a non-exhaustive review of regulatory frameworks comprising substance-specific provisions and lists with regards to electronic and electrical products and batteries which may be used as the first point of reference for stakeholders looking to increase their knowledge on substances which may be relevant for the electronics sector. GreenScreen List Translator™ - GreenScheme for Chemicals has a suite of tools including the list translator which also provides a “list of lists” approach to quickly identify chemicals of high concern. It does this by scoring chemicals based on information from over 40 hazard lists developed by authoritative scientific bodies convened by international, national and state governmental agencies, intergovernmental agencies and NGOs.

2. **Substance Restriction Lists (SRLs)**
   These include, but are not limited to, lists of regulated/legally restricted substances; Restricted Substance Lists by manufacturers/assemblers etc.; lists of substances of concern (‘deny lists’); other lists e.g. a list of endocrine-disrupting substances.

3. **The SIN (Substitute it Now!) List**
   Developed by the Not-for-Profit ChemSEC, a list of hazardous chemicals that are used in a wide variety of articles, products and manufacturing processes around the globe. The SIN abbreviation – Substitute It Now – implies that these chemicals should be removed as soon as possible as they pose a threat to human health and the environment.

4. **Chemical Footprint Project (CFP) Assessment Tool**
   Clean Production Action who rate companies through measuring and disclosing data on business progress to safer chemicals.

5. **BOMCheck**
   Generates Regulatory-Compliance-Declarations (RCD) and/or Full Materials-Declarations (FMD) and is used by a variety of large-scale manufacturers.

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75 UN Environment ISSPRO Life cycle management of chemicals present in products: Strengthening Action, 2018
6. **chemSHERPA**

   Information transfer scheme for chemicals in products throughout supply chains developed by the initiative of Ministry of Economy, Trade and Industry (METI) in Japan and incorporating JAMP AIS (Composition Information) and JGPSSI (Compliance Assessment information). It conforms with IEC and IPC etc.

7. **International Material Data System (IMDS)**

   When looking at CoCs in vehicles the IMDS is the automobile industry’s material data system. It maintains data for various reporting requirements for hazardous and controlled substances by comparing entered data with regulatory-originated lists of prohibited substances (REACH, GADSL, ELV, etc).

8. **Pharos**

   Setup by the Healthy Building Network it provides resources to assess human and environmental health hazards of chemicals in building products to improve human health and the environment and is not limited to just chemicals used in the building industry.

9. **Chemical Management Database (CMD)**

   There are a variety of CMD systems offered commercially for managing and distributing Material Safety Data Sheets (MSDS) and connecting buyers to sellers on collection and verification of Bills of Substances (see Box 9).

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**Box 9 Bill of Substances**

The Bill of Substances (BOS) is a way to manage compliance information-gathering with regard to the parts and materials used in the manufacturing process. It is a hierarchical list of substances that are contained in the parts and assemblies that make up a Bill of Materials (BOM) of the manufactured product.

The BOS contains a series of hierarchical levels from any composition of a part or part group or subassembly or top-level assembly:

- **First or top-level:** Composition of a part or assembly
- **Second level:** Subpart
- **Third level:** Homogeneous Material
- **Fourth level:** Substance Group
- **Fifth level:** Substance

*Source: Agile Product Lifecycle Management, Product Governance and Compliance User Guide Release 9.3.3. 2014 Oracle*
2.3 Encouraging substitution

An important element of good practice is working towards safer substitutes either through a proactive choice of more sustainable products available in the current marketplace and/or specification of substances to be avoided. This is a particularly important procurement decision where the end-of-life fate of electrical and electronic products (WEEE) is either not certain or potentially unregulated.

Step 2 of the CoC management approach refers to the identification of priority products and spend areas for action (Part B.3.2). Identifying priority products and spend areas to be the focus of substitution efforts requires both baselining current spending to identify areas where CoCs are potentially an issue; and, prioritising the product and spending hotspots for action on substitution. **Once a specific set of products has been identified for potential substitution, the next step is to identify safer and more sustainable alternatives.** This could either be working with suppliers towards substituting CoCs within given products or substituting actual e-products themselves for more sustainable products.

BizNGO, for example, has developed a set of alternatives assessment principles. The assessment is a process for identifying, comparing and selecting safer alternatives to chemicals of concern (including those in materials, processes or technologies) on the basis of their hazards, performance, and economic viability. A primary goal of Alternatives Assessment is to reduce risk to humans and the environment by identifying safer choices. These principles are set out in Box 10.

### Box 10 BizNGO Alternative Assessment Principles

**Reduce the hazard**

Reduce the hazard by replacing a chemical of concern with a less hazardous alternative. This approach provides an effective means to reduce risk associated with a product or process if the potential for exposure remains the same or lower. Consider reformulation to avoid use of the chemical of concern altogether.

**Minimise exposure**

Assess use patterns and exposure pathways to limit exposure to alternatives that may also present risks.

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Box 10 (cont.d)
BizNGO Alternative Assessment Principles

Use best available information
Obtain access to and use information that assists in distinguishing between possible choices. Before selecting preferred options, characterize the product and process sufficiently to avoid choosing alternatives that may result in unintended adverse consequences.

Require disclosure and transparency
Require disclosure across the supply chain regarding key chemical and technical information. Engage stakeholders throughout the assessment process to promote transparency concerning alternatives assessment methodologies employed, data used to characterise alternatives, assumptions made and decision-making rules applied.

Resolve trade-offs
Use information about the product’s life cycle to better understand potential benefits, impacts, and mitigation options associated with different alternatives. When substitution options do not provide a clearly preferable solution, consider organizational goals and values to determine the appropriate weighting of decision criteria and identify acceptable trade-offs.

Take action
Take action to eliminate or substitute potentially hazardous chemicals. Choose safer alternatives that are commercially available, technically and economically feasible, and satisfy the performance requirements of the process/product. Collaborate with supply chain partners to drive innovation in the development and adoption of safer substitutes. Review new information to ensure that the option selected remains a safer choice.

Source: BizNGO The Commons Principles for Alternatives Assessment

Substitution can be ensured for example, by the inclusion of requirements in tenders to confirm that CoCs identified in relevant authoritative lists are not being used in any way associated with the subject matter of the contract (see Criteria example).
2.4 Reuse and using e-products longer

A further consideration when selecting e-products is to consider the potential for reuse, either through the purchase of reused e-products (where suitable), and/or disposal to reuse rather than recycling. Reuse of electrical and electronic equipment, i.e. to be used for the same purpose for which it was initially manufactured, may or may not involve a change of equipment ownership. This product life extension creates more optimal use of environmental and economic resources. Generally, it also involves a combination of specific after-use services like data destruction and environmental compliance certification. However, it does not constitute a direct solution to the e-waste problem but can contribute indirectly to reducing the amounts of waste generated, by displacing the use of virgin raw materials in new e-products. This action will also contribute to the UN Sustainable Development Goal 12 for Sustainable Consumption & Production (SDG12).

Criteria Example
Chemical substitution

The contractor ensures that none of the 12 chemicals (Electronics Watch 2020, Annex 1) to be discontinued are used in the factories linked to the subject matter of the contract.

Verification options

1. The contractor states which of the 12 chemicals to be discontinued have been eliminated, which ones are used instead, and why those chemicals are less toxic.

2. Confirmation from independent union [body].

3. Confirmation from independent audit.

Source: Electronics Watch 2020 How to Protect Workers from Chemical Hazards in Electronics Supply Chains

Recommended Actions for Procurers

Collaborate with suppliers, for example through market engagement, to encourage shifts within the relevant electronics sector towards more sustainable products with lower dependency on CoCs within their production.

Require disclosure across the supply chain regarding key chemical and technical information.

Reduce impacts by encouraging suppliers to identify safer and more sustainable alternatives and replacing a chemical of concern with a less hazardous alternative.

Ensure that any ecodesign requirements specified include adequate reference to management and/or reduction in chemicals of concern, and if not, include reference to a broader chemical management plan in criteria (e.g. ecodesign) for electronics products.
2.5 Criteria for good practice

The analysis of 73 different criteria sources produced 310 separate criteria of which 118 (38%) could be considered good practice because they go beyond regulatory compliance. Within the EU GPP criteria, these equate to the comprehensive criteria requirements, and in the IEEE Standard for Environmental Assessment of products, these would include consideration of the optional requirements.

As well as using requirements to cover the management of chemicals in e-products, also give consideration to encouraging better supplier practice through award criteria. This can address good practice beyond standard requirements through the award of additional points, and/or good practice through developing, implementing or participating in chemical management processes within the supply chain for restricted substances. These practices should cover more transparent chemicals information management to improve end-of-life options for e-products; and, to build capacity and knowledge across the supply chain and users around CoCs.

The key to good practice is moving beyond reacting to CoCs within goods and services, e.g. through compliance with existing regulations in what is being procured, towards actively encouraging better chemicals management within the demand for e-products and services and rewarding better supply chain practice. Good practice criteria typically focus on the following themes highlighted in the recommendations box below.

Most criteria relating to CoCs focus on specific products. There are notable variations in criteria relating to the same subject (e.g. flame retardants or phthalates in plastics) particularly where specific CoCs are mentioned. This might be partly due to the date at which the criteria were published as well as different regulatory frameworks. Procurement will also typically (but not exclusively) include a variety of products, e.g. computers and monitors, and also a mix of products and services, for example in an office fit-out contract. Reference to only one type of product could potentially overlook the same potential CoCs in others - this could lead to a scenario where one product type is specifying a restriction on the use of, e.g. a specific phthalate compound whereas another product type within the same tender may not. Therefore:

- Either ensure that the procurement policy specifically identifies the chemicals of concern of relevance to the organisation and that these restrictions are applied consistently to all e-products (and accessories) likely to contain them; or,
- Specify requirements relating to impacts, e.g. must not contain carcinogenic, mutagenic or reprotoxic substances (see Criteria Example below).
The plastics used in housings and housing parts must not contain constituents with the following characteristics:

1. Substances that have been identified as substances of very high concern according to REACH (Regulation (EC) No 1907/2006) and have been included in the list (so-called Candidate List) set up in accordance with REACH, Article 59(1).

2. Substances that have been classified according to the Classification, Labelling and Packaging (CLP) Regulation in the following hazard categories or meet the criteria for such classification:
   - Carcinogenic of category Carc. 1A or Carc. 1B
   - Mutagenic of category Muta. 1A or Muta. 1B
   - Reprotoxic of category Rep.. 1A or Rep.. 1B
   - Mutagenic of category Mut.. 1A or Mut.. 1B
   - Carcinogenic of category Carc.. 1A or Carc.. 1B
   - Aquatic Chronic 1

Halogenated polymers shall not be permitted in housings and housing parts. Nor may halogenated organic compounds be added as flame retardants. Nor shall any flame retardants be permitted which are classified under the CLP Regulation as carcinogenic of Category Carc. 2 or as hazardous to waters of Category Aquatic Chronic 1.

Verification

The applicant shall declare compliance with the requirements in Annex 1 to the Contract and present a list of the housing plastics used according to Annex P-L 10 for all housing parts weighing more than 10 grams. Also, the applicant shall submit a written declaration from the plastic manufacturers or ensure the submission of such declaration to RAL GmbH for all parts appearing on said list. Such declaration shall confirm that the banned substances have not been added to the plastics and give the chemical designation of the flame retardants used, including CAS No. and classifications (H statements) (Annex P-M to the Contract). When first applying for the Blue Angel eco-label, the declaration may be presented unaltered during the term of the basic criteria. Notwithstanding this, the applicant shall be entitled to ask for an updated version of the declarations if the Umweltbundesamt (Federal Environmental Agency) finds that product relevant substances have been added to the Candidate List.

Source: Mobile Phones DE-UZ 106 (2017) Blue Angel - The German Ecolabel

Introduction

B CoC Management Guidelines

C Procurement Toolbox

Level 2: Adopting good practice  »  2.5 Criteria for good practice
Recommended Actions for Procurers

Where these are not already covered in existing regulations, extending restrictions on CoCs from the primary e-product, e.g. a computer, to the cabling and accessories, e.g. keyboard, mouse (and charger) etc.

Extending restrictions on content of CoCs in e-products to the packaging of products.

Extending CoCs criteria to other products containing e-products and electrical components, e.g. transportation and to services that cover the use of e-products and electrical components within their service agreements, for example buildings maintenance, facilities management, ICT service contracts etc.

Propose award criteria for addressing end of life impacts. For example, awarding points where the product or component, such as main Printed Circuit Board, is ‘halogen free’ in conformance with appropriate standards and fire tests.

Ensuring the supplier can demonstrate a framework or process for managing restricted substances. Also, include including the ability to review and update through the use of appropriate performance criteria within contract management.
Public sector leadership is often cited as an important aspect of procurement whether that is in dealing with the climate emergency (carbon reduction), reducing environmental impacts of consumption and production, encouraging a more circular economy or improving the welfare and living standards of citizens. The UN Sustainable Development Goals encapsulate all the above and more. In terms of procurement, two relevant leadership principles are:

Adopting shared services, strategic sourcing and collective purchasing

for example, collaboration with other buyers (pool purchasing, buyer groups etc) as well as suppliers and supply chains.

Managing competition and the supply base

focused on deploying the right set of procurement practices that result in finding the best/right suppliers and at ‘best value’. This includes, but is not limited to, strategic (i.e. regular) market engagement with the ICT and electronics sector.

Part B sets out an approach (Figure 5) for managing chemicals of concern in the procurement of electronics and electrical equipment (EEE). This incorporates an underlying approach of continual improvement in procurement practices over time as well as encouraging the electronics industry to progress responsible production in line with the rapid evolution of electronic products and their chemical ingredients.

Moving beyond good practice includes the following key elements:

- Encouraging a shift in the design of electronics to reduce the dependency on chemicals of concern;
- Moving from avoidance of chemicals to preference for safer chemicals within electronics products; and,
- Moving towards a lifecycle approach to managing chemicals of concern.

Moving beyond good practice is dependent on sharing information and collaboration. Previous studies on best practice in procurement of ICT have shown that best practice practitioners do not always understand the importance of sharing materials and experiences with other public administrations. This is in part, due to time pressures and in part also due to limited resources within procurement functions. Platforms like the recently formed Circular & Fair ICT Pact (CFIT) under the SPP Programme of the One Planet Network.

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78 See for example, Study on best practices for ICT procurement based on standards in order to promote efficiency and reduce lock-in. European Commission DG Communications Networks, Content & Technology, 2016.
79 https://circularandfairictpact.com
Sharing procurement knowledge is particularly important when working with electronics products that have global supply chains. This improves collective demand pull from the purchaser side as well as developing a more consistent understanding of need, and performance improvement, from the customer for suppliers to work towards.

A further factor the EU DG Communications Networks report (2016) highlighted was the impact of being ‘locked-in’ to contracts and to technology, platforms and infrastructure. Around 40% of those surveyed for the report experienced issues of lock-in, for example being tied into products and technologies within existing contracts – with the inference that switching could provide more beneficial environmental outcomes. This has a knock-on impact when considering how to reduce dependency on electronic products containing chemicals of concern. It also highlights the importance of:

- explicitly identifying criteria on CoCs within tender requirements and award criteria; and,
- encouraging shifts in performance within contracts by ensuring that performance management criteria relating to CoCs are included in contract management terms.

**Chemicals management in the procurement of electronics requires a lifecycle approach from the very start of the procurement cycle** (see Part B.2). In line with Figure 5 this requires assessment and mitigation of CoC impacts in three key stages of the product lifecycle, as identified in the Norden study on needs, gaps, obstacles, and solutions to provide and access information on chemicals in electronic products.

The Norden 2011 report also recommended the creation of a global standard for Chemical in Products (CIP) information. While the UNEP Chemicals in Products Programme provides guidance for stakeholders exchanging chemicals in products information, a global standard has yet to be achieved.

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81 Information on Chemicals in Electronic Products.
3.1 Criteria

Going beyond practice requires an integrated and holistic approach that addresses the life cycle of e-products. **Considering this life cycle approach requires a more systemic approach to using criteria within tenders.** Intended use and impacts at end of first use, e.g. reuse or recycling options, should always influence the purchasing decisions and therefore the choices of criteria within tenders.

'Best' practice criteria also address impacts such as emissions in production and are also included in standards such as the IEEE 1680.1-2018 - IEEE Standard for Environmental and Social Responsibility Assessment of Computers and Displays (March 2018, amended 2020). These include a criterion requiring the manufacturer to declare that the supplier of flat panel displays and semiconductor production used in products has installed, operated, and maintained control technology designed specifically to recover or destroy fluorinated greenhouse gases (F-GHGs) used in the production of flat panel displays.

In short, going beyond good practice means going beyond the product itself and considering the production environment as part of thinking about lifecycle impacts.

For example, in ensuring safe working practices within the manufacturing supply chain, safe storage and management of chemicals on-site may also be specified. For example, the Better Environmental Sustainability Targets (BEST) Standard 1001 – Batteries requires that operators, where relevant, maintain an:

> "inventory and monitor the type and quantity of chemicals used and stored on-site. Ensure the integrity of aboveground and underground storage tanks with regular monitoring; provide instructions to all workers on safe handling of all hazardous materials used or stored at the facility; and, ensure the appropriate storage of chemicals".

Going beyond good practice also means extending the duty of care beyond the product to the consumables used. For example, the 2014 Japanese EcoMark (Japan Environment Association Eco Mark Office) for imaging equipment, requires that:

> "toners, inks or solid inks, etc. (colourants) shall not use azo colouring agents (dyes and pigments) that generate carcinogenic aromatic amines listed [in Appendix 8, Annex XVII of REACH Regulation ((EC) (1907/2 006)) (Table 8.)]."
Managing information on Chemicals in Products (CIP)

Addressing chemical and product life cycles in a sustainable way requires proper management of information flows and feedback loops among stakeholders involved in the product lifecycle. At present, there are a number of potential barriers at key interfaces within the information flow across the EEE value chain. These all happen after the initial procurement and occur at several points within an e-products use phase. Breaks in the information chain do not help the service providers in terms of repairing, reusing, remanufacturing or recycling the e-products. As such, they contribute to the potential for downstream impacts to occur as a consequence of public sector procurement. Closing e-product material loops would enable a better, more transparent chain of custody and flow of information from production through use to the different disposal options.

Some suppliers are not used to having to provide information downstream within the value chain and ultimately to the procuring body/customer. They also may not understand what the downstream user is asking for or have certainty of what is coming next in terms of chemicals legislation or new research about chemical hazards. Errors can creep into the data transmission process and many downstream users have their own customized forms, the format and requirements may not be familiar to the supplier.

This highlights the importance of market engagement and developing robust and transparent supply chain partnerships. **Forward communication of general needs, along with specific policies on CoC management and direction, as well as spending levels is an essential best practice.**

A further aspect is communicating information. There is an enormous variety of information about chemicals in e-products (e.g. from manufacturers, NGOs, Government, etc) that is publicly available. Specifying verification through standards such as IPC-1752 (Materials Declaration Data Exchange Standards)\(^85\) or similar is one option. IPC-1752 (A & B) provide a standard reporting format for data exchange between supply chain participants which allows for more efficient and effective communication of data.

\(^85\) Materials Declaration Data Exchange Standards (IPC75XX)
Recommended Actions for Procurers

Be proactive with market engagement and information sharing by:

1. Allocating time and resources to finding the relevant information, and to actively keeping up to date with the evolving policy, product development and practices relating to CoCs within the electronics sector and its e-products.

2. Allocating time, capacity and a mandate to drive market engagement and communications activities within the relevant e-product supply chains. This is cost-efficient especially as it can address issues of lock-in to specific technologies, systems or IT solutions.

Share experiences and learning through peer-to-peer groups to disseminate both good and best practices. What is good practice in one supply chain may be best practice in another. This can be achieved through participation in regional, national or international platforms.

Sharing experience may also help develop a more consistent demand pull from the public sector, e.g. through buyer groups, for green products and practices within the electronics sector.

3.3 Design shifts in electronic equipment

Procurement can play a significant role in encouraging a shift in the design and production of products to manage CoCs. This requires a strong partnership with suppliers. The BizNGO Guide to Safer Chemicals identifies some common strategies used by a range of leading manufacturers and companies to manage chemicals and materials in their products:

- identify all chemicals in products;
- eliminate high-hazard chemicals;
- strive to use only safe chemicals;
- commit to product redesign, e.g. eco-design;
- take responsibility for products cradle-to-cradle;
- adopt internal chemical policies;
- work collaboratively with environmental advocates; and
- publicly support government reform of chemical policies.

Evidencing these strategies in supplier responses can be used when selecting suppliers. A further level of evidence when selecting suppliers is evaluating their organisational standards. For example, are they ISO14001\(^{87}\) certified for environmental management or implementing social responsibility guidelines like ISO26000\(^{88}\) or the OECD Guidelines for Multinational Enterprises\(^{89}\)?

**Design shifts also need to build on inserting criteria in tenders** and focus on developing a coherent, strategic and sustainable approach to the management of chemicals in products. For procurers there are three inter-related elements:

1. Embedding chemicals management into existing sustainability and procurement policies – this goes beyond straightforward referencing of adherence to MEAs and national regulations. It requires setting out aims and targets for the reduction in dependency and impact of chemicals of concern.

2. Communicating to suppliers the chemicals management policy and steps required for continual improvement in line with targets set out in the policy.

3. Linking the flow of information on chemicals in products from the initial procurement of products through the use phase into disposal either for reuse or recycling.

Taken together, these elements will form a viable approach to shifting design towards products containing safer chemicals. A number of factors however need to be taken into account to ensure effective communication.

Original Design Manufacturers (ODM) also need to be considered when encouraging design shifts. An ODM is a company that designs and manufactures a product that is specified and eventually branded by another firm for sale. In contrast to a contract manufacturer, the ODM owns and/or designs in-house the products that are third-party branded. This can have an impact on the flow of information, as it may be interrupted between the ODM and the Original Equipment Manufacturer (OEM). The ODM may choose to not forward all/parts of information due to resource or proprietary information issues.

**From a procurement perspective, the procuring body, therefore, needs to understand which business model it is contracting with, and the potential for information gaps.** The procuring body, therefore, needs to ensure that CoC management is explicitly addressed within tenders and contract management.

**A further factor for procuring bodies to consider is the role they play within the value chain,** acting as a conduit for information from the suppliers to the e-waste recyclers (or re-users). Even where information can be given about chemical content to e-waste handlers in developing countries, the handlers may not understand it or be able to use it. Even if these

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\(^{89}\) OECD (2011). Guidelines for Multinational Enterprises
e-waste handlers know about the risks associated with their work in product disassembly and extraction of valuable materials, they may not be in a position to act upon it as they may not have the resources to improve the ways they are currently handling e-waste. This requires a more integrated approach across the public sector within countries to ensure they are contributing to performance improvement rather than contributing to the problem around safer reuse of electronic equipment and recycling of e-waste.

**Recommended Actions for Procurers**

Identify the nature of the supplier and the business model being contracted (ODM, OEM etc) and set requirements accordingly to ensure that the chemicals information may be transferred through all stages of the product lifecycle. This requires the procuring entity to recognise and actively participate in its role to facilitate information flow from the producers to the e-waste management companies at end of life.

**3.4 Cleaner Production**

Cleaner production (CP) is a preventive approach to managing the environmental impacts of business processes and products. A significant advantage of cleaner production is that it is applicable to all businesses, regardless of size or type and therefore does not exclude small, medium enterprises within the EEE supply chain or e-recycling sector.

**Key principles of clean production:**

1. encouraging changes in technology, processes, resources or practices to reduce waste, environmental and health risks;
2. minimising environmental damage through unnecessary use of CoCs; use energy and resources more efficiently; increase business profitability and competitiveness; and,
3. encouraging an increase in the efficiency of production processes.
Best practice sustainable procurement should encourage supply chains to follow those key principles. Specifying cleaner production can be a component of supplier selection (see Part C.1). For example, requiring evidence of an integrated approach to:

- **Technology** – emphasising a reduction in materials and energy consumption;

- **Product design** – reducing chemicals input and dependency on CoC, for example, replacement of hazardous or non-renewable inputs by less hazardous or renewable materials or by materials with a longer service lifetime.

- **Operating practices** – reducing workforce exposure to CoCs during production or disassembly/disposal;

- **Maintenance** – improving repair and reuse options, and extension of product life, for example through remanufacturing;

- **Waste treatment** – ensuring products are recyclable; and,

- **Packaging of e-products** e.g. reduction of EPS and/or single-use plastics.

Cleaner production can also be used as a methodology to support SMEs in countries where there are fewer regulations specifically addressing chemicals management in products. Cleaner production can be a transition pathway for the continuous application of an integrated preventative environmental strategy to processes, products and services to increase efficiency and reduce risks to humans and the environment.

### Recommended Actions for Procurers

**Adopt an integrated approach to technology needs, production methods, products, operation and disposal**, i.e. a lifecycle procurement approach to mitigating impacts from ICT.

**Specify cleaner production**, where relevant, as a requirement for supplier selection

### 3.5 Extended Producer Responsibility

Many waste-related policies are based on the principle of extended producer responsibility (EPR). The idea behind this principle is that manufacturers have a responsibility for their products, and the environmental impacts related to these products, which goes beyond the production stage. There are three primary objectives of the EPR principle:
1. Manufacturers shall be incentivised to improve the environmental design of their products and the environmental performance of supplying those products.

2. Products should achieve a high utilisation rate.

3. Materials should be preserved through the effective and environmentally sound collection, treatment, reuse, and recycling.

The EPR principle stresses the manufacturers’ responsibility for the end-of-life treatment of their products and is contingent on a transparent and robust information transfer system. Purchasing bodies and procurement functions, therefore, play a significant facilitating role, for example through information transfer at the point of purchase and the point of disposal.

For procurers seeking to manage chemicals in procurement, the concept of Extended Producer Responsibility (EPR) is key. Most legislation and policies currently refer to the principle of "Extend Producer Responsibility", which emerged in academic circles in the early 1990s. It is generally seen as a policy principle that requires manufacturers to accept responsibility for all stages in a product’s lifecycle, including end-of-life management.

**Implementing EPR through procurement can cover specifying actions such as:**

- Designing products, e.g. eco-design for re-use or recyclability.
- Implementing take-back programmes for e-products and e-waste.
- Arranging waste collections, recycling or another suitable disposal for products with specific CoC treatment needs (e.g. mercury).

Sustainable Public Procurement criteria should take EPR into account, where applicable. This guidance does not address the details of EPR as these vary considerably and can be accessed through national regulatory portals etc.

In some situations, e.g. as a matter of policy or practicality, tenders may not be able to test competition, or added value, regarding EPR. **If it is not possible to consider introducing EPR, it would be beneficial to supplement procurement by benchmarking the cost of an equivalent service for a given waste management activity.** For example, additional infrastructure to mitigate CoCs during WEEE recycling, to ensure that the local costs are not significantly above expectations once EPR has been incorporated. There are various approaches to benchmarking and much of the necessary information may already have been gathered during the development of chemicals management plans for specific products or spend categories. For example:
Costs could be compared against those of other public bodies (or even countries), e.g. on a per capita or per tonne collected basis, taking into account factors likely to lead to variation in costs, such as the type of service or geographic accessibility.

It may not be necessary to seek to achieve a precise evaluation of the costs, but to ensure the costs are not outside the normal range, once any specific local considerations (e.g. local wage costs, capital costs, local geography, feedstock and waste composition) are taken into account.

Implement standards with the goal of normalising levels of productivity, giving producers assurance that, so long as the service was meeting a standard or a due process had been carried out by the municipality, the ‘necessary costs’ test had been met with regard to tender evaluation.

Further information on procuring and incorporating EPR into chemicals management planning can be found in the recent (2020) Eunomia study on EPR for the European Commission90.

**Recommended Actions for Procurers**

Extended Producer Responsibility (EPR) should be specifically referenced, where relevant, when procuring all manner of products containing electrical & electronics equipment and ICT.

Where EPR is not in place, benchmarking the cost of an equivalent service for a given waste management activity, for example, additional infrastructure to mitigate CoCs during WEEE recycling, will ensure that the local costs are proportionate and not significantly in excess of expectations had EPR been in place.

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3.6 Procurement approaches

Selecting the procurement approach can have a marked positive (or negative) effect on the outcome of a chemicals management policy. This guidance has highlighted the basic requirement to ensure that chemicals of concern are embedded within award criteria in order that suppliers understand the importance of going beyond minimum compliance. A further element of best practice is linking the mitigation of impacts of chemicals of concern to wider sustainable procurement and socially responsible procurement. The OECD has set out the link between public procurement and encouraging responsible business conduct (including ethical business) through, for example, supply chain due diligence to encourage a better procurement environment to deliver better outcomes. Managing chemicals of concern from extraction through to disposal through public procurement is intrinsically a part of socially responsible procurement but is seldom explicitly referenced or linked.

Part C.3.3 also noted that the electronics supply chain is subject to different ODM and contracting manufacturer supplier models.

Circular procurement

Implementing circular economy principles in procurement is another approach to designing out dependency on chemicals of concern in products. Circular economy principles are becoming the norm in national and multinational policies within the public and the private sector. For example, the EU Circular Economy Action Plan\(^1\).

Using procurement as an instrument for delivering a more circular economy, i.e. circular procurement contributes to chemical management planning by closing product and materials loops and retaining materials value within the closed loops for as long as possible. Circular procurement (CP) is a rapidly evolving approach that has roots in the Netherlands Green Deal for Circular Procurement which initiated a range of CP pilots from 2014 to 2018 to accelerate the shift in the Dutch ambition for a circular Netherlands by 2030. Over 40 pilot factsheets have been produced across a range of categories and 4 pilot factsheets relate to ICT directly\(^2\). Figure 7 summarises how integrating circularity into procurement can contribute to a more effective chemicals management plan for electronics and ICT, particularly through the adoption of key enablers like lifecycle costing, collaboration, and incorporation of knowledge management and information systems. These circular approaches, tools and solutions can also provide inspiration and ideas on how to better manage CoC in products through procurement.

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\(^1\) European Commission (2020). EU Circular Economy Action Plan

\(^2\) See for example: Pianoo Circular Procurement Examples in IT
Circular procurement also champions a lifecycle approach to products and materials management (see Part B.1). CP can be an effective instrument in tackling end-of-life approaches to COCs in e-waste where national regulation or local recycling infrastructure may not be as advanced. **Circular procurement actively encourages closing material loops and the lifecycle approach it is based on will incorporate disposal duty-of-care consideration at the time of tendering.**

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**Figure 7 Circular procurement scope**

**Pillar One**
- Procuring more circular products, materials & services
- Developing & using **circular procurement criteria** in tenders’ specifications
- Promoting **product lifetime extension**

**Pillar Two**
- Promoting new business models based on innovative and resource-efficient solutions
- Encouraging **product-service systems**
- Adopting **Supplier take-back systems**
- Using **sharing platforms/collaborative consumption** and **sharing economy services**

**Enablers**
- **Strengthening & adapting consumer information tools**
- **Lifecycle cost & total cost of ownership** methods
- **Cooperating** with other organisations
- **Knowledge & information management systems**
- **Legal instruments**
- **Fiscal instruments**

Source: UNEP, 2019\(^{93}\)

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\(^{93}\) United Nations Environment Programme (2019). *Building Circularity Into Our Economies Through Sustainable Procurement*
Example: Utrecht Circular IT Purchasing Criteria

The pilot consists of a procurement process to purchase IT equipment for 1,000 workstations. The preparations started in April 2015. The criteria for the Province of Utrecht’s purchasing department are that on the one hand a large part of the products the producer supplies are used, and on the other hand, the products or materials supplied can be used again for another cycle at the end of the lifespan or use phase.

The Province of Utrecht looked at options to lease workstations through a circular business model but chose in the end to take an interim step of purchasing the equipment in order to give suppliers the opportunity to develop the circular service provision. The winning supplier had to draw up an action plan in cooperation with the province of Utrecht to get the IT hardware supplied back into the supply chain with the highest possible value.

The pilot highlighted the importance of market consultation and working with the market in the circular developments to make sure tenders could be fulfilled and the playing field is level.

Source: Circular Procurement IT equipment province of Utrecht. EU LIFE Rebus, 2017

Innovation in procurement

There are two aspects relating innovation procurement to managing chemicals of concern in electronic products:

1. Innovating procurement processes to improve procurement outcomes.
2. Applying innovation procurement approaches to encourage more sustainable products, e.g. through eco-innovation of electronic products.

In many cases, including countries actively implementing SPP principles, encouraging innovation within electronic first requires innovation of existing procurement approaches. Innovation procurement also requires significant supplier engagement which can also be subject to perceptions of risk, e.g. in terms of restricting competition. More detailed information on establishing innovative procurement practice, along with global case studies, can be found, for example, in the OECD guidance on innovation procurement94.

Innovation procurement can, and should, encourage eco-innovation in production and products. In terms of competition, eco-innovation enables small businesses as well as large-scale multinationals to offer innovative products and solutions. SMEs are often more agile and can respond more rapidly to innovation calls than larger businesses. However, as with all innovation and R&D there are risks in terms of market development and access that can act as barriers, especially to smaller businesses. Public Procurement of Innovation (PPI) approaches can encourage the substitution of hazardous chemicals.

through R&D into new product materials and design by enabling the public sector to act as a launching customer/first purchaser/early adopter. Innovation procurement can also encourage the adoption of eco-design as well as improving communication with the value chain and stakeholders.

Creating demand-pull

Most ICT brands operate on a worldwide scale. They require a sufficiently large and uniform demand to effectively change the direction of their business. Relative to that, current sustainability demand from public procurers is too small-scale and fragmented (there may be exceptions for some niche sectors, for example, medical equipment) to enable the change needed. Even collaboration on a national level falls short in terms of scale.

Therefore, to effectively empower public procurement of ICT, public procurers need to collaborate across borders and operate on an international scale as well. Collaborative purchasing arrangements, for example, Frameworks, are frequently used for common purchase categories including spend areas like ICT, Transport, Health and Education etc - all areas where ICT and electronics products are commonly found. Frameworks will typically focus on cost and whilst sustainability criteria are included, these typically represent basic GPP criteria rather than best practices.

Sectoral buyer groups are one way to signal broader sustainability (and circular) ambitions to suppliers as well as create platforms for pre-competitive dialogue and peer-2-peer exchange of knowledge. The Circular and Fair ICT Pact (CFIT) is one such example and is a partnership under the SPP Programme of the One Planet Network.

Recommended Actions for Procurers

Buyers groups for particular products and categories can standardise demand to supply chains, support collaborative procurement and innovation, and foster consistency in market dialogue.

→ Consider joining a relevant buyers group for electronics and ICT products, e.g. the Circular and Fair ICT Pact (CFIT).

→ Check that the scope extends not only to sustainable purchasing but improving sustainability in a dialogue with suppliers that includes addressing chemicals of concern.

→ Encourage the group to initiate a clear transformation pathway for chemicals management in products. This should include reference to improving outcomes for e-waste recycling alongside reducing inputs of chemicals of concern into new products.

→ If a local or national buyer group for electronics products is not available then consider establishing one with similar commissioning organisations.
Preferring safer chemicals

From a procurement perspective, keeping pace with developments in chemicals and their use in electronic products can be resource-intensive and can also create delays in incorporating changes into procurement criteria. Preferring safer chemicals represents the highest tier on the GreenScreen benchmarking methodology\(^95\) and in the progression set out in Part B.3. Instead of relying on avoidance of chemicals of concern a more proactive approach is stating a preference for safer chemicals. Preferred lists or chemical screening are becoming more common elements of chemicals management in other sectors, for example, textiles such as workwear, as well as in e-products\(^96\). This would facilitate a shift from a product by product (bottom-up) focus to a top-down focus and enable the purchasing entity to combine requirements for chemicals of concern within an organisation-wide policy (e.g. Sustainability, CSR and/ or Sustainable Procurement policy) rather than focussing on a specific product or sector-specific spend area, like ICT. A key benefit of this top-down approach is that it would include the wider spend areas where electronic products and components form an important, but not necessarily highly visible, part – for example, in transport or in buildings services.

Chemical screening methodologies, for example, GreenScreen from the NGO Cleaner Production Action and the US EPA Safer Chemical Choice programme, enable scoring against criteria to assess chemicals and formulations. These can be grouped, for example, as either ‘preferred’, ‘needs improvement’, or ‘phase out’ according to the procurer’s criteria and preferences.

**Adopting a chemical management system that screens preferred chemicals is one action that can manage the risks around chemicals of concern.** Screening methodologies within chemical management systems can, for example, be based on third party methodologies and verification such as those found in Type 1 ecolabels (see Part C.2.1). Restricted substances lists, e.g. based on regulatory restriction or identification of certain hazards (such as the EU Substances of Very High Concern list) are reasonably common and familiar to procurers and electronics supply chains alike. Some manufacturers use Manufacturing Restricted Substances Lists (MRLSs) to develop the restrictive substances list by managing the inputs of chemicals at the front of the manufacturing process rather than the back end. These are both examples of ‘negative lists’ in that they focus on eliminating harmful chemicals after the fact, i.e. risk management tools.

\(^95\) [www.greenscreenchemicals.org/learn/full-greenscreen-method](http://www.greenscreenchemicals.org/learn/full-greenscreen-method)

\(^96\) ZDHC Foundation. Roadmap to Zero [www.roadmaptozero.com](http://www.roadmaptozero.com)
As noted in Part C.2.2, the UNEP has produced a ‘list of lists’, which provides a non-exhaustive review of Regulatory frameworks comprising substance-specific provisions and lists with regards to electronic and electrical products and batteries. These may be used as the first point of reference for stakeholders looking to increase their knowledge on substances which may be relevant for the electronics sector.\(^\text{97}\)

Recommendations: Sustainable procurement of electronics

Sustainable Procurement of Electronics: A Progressive Approach to Chemicals of Concern
This guidance highlights that policies should be more explicit in the inclusion of chemicals management within sustainable procurement policies and more emphasis on dialogue and collaboration with supply chain in the electronics sector.

This guidance is aimed at helping procurement practitioners implement policies on chemicals management through sustainable procurement approaches and tools such as market dialogue, criteria and ecolabels. In compiling the guidance, a number of recommendations for policymakers and well as practitioners are relevant.

Actions to address chemicals of concern need to consider all stages of the value chain of electronic products, and as a central link between suppliers, refurbishers and waste handlers, public procurement can make a significant contribution to advancing on the challenge of chemicals of concern in electronics.

**Recommendation**

Actions on managing chemicals in products are embedded in, and mandated through, sustainability, circular and procurement policies that explicitly define organisations’ approach to chemicals management and the mitigation of impacts.

Moving beyond complying with legislation is an important element within the implementation of a broader integrated sustainability policy in public sector organisations. CoCs should be addressed in a systematic way within sustainable public procurement in order to reduce the inconsistencies in requirements and criteria between product types, lack of coverage for many e-products, or in the adoption of a lifecycle approach to managing CoCs from sourcing through to end-of-life waste management.

**Recommendation**

Public sector organisations set out a proactive, lifecycle approach to managing chemicals of concern within sustainability and sustainable procurement policies, for example through a clear chemicals management plan. This can be achieved by including considerations on chemicals of concern in EEE into broader sustainability action and initiatives, such as initiatives on increasing circularity of products or sustainable procurement.
While some chemicals are covered by numerous multilateral environmental agreements and national legislation, there is still a large number of substances used in e-products, and their production, that potentially have a harmful impact and have not yet been addressed by regulatory action. These are highlighted in guidance referenced through this publication.

**Recommendation**

Policymakers should recognise chemicals of concern in the development of sustainability and procurement policies and procurers should be mandated to work with suppliers ahead of future legislation and take steps towards the specification of more sustainable, non-harmful products.

The guidance highlights a significant information gap between the manufacture of EEE products and their end-of-life treatment. This gap is also identified in the UNEP report on SAICM Options for Action for Policymakers which, *inter alia*, recommends:

- leveraging public procurement to include considerations on chemicals of concern into public procurement policies for EEE; and,
- addressing the data gap in "environmental and health hazards and risks of chemicals in EEE which account for currently prevalent practices and contexts of manufacturing and end-of-life handling, including informal recycling". Procurement plays a significant role in bridging this gap.

Where information on the impacts of products procured is either absent or uncertain the main procurement aim is to avoid the use of chemicals of concern in products, where possible.

**Recommendation**

Follow a precautionary approach, for example based on the waste hierarchy principles of avoidance and reduction first, in situations where information on hazards and impacts of chemicals on human health or the environment is incomplete or inadequate.
In terms of addressing the information gap, collaboration is a key aspect of managing chemicals as with other aspects of sustainability. It is not cost-effective or resource efficient for all knowledge to be developed within procurement teams, so making use of expertise outside of the organisation is desirable to bridge the gap.

**Recommendation**

Explore cooperation with regulatory authorities, policymakers, other procuring bodies, academia, industry (trade and professional bodies as well the wider EEE market) and civil society at regional and international level to build on existing knowledge and avoid duplication of efforts. Establishing platforms for dialogue and exchange on innovations for actors of the EEE value chain to facilitate sustainable procurement goals, for example, mainstreaming and upscaling of innovations supporting action on chemicals of concern in EEE.

Procurement can further address the information gap and improve the robustness of verification of CoC criteria in tenders by adopting another option noted by the UNEP report on SAICM Options for Action for Policymakers:

**Recommendation**

Promote the development and use of eco-labelling initiatives for EEE that consider the issue of CoC within their criteria.

Continual improvement within procurement should also extend to managing the impacts of procurement practices specifically relating to chemicals in products. This includes addressing chemicals of concern in a systematic way through the 5 clear steps linking product prioritisation to sustainable policy objectives and carrying this through to specifications in tendering and into contract management (Part B.2). The transition pathway is based on a commitment to continual improvement in managing CoCs within the procurement of e-products. This requires working with internal stakeholders as well as suppliers to improve performance, building knowledge around CoCs and their mitigation internally, and committing to continual improvement within sustainable public procurement (Part B.4).

**Recommendation**

Public sector organisations and their procurement functions adopt a clear approach to continuous improvement within chemicals management, for example through the adoption of the transition pathway set out in Part B.3.
Recommendations: Sustainable procurement of electronics

Regulatory action addressing CoC in EEE is an important driver of upstream action, increasing innovation and substitution of harmful chemicals in the sector. Evidence from procurement practice should be used to inform the development of procurement policy and also to influence wider policies to support the shift towards more circular models. This recognises the fact that chemicals of concern are part of a wider, complex role that sustainable procurement plays in delivering goods and services. It also recognises that policies should be integrated and not developed in silos, particularly with regards to encouraging a more circular and low carbon economy.

| Recommendation | Procurement practice should inform the development and implementation of regulation addressing chemicals of concern where it does not exist. Such regulations should include the development of national strategies and legislation with clear allocation of mandates and responsibility of public bodies and other actors involved. Where regulations exist, these should be reviewed regularly in light of procurement practice and strengthened to address CoC in EEE, including legal and institutional infrastructure, with sufficient government funding. |

These last four recommendations can be summarised by acknowledging the strategic role that procurement plays in meeting the needs for public goods and services that achieve value for money on a whole life basis. This would generate benefits not only to the organisation, but also to society and the economy, whilst minimising damage to the environment and delivering the UN Sustainable Development Goals.
Product Profiles

Sustainable Procurement of Electronics:
A Progressive Approach to Chemicals of Concern
PRODUCT PROFILES

1. Information & Communications Technology (ICT) 102
2. Electrical Equipment 104
3. Large and small appliances 106
4. Lighting 108
Part B.2 highlighted the four key procurement spend categories relating to electronic products. The following section contains summary profiles relating to these product groups:

- Information & Communications technology (ICT) related equipment and devices
- Electrical equipment
- Appliances (large and small) – note this includes medical & laboratory equipment highlighted in spend analysis as a key sub-group of e-products
- Lighting

The profiles bring together examples of products and relevant procurement codes in which they commonly occur. The profiles also summarise relevant national legislation (or MEAs at the international level) covering the group. Common components are listed with examples of potentially hazardous substances contained within them. These examples include but are not limited to chemicals of concern in order to flag the potential for some substances to cause harmful impacts to health and the environment if e-waste is not treated properly. If disposal of e-products is not considered at the procurement stage then improper treatment of e-waste and its consequences can become a risk to the procuring entity.

The profiles highlight that potentially hazardous substances may be present in a very broad range of e-products. These need to be considered when including relevant requirements and criteria in tenders as part of an integrated chemical management plan.
**Product Profile: Information & Communications Technology (ICT)**

### Example Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Example products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office &amp; computing</td>
<td>PCs, laptops, tablets, screens &amp; monitors, MFDs, data drives, printers, servers etc</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>receivers, transmitters, mobile phones etc</td>
</tr>
<tr>
<td>Audio Visual (AV)</td>
<td>televisions, screens, projectors, speakers, cameras etc</td>
</tr>
</tbody>
</table>

### Common Procurement Codes

<table>
<thead>
<tr>
<th>Spend categories</th>
<th>CPV Codes</th>
<th>UNSPSC</th>
<th>Main ISIC Codes</th>
<th>Description (but not limited to)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office &amp; computing</td>
<td>30X</td>
<td>43X</td>
<td>2620</td>
<td>Computers and peripheral equipment</td>
</tr>
<tr>
<td></td>
<td>31X</td>
<td>43X, 45X</td>
<td>2630</td>
<td>Communication equipment</td>
</tr>
<tr>
<td>Consumer electronic items</td>
<td>30X</td>
<td>43X</td>
<td>2640</td>
<td>TVs, television monitors and displays, CD &amp; DVD players, headphones, speakers etc</td>
</tr>
<tr>
<td>(all the above)</td>
<td>317121X</td>
<td>321X</td>
<td>2610</td>
<td>Electronic components, assemblies and boards</td>
</tr>
<tr>
<td>(all the above)</td>
<td>3161X, 4531</td>
<td>26120X</td>
<td>273</td>
<td>Wiring and wiring devices</td>
</tr>
<tr>
<td>(some of the above)</td>
<td>31158X, 31140X</td>
<td>261117</td>
<td>2720</td>
<td>Batteries and accumulators</td>
</tr>
</tbody>
</table>

### Related categories

#### Electronic Equipment

- **Batteries**

#### Relevant Regulations & examples

- **The Minamata Convention on Mercury (2017)**
- **The ILO Chemicals Convention (C. 170)**
- **RoHS (& RoHS type equivalents) – see examples Part A.7.1**
- **EU REACH – commonly referred to in global standards etc.**
- **European WEEE Regulation (Directive 2012/19/EU).**
- **European Portable batteries and accumulators containing cadmium Directive (Batteries Directive 2013/56/EU).**
There are many criteria examples relating to ICTs.

These typically cover:

- Supplier selection – for example, demonstrating implementation of a framework for the operation of restricted substance controls (RSCs) along the supply chain for the products to be supplied.
- Providing records of declarable substances
- Heavy metals (including mercury in lamps where relevant)
- Plasticisers including, but not limited to, phthalates
- Chlorine containing polymers in plastics parts
- Flame retardants in plastic parts and components, including but not limited to, chlorine, brominated and halogenated compounds.

See Part C.1.3, C.2.5 and C.3.1 specific examples.

Further information – see the Type 1 ecolabels listed above for additional detailed examples of available criteria.

Other CoC criteria to consider:

- Labour and human Rights (ILO) see for example Electronics Watch How to Protect Workers from Chemical Hazards in Electronics Supply Chains Guidance for Public Buyers V.1.0 (2020) for example criteria.
- Batteries, for example inclusion of heavy metals in built in batteries (e.g. EPEAT Environmental Leadership and Corporate Social Responsibility Assessment of Servers NSF/ANSI 426 - 2019) and plastics parts in battery chargers (e.g. Nordic Ecolabelling of Rechargeable batteries and portable chargers - Criteria Document - Version 5.1, 2018).
- Emission of hazardous substances in production. For example, mitigation and inventory of process fluorinated greenhouse gas emissions resulting from semiconductor, television and imaging equipment manufacturing (source: IEEE 1680.2a-2017 - IEEE Standard for Environmental Assessment of Imaging Equipment - Amendment 1).
- End-of-life processing requirements (WEEE recycling). This may also include dismantling and extraction of the pre-defined components from e-products.
- Recycling or reuse of toner material and/or plastics collected through a take-back programme.
- Packaging of products, e.g. recycled content and/or reuse and takeback options; and, inclusion of PVC and/or single-use plastic in packaging.
2. Product Profile: Electrical Equipment

Example Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Example products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical</td>
<td>imaging devices, monitoring devices, electro-medical equipment etc</td>
</tr>
<tr>
<td>Security</td>
<td>search, detection, surveillance, CCTV, access controls etc</td>
</tr>
<tr>
<td>Controls &amp; measuring</td>
<td>environmental Controls, process control units etc</td>
</tr>
</tbody>
</table>

Example products:
- Imaging devices, monitoring devices, electro-medical equipment etc
- Search, detection, surveillance, CCTV, access controls etc
- Environmental Controls, process control units etc

Common Procurement Codes

<table>
<thead>
<tr>
<th>Spend categories</th>
<th>CPV Codes</th>
<th>UNSPSC</th>
<th>Main ISIC Codes</th>
<th>Description (but not limited to)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Equipment</td>
<td>31X</td>
<td>32X; 39X; 56X</td>
<td>2710</td>
<td>Electrical machinery, apparatus, equipment, electric motors, generators, transformers and electricity distribution</td>
</tr>
<tr>
<td>Laboratory Equipment</td>
<td>38X</td>
<td>41X</td>
<td>2651</td>
<td>Measuring, testing, navigating and control equipment</td>
</tr>
<tr>
<td>Security &amp; controls</td>
<td>351X</td>
<td>4617X</td>
<td>2610; 2670; 2680; 2733; 2790; 2930</td>
<td>Security surveillance and detection, Safety and security systems, Security and Safety Equipment and Supplies</td>
</tr>
<tr>
<td>(all the above)</td>
<td>317121X</td>
<td>321X</td>
<td>2610</td>
<td>Electronic components, assemblies and boards etc</td>
</tr>
<tr>
<td>(all the above)</td>
<td>3161X, 4531</td>
<td>26120X</td>
<td>273</td>
<td>Wiring and wiring devices</td>
</tr>
<tr>
<td>(some of the above)</td>
<td>31158X, 31140X</td>
<td>261117</td>
<td>2720</td>
<td>Batteries and accumulators</td>
</tr>
</tbody>
</table>

Note that electrical equipment will also form part of many broader spend areas, e.g. construction and building maintenance, facilities management etc.

Common components

<table>
<thead>
<tr>
<th>Component</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing &amp; parts</td>
<td>Plasticisers, e.g. Phthalates (DEHP, DBP, BBP, DIBP and SCCP) in plastics</td>
</tr>
<tr>
<td></td>
<td>Flame retardants (e.g. PBB, PBDE, HBCDD and SCCP)</td>
</tr>
<tr>
<td>Printed Circuit Boards (PCBs)</td>
<td>Lead, Copper, Mercury, Chromium, Beryllium, Cadmium, May also contain brominated flame retardants</td>
</tr>
<tr>
<td>Control Processor Units (CPUs)</td>
<td>Lead, Nickel, Lithium, Cadmium, Mercury, Nickel metal hydride</td>
</tr>
<tr>
<td>Data storage</td>
<td>Lead, Cadmium, Mercury</td>
</tr>
<tr>
<td>Power supply units</td>
<td>Lead; May also contain flame retardants and plasticisers, e.g. ortho-phthalates</td>
</tr>
<tr>
<td>Batteries &amp; Accumulators</td>
<td>Mercury, Lead</td>
</tr>
<tr>
<td>Wiring</td>
<td></td>
</tr>
<tr>
<td>Lamps</td>
<td></td>
</tr>
</tbody>
</table>

Related categories

- ICT; Batteries; Lighting, Transportation and vehicles
  - The ILO Chemicals Convention (C. 170)
  - RoHS (& RoHS type equivalents) – see examples Part A.7.1

Relevant Regulations & examples

- EU REACH – commonly referred to in global standards etc.
Product Profile: Electrical Equipment (cont.d)

→ Consider CoCs in peripherals, accessories & batteries (internal and removable)
→ Within this category, WEEE regulations classify some of these products into:
→ Temperature exchange equipment
→ Small equipment (no external dimension more than 50 cm)

Example labels and standards

→ Type 1 ecolabels include: Blue Angel; China Environmental Labelling; GECA; Nordic Swan; TCO Certified; EPEAT;
→ IEC; CENELEC standards
→ ECMA: TR/370 The Eco Declaration* (Type 2 label)
→ Additional information

Example CoC criteria for electrical equipment:

There are many CoC related criteria relating to electrical equipment – as this is a broad category - and these overlap significantly with those targeting ICT products so cross reference in tenders for consistency.

Criteria typically cover:

→ Supplier selection – for example, demonstrating implementation of a framework for the operation of restricted substance controls (RSCs) along the supply chain for the products to be supplied.
→ Providing records of declarable substances
→ Heavy metals (including mercury in lamps where relevant)
→ Plasticisers including, but not limited to, phthalates. Includes the restricted use of plasticisers in cabling
→ Flame retardants in plastic parts and components, including but not limited to, chlorine, brominated and halogenated compounds.

See Part C.1.3, C.2.5 and C.3.1 for specific examples.

Further information – see the Type 1 ecolabels listed above for additional detailed examples of available criteria

Other CoC criteria to consider:

→ Labour and human Rights (ILO) see for example Electronics Watch How to Protect Workers from Chemical Hazards in Electronics Supply Chains Guidance for Public Buyers V. 1.0 (2020) for example criteria.
→ Batteries, for example inclusion of heavy metals in built in batteries (e.g. Japan Eco Mark Product Category No. 119 - “Personal Computers” - Version 3.1, revised 2020) and plastics parts in battery chargers (e.g. Nordic Ecolabelling of Rechargeable batteries and portable chargers - Criteria Document - Version 5.1, 2018).
→ Emission of hazardous substances in production. For example, mitigation and inventory of process fluorinated greenhouse gas emissions resulting from semiconductor, television and imaging equipment manufacturing (source: IEEE 1680.2a-2017 - IEEE Standard for Environmental Assessment of Imaging Equipment - Amendment 1).
→ Inclusion of coatings (e.g. paint, metal plating, biocidal etc) on equipment.
→ Refrigeration – inclusion of corrosion inhibitors, refrigerants and precipitation limits for metals in water-exposure components.
→ Discharge rates (e.g. TVOC, Benxene, Styrene, Ozone, Dust) for some equipment (e.g. multifunctional devices).
→ End-of-life processing requirements (WEEE recycling). This may also include dismantling and extraction of the pre-defined components from e-products.
→ Recycling or reuse of mercury lamps (where relevant) and/or plastics collected through a take-back programme.
→ Packaging of products, e.g. recycled content and/or reuse and takeback options; and, inclusion of PVC and/or single-use plastic in packaging.
3. Product Profile: Large and small appliances

Example Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Example products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature exchange equipment,</td>
<td>Refrigeration, vending machines, air conditioning, dehumidifiers, heat pumps,</td>
</tr>
<tr>
<td>Large Appliances</td>
<td>boilers and hot water heaters</td>
</tr>
<tr>
<td>Controls &amp; measuring</td>
<td>TVs, television monitors and displays, CD &amp; DVD players, speakers, vacuum cleaners,</td>
</tr>
<tr>
<td></td>
<td>Small equipment (external dimension &lt;50 cm)</td>
</tr>
</tbody>
</table>

Example Products

- **Temperature exchange equipment**: Refrigeration, vending machines, air conditioning, dehumidifiers, heat pumps, boilers and hot water heaters.
- **Large Appliances**: Kitchen & catering, cooking appliances, cleaning washing, drying equipment etc.
- **Controls & measuring**: TVs, television monitors and displays, CD & DVD players, speakers, vacuum cleaners, Small equipment (external dimension <50 cm).

Relevant Regulations & examples

- The ILO Chemicals Convention (C. 170)
- RoHS (& RoHS type equivalents) – see examples Part A.T.1
- EU REACH – commonly referred to in global standards etc.

Relevant Regulations & examples

- The ILO Chemicals Convention (C. 170)
- RoHS (& RoHS type equivalents) – see examples Part A.T.1
- EU REACH – commonly referred to in global standards etc.

Common Procurement Codes

<table>
<thead>
<tr>
<th>Spend categories</th>
<th>CPV Codes</th>
<th>UNSPSC</th>
<th>Main ISIC Codes</th>
<th>Description (but not limited to)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature exchange equipment</td>
<td>401X</td>
<td>425X</td>
<td>28X</td>
<td>Heat-exchange units, air-conditioning, refrigerating &amp; vending equipment, ventilation equipment</td>
</tr>
<tr>
<td></td>
<td>411X</td>
<td>4293X</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4811X</td>
<td>4462X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office &amp; computing</td>
<td>30X</td>
<td>43X</td>
<td>2620</td>
<td>Computers and peripheral equipment</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>31X</td>
<td>43X; 45X</td>
<td>2630</td>
<td>Communication equipment</td>
</tr>
<tr>
<td>Consumer electronic items</td>
<td>30X</td>
<td>43X</td>
<td>2640</td>
<td>TVs, television monitors and displays, CD &amp; DVD players, speakers, vacuum cleaners</td>
</tr>
<tr>
<td>Kitchen equipment, household &amp; domestic items &amp; catering</td>
<td>47X</td>
<td>3922X</td>
<td>2750</td>
<td>Domestic appliance, catering equipment etc</td>
</tr>
<tr>
<td></td>
<td>5214X</td>
<td>3931X</td>
<td>2790</td>
<td></td>
</tr>
<tr>
<td>(some of the above)</td>
<td>31158X, 31140X</td>
<td>261117</td>
<td>2720</td>
<td>Batteries and accumulators</td>
</tr>
</tbody>
</table>

Common components

<table>
<thead>
<tr>
<th>Component</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing &amp; parts</td>
<td>Plasticisers, e.g. Phthalates (DEHP, DBP, BBP, DIBP and SCCP) in plastics</td>
</tr>
<tr>
<td></td>
<td>Flame retardants (e.g. PBB, PBDE, HBCDD and SCCP)</td>
</tr>
<tr>
<td>Printed Circuit Boards (PCBs)</td>
<td>Lead, Copper, Mercury, Chromium, Beryllium, Cadmium, May also contain brominated flame retardants</td>
</tr>
<tr>
<td>Control Processor Units (CPUs)</td>
<td>Lead, Nickel, Lithium, Cadmium, Mercury, Nickel metal hydride</td>
</tr>
<tr>
<td>Power supply units</td>
<td>Lead, Cadmium, Mercury</td>
</tr>
<tr>
<td>Batteries &amp; Accumulators</td>
<td>Lead, May also contain flame retardants and plasticisers, e.g. ortho-phthalates</td>
</tr>
<tr>
<td>Wiring</td>
<td>Mercury, Lead</td>
</tr>
<tr>
<td>Lamps</td>
<td>Refrigerants containing ozone depleting substances (e.g. chlorines and halogens) May also contain flame retardants and ozone-depleting substances (ODS) used as blowing agent during production</td>
</tr>
<tr>
<td>Temperature exchange units</td>
<td></td>
</tr>
<tr>
<td>Insulation</td>
<td></td>
</tr>
</tbody>
</table>

Sustainable Procurement of Electronics: A Progressive Approach to Chemicals of Concern
Within this category, WEEE regulations classify products into
- Large equipment (dimension > 50 cm)
- Small equipment (dimension < 50 cm)

Criteria typically cover:
- Supplier selection – for example, demonstrating implementation of a framework for the operation of restricted substance controls (RSCs) along the supply chain for the products to be supplied.
- Providing records of declarable substances within products.
- Heavy metals (including mercury in lamps where relevant)
- Plastics including, but not limited to, phthalates. Includes the restricted use of plasticisers in cabling.
- Chlorine containing polymers in plastics parts.
- Flame retardants in plastic parts and components, including but not limited to, chlorine, brominated and halogenated compounds.
- Coatings of housing surfaces and anti-corrosion additives
- Refrigerants and HFCs used in products and production

See Part C 1.3, C.2.5 and C.3.1 for specific examples.

Further information – see the Type 1 ecolabels listed above for additional detailed examples of available criteria.

Example CoC criteria for electrical equipment:

As this is a broad category, there are many CoC related criteria that overlap with electrical equipment so cross reference in tenders for consistency.

Other CoC criteria to consider:
- Labour and human Rights (ILO) see for example Electronics Watch How to Protect Workers from Chemical Hazards in Electronics Supply Chains Guidance for Public Buyers V.1.0 (2020) for example criteria.
- Batteries, for example inclusion of heavy metals in built in batteries (e.g. EPEAT Environmental Leadership and Corporate Social Responsibility Assessment of Servers NSF/ANSI 426 - 2019) and plastics parts in battery chargers (e.g. Nordic Ecolabelling of Rechargeable batteries and portable chargers - Criteria Document - Version 5.1, 2018).
- Emission of hazardous substances in production. For example, mitigation and inventory of process fluorinated greenhouse gas emissions resulting from semiconductor, television and imaging equipment manufacturing (source: IEEE 1680.2a-2017 - IEEE Standard for Environmental Assessment of Imaging Equipment - Amendment 1).
- Inclusion of coatings (e.g. paint, metal plating, antibacterial or disinfectant surfaces, biocidal etc) on appliances.
- HFCs used as blowing agents in expanded polystyrene insulation boards, PU foams and PUR insulation elements.
- Refrigeration – inclusion of corrosion inhibitors, refrigerants and precipitation limits for metals in water-exposure components.
- Discharge rates (e.g. TVOC, Benxene, Styrene, Ozone, Dust) for relevant appliances.
- End-of-life processing requirements (WEEE recycling). This may also include dismantling and extraction of the pre-defined components from e-products.
- Recycling or reuse of plastics collected through a take-back programme.
- Packaging of products, e.g. recycled content and/or reuse and takeback options; and, inclusion of PVC and/or single-use plastic in packaging.
### Product Profile: Lighting

#### Example Categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Example products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamps</td>
<td>Straight (tube) fluorescent lamps, compact fluorescent and fluorescent lamps, high intensity discharge lamps, including sodium pressure and metal halide lamps, low pressure sodium lamps and LED lamps.</td>
</tr>
<tr>
<td>Lighting fixtures and equipment</td>
<td>Outdoor lighting, commercial and industrial lighting, indoor lighting, safety lighting etc</td>
</tr>
</tbody>
</table>

#### Common Procurement Codes

<table>
<thead>
<tr>
<th>Spend categories</th>
<th>CPV Codes</th>
<th>UNSPSC</th>
<th>Main ISIC Codes</th>
<th>Description (but not limited to)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric lighting equipment &amp; lamp</td>
<td>3150X, 3151X</td>
<td>391X</td>
<td>2740</td>
<td>Electric lighting equipment &amp; lamps</td>
</tr>
<tr>
<td>Outdoor lighting</td>
<td>439285X</td>
<td>391X</td>
<td>2740</td>
<td>Street lighting equipment, traffic lights, navigation lighting</td>
</tr>
<tr>
<td>Industrial lighting</td>
<td>31X</td>
<td>391X</td>
<td>2740</td>
<td>Indoor commercial and industrial lighting</td>
</tr>
<tr>
<td>Indoor lighting</td>
<td>3150X</td>
<td>391X</td>
<td>2740</td>
<td>Lighting fixtures and accessories</td>
</tr>
<tr>
<td>(some of the above)</td>
<td>3161X</td>
<td>4531</td>
<td>26120X</td>
<td>273</td>
</tr>
</tbody>
</table>

Note that electrical equipment will also form part of many broader spend areas, e.g. construction and building maintenance, facilities management etc.

### Example Categories

<table>
<thead>
<tr>
<th>Component</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing &amp; parts</td>
<td>Plasticisers, e.g. Phthalates (DEHP, DBP, BBP, DIBP and SCCP) in plastics</td>
</tr>
<tr>
<td>Printed Circuit Boards (PCBs)</td>
<td>Flame retardants (e.g. PBB, PBDE, HBCDD and SCCP)</td>
</tr>
<tr>
<td>Power supply units</td>
<td>Lead, Copper, Mercury, Chromium, Beryllium, Cadmium, May also contain brominated flame retardants</td>
</tr>
<tr>
<td>Wiring</td>
<td>Lead, Nickel, Lithium, Cadmium, Mercury, Nickel metal hydride</td>
</tr>
<tr>
<td>Lamps</td>
<td>Lead, May also contain flame retardants and plasticisers, e.g. ortho-phthalates</td>
</tr>
</tbody>
</table>

### Related categories

- Office & computing, Telecommunications, Audio Visual, Consumer electronic items, Construction and maintenance, Transportation & vehicles

### Relevant Regulations & examples

- The ILO Chemicals Convention (C. 170)
- RoHS (& RoHS type equivalents) – see examples Part A.7.1
- EU REACH – commonly referred to in global standards etc.
Cross reference with criteria in tenders relating to electrical equipment and those targeting ICT products such as Multi Functional Devices for consistency.

Criteria typically cover:

- Supplier selection – for example, demonstrating implementation of a framework for the operation of restricted substance controls (RSCs) along the supply chain for the products to be supplied.
- Providing records of declarable substances within products.
- Heavy metals - especially mercury in lamps where relevant. Also in LED lamps and components.
- Plasticisers including, but not limited to, phthalates. Includes the restricted use of plasticisers in cabling.
- Chlorine containing polymers in plastics parts.
- Flame retardants in plastic parts and components, including but not limited to, chlorine, brominated and halogenated compounds.
- Coatings of housing surfaces and anti-corrosion additives.
- Metal Halide Lamps containing thorium-232 (232Th) and krypton-85 (85Kr).

See Part C.1.3, C.2.5 and C.3.1 for specific examples.

Further information – see the Type 1 ecolabels listed above for additional detailed examples of available criteria.

Example CoC criteria for ICT:

Other CoC criteria to consider:

- Labour and human Rights (ILO) see for example Electronics Watch How to Protect Workers from Chemical Hazards in Electronics Supply Chains Guidance for Public Buyers V. 1.0 (2020) for example criteria.
- Batteries where relevant. For example in battery chargers (e.g. Nordic Ecolabelling of Rechargeable batteries and portable chargers - Criteria Document - Version 5.1, 2018).
- Emission of hazardous substances in production. For example, mitigation and inventory of process fluorinated greenhouse gas emissions resulting from semiconductor, television and imaging equipment manufacturing (source: IEEE 1680.2a-2017 - IEEE Standard for Environmental Assessment of Imaging Equipment - Amendment 1).
- Inclusion of coatings (e.g. paint, metal plating, etc) on luminaires.
- Discharge rates (e.g. TVOC, Benzene, Ozone, Dust etc) for relevant lighting equipment and accessories.
- End-of-life processing requirements (WEEE recycling). This may also include dismantling and extraction of the pre-defined components from lighting products and lamps.
- Recycling or reuse of mercury lamps (where relevant) through a take-back programme.
- Packaging of products, e.g. recycled content and/or reuse and takeback options; and, inclusion of PVC and/or single-use plastic in packaging.
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