Chemicals in Products

An overview of systems for providing information regarding chemicals in products and of stakeholders' needs for such information.

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Executive Summary

Information on chemicals in products/articles[1] has gained increasing attention in recent years. The reasons are several and include new legal requirements, changes in consumer interests, increased attention to product safety and control, opportunities for substitution of hazardous substances, demands for instruction for proper use, and impacts associated with end-of-life handling. It is clear that the expressed interest for information vary between product groups and stakeholder groups, as well as between different countries and regions, but the attention is growing and spreading, not least due to increasingly globalised production systems and an increased awareness of potential risks related to human health and the environment. However, the knowledge on what specific information regarding chemicals in products that is demanded, by what actor groups, and how such information potentially is communicated in order to meet the information needs is still relatively weak.

This report was prepared under direction of Agneta Sundén and Kevin Munn of United Nations Environment Programme (UNEP), Chemicals Branch, Division of Technology, Industry and Economics (DTIE), and is part of the efforts of the international policy framework "Strategic Approach to International Chemicals Management" (SAICM) to address "*that information on chemicals throughout their life cycle, including, where appropriate, chemicals in products, is available, accessible, user-friendly, adequate and appropriate to the needs of all stakeholders*" with the aim to "*improve the availability of and access to information on chemicals in products in the supply chain and throughout their life cycle*"(SAICM).

The aim of the report is to present an overview of stakeholder needs for information regarding chemicals in products (CiP), of existing systems for information provision of CiP information and to identify gaps between the identified needs and the information that is accessible.

The intention is that this report should serve as a background document for decisions and contributing to further investigations and initiatives aiming for bridging gaps between information demand and information available.

Systems for provision of CiP information were primarily identified through a survey distributed to the SAICM focal points, questions to professional networks, and stakeholder interviews. The stakeholder groups that demand/ may demand information on chemicals in products were identified through three paths; a) literature and reports on the issue, b) the targets groups of identified information systems for CiP, and c) consultations and interviews with associations representing industries and other stakeholders, and NGOs. The needs for information were summarized for the different actors and stakeholders. These summaries were compared in the gap analysis with the relevant existing information systems pertaining to information on chemicals in products.

Systems for provision of CiP information

Numerous systems for provision of CiP information were identified. In the report 22 examples of different types of systems are categorized and described. The different systems were categorized from an actor – chain perspective. The rational is to illustrate the different kinds of systems and their potential merits as prototypes for generic systems collecting, conveying and providing upstream information to downstream actors. The systems are described in four different categories according to extent or product chain coverage:

- Systems for inter-chain information exchange;
- Systems for producer – consumer/customer information;
- Systems for information from producer to end-of-life actors;

[1] The product concept is in this study defined as articles, goods, items and products that are not defined as chemical products, blends and mixes thereof, or preparations (see Report section "Terms and Definitions").

- Systems for information from external stakeholders to consumers/customers and the general public.

Only a few of the systems explicitly aim to convey CiP information from actor to actor throughout supply chains. Their apparent strength is the supply chain coverage. Consumers and/or EoL actors are rarely automatically connected to the information but can be given access to it. These systems are often systematized and organized with well established rules of information provision, storage and formats of data handling. Two prominent examples are the International Material Data System (IMDS) in the automotive sector and the IPC 1752 standards for producers of electrical and electronic appliances.

The systems for producer – consumer/customer information are characterized by producers providing information to concerned consumers/customers. These systems have more limited chain coverage compared to the previous category though the producers can have their own systems for the collection of necessary upstream information. This category is more diverse and covers systems such as Öko-Tex, Electronic Product Environmental Assessment Tool (EPEAT), and California's Proposition 65 – Safe Drinking Water and Toxic Enforcement Act.

Systems for CiP information from producer to end-of-life actors provide easy to use information from producers of components and final products to the EoL actors. In most cases, the information consist of symbols or short messages on for instance content of specified heavy metals in batteries or hazardous substances in electronic components indicating special treatment or that the products should be kept separate from the ordinary product flow.

Some external stakeholders, primarily NGOs and private organisations, collect and present CiP information to consumers/customers and the general public. These organisations have affiliated expert panels that gather and evaluate information and in some cases also test laboratories for actual measurements on the products. Most examples of this category, for instance Healthy Stuff and the GoodGuide, address typical consumer products. The Pharos project for building material is an example of such a system directed to professional customers.

Stakeholder needs for CiP information

A wide range of stakeholder groups across the globe recognise the presence of chemicals in products as an issue of concern and that they need (more) information regarding chemicals in products. The underlying argument for this need is the recognition that products are vehicles through which chemicals travel through our societies. When these chemicals have hazardous properties they may cause harm in relation to product safety for the consumer/user, environmental protection with respect to impacts caused through out the products life cycle, and occupational health and safety for people handling or using the product in their work, in production and distribution, at the point of sale and in the EoL management of products.

It is clear that stakeholders in developing as well as in developed countries perceive a need for CiP information. Irrespective of the geographical perspectives, stakeholders with an expressed interest in CiP information can be found among actors that operate along the product chain, such as actors involved in production, distribution and sale, consumers and end-of life actors. However, stakeholders can also be found among actors that have an interest in CiP information even though they are not directly handling the product at any phase of the product's life cycle. This second broad group of stakeholders include, e.g. policy makers, a wide range of government agencies, and NGOs.

Different stakeholders providing input to this report have identified a range of different types of information that they perceive as useful for the purpose of addressing the issue of chemicals in products including:

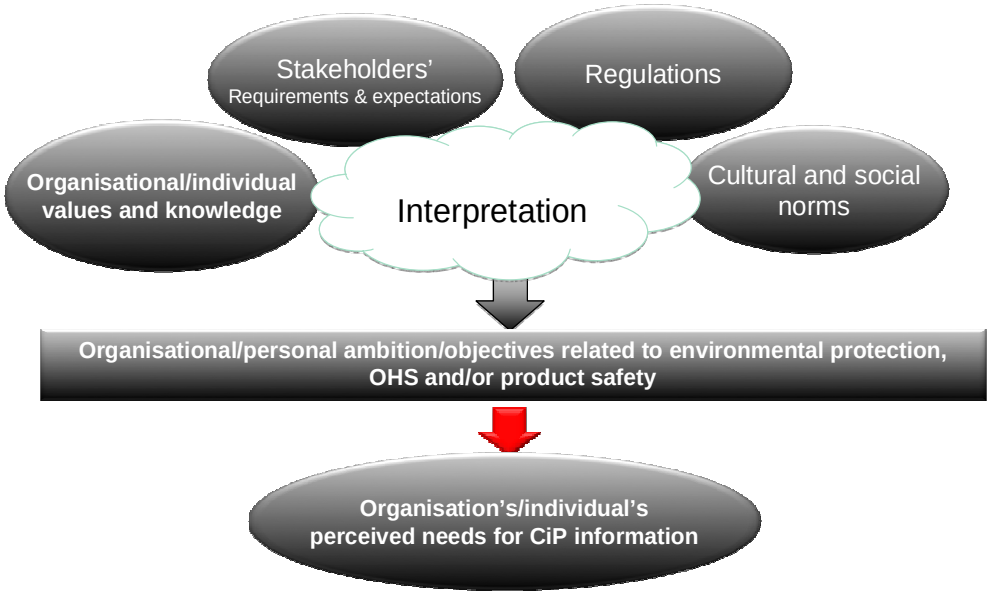
Producer related information to enable traceability of products and information, but also to ensure an ability to monitor and enforce compliance with customer requirements, regulations and liability.

Supply chain related information, related to the structure and details of companies involved in supplying input materials, components or products to the company or organization responsible for placing the product on a defined market.

Chemicals related information including the content of chemicals (*generic* and *trade names,* as well as *CAS numbers*) in the product and any potential hazards and risks associated with this content. Here we find some stakeholders expressing a need for information regarding all chemicals but also stakeholders limiting their need to information regarding chemicals of concern. Less frequently, but also expressed is a need for information regarding the *weight* or the *percentage* of the chemical makeup in the products.

Information needs regarding precautions for safe use/handling and disposal including a) safe use and storage of products, b) instructions on what to do in case of accident, exposure or injury, and c) recycling, remanufacturing and reuse information, including producer take-back schemes.

While these types of generic categories of desired CiP related information can be identified is it important to recognize that product chains and actor interconnections are often complex structures, and individual organisations or individuals within each stakeholder category may not necessary share the same idea of what type of information they need. The perception of information needs will be coloured by the specific context in which each actor is operating, but also by their internally held norms and their understanding of the problems and risks that may be associated with chemicals in products, as illustrated in the figure below.



Gaps

It is clear that there is a perceived stakeholder need for more information regarding the chemical content of products than what is currently accessible. It's also likely that there is a reasonably significant group of stakeholders who may not *perceive* a need for CiP information, but who would arguably benefit from having such information if it was presented in a format that would enable them to make decisions that would be beneficial to individuals' health and/or to the environment.

Stakeholders with an interest in CiP information include product chain actors (from cradle to grave/cradle) as well as actors outside the chain. The group of stakeholders is tremendously

heterogeneous in all respects; including resources, skills, priorities, and values of the individual or organisation, as well as the cultural, social, environmental and regulatory contexts in which they operate.

Another important element to consider is the different levels of relevant expertise or knowledge that different stakeholders possess. To the expert, information regarding chemical content may be very useful, but to the layman this information may not be helpful at all unless it is interpreted and translated into a language he can understand, e.g. what does this mean in terms of whether the product is safe or harmful. We have established that CiP information can be required for many different purposes and is used by people of very differing levels of chemical expertise. To enable non-experts to interpret the information regarding chemical content, information regarding hazards and risks are desired and, associated with this, information regarding precautions for safe use/handling and disposal. In addition, a significant number of respondents have indicated that they want information that enables them to trace the product upstream.

In this study we have found several systems providing some sort of CiP related information, however, there are only a few systems that are broadly adopted and convey comprehensive information along several tiers of the product chain, most notably the IMDS and the systems following the IPC 1752 standard for specific industry sectors. There are also plenty of initiatives that provide limited/narrowly defined CiP information, e.g. information regarding the content of one or a few particular substances of concern, as well as systems that provide one-way information from one sender to a specific stakeholder group, such as NGO or government initiatives for providing information for consumers.

While most of the initiatives to develop and establish specific CiP information systems and information exchange, identified in this study, originate in Japan, North America and Europe. More such information is also available to stakeholders in these countries. This does *not* however mean that stakeholders in other regions don't perceive a need for CIP information. On the contrary, the SAICM survey shows that CiP information and associated capacity-building is requested in other regions.

When going over the list of identified systems it becomes apparent that some form of system for provision of CiP information exists in practically all sectors/product groups. However, an overview like this one can be deceptive as most of these systems are limited in terms of who they reach and/or in terms of the information that they carry. Even in cases where systems are in place some stakeholders have expressed a content related gap. Stakeholder may, for instance, want information regarding more substances than what is currently declared through the system. Moreover, stakeholders want guidance with regards to how to interpret and make use of the provided information. There are stakeholders that claim they do not only need to know what substances a product contains but also the level of migration from the product during use and/or the end-of-life phase.

Closing the gap

While it is possible to find common ground regarding the need for information and general principles with respect to the nature of information that a system is desired to deliver, it is clear that a CiP system can not be built on consensus regarding general directions. The development of a CiP system requires decisions regarding detailed specifications related to several issues such as what type of information that should be conveyed, format for the information exchange and technical platforms, among other things. Further aspects to consider for a CiP system are its user friendliness, harmonization, and appropriateness for the needs of different types of stakeholders.

It appears that the challenge faced by anyone who seeks (or should be encouraged) to make a decision taking into account the impacts of chemicals in products is two fold:

- The first challenge is to know what substances are present in the product or able to migrate from it.

- The second challenge is to interpret and evaluate the information to serve one's purpose.

To reflect these challenges, CiP information systems need to contain components of information and knowledge in two distinct tiers:

- Tier 1: Information on what chemicals there are in the product, and possibly also what chemicals that can migrate from the product in which life cycle phase of the product;
- Tier 2: Information on/interpretation of what the chemical content means, how this should be evaluated and, sometimes, instructions for actions.

While tier 1 information is constant (unless the specific product, for which the information applies, is modified in any way that changes the chemical content), tier 2 information may change as our understanding of environmental and health related impacts associated with distinct chemical substances and/or "cocktails" of chemical substances, evolve. Tier 2 information is also, to a certain extent, subject to value judgements, e.g. as different stakeholders may have different opinions regarding to what extent the precautionary principle should be applied when evaluating the hazards and risks associated with chemicals. In addition to the evolving nature of information it is also clear that the format and content of tier 2 information will need to be adjusted to different receivers of the information. In light of this we argue for a CiP information system that harmonize the tier 1 information and that this information should be supplemented with the tier 2 kind of information as tailored support functions to be adjusted and harmonized by and for certain stakeholder groups/sectors sharing similar needs.

In the report, we outline fundamental decisions and measures to be addressed for the development of a potential future CiP information system. These decisions and measures regard chemical disclosure of the system, rules and principles, information access and ownership, control and verification, sanctions, and legal status along with practical issues, such as information format and technical platform.

We also conclude that policy-makers have several crucial roles in order to devise incentives for producers and other chain actors to participate in designing and using CiP systems, and to facilitate further development of such systems to match evolving needs and requirements. One such role and intervention may contain defining and shaping requirements on producers to take on the responsibility for building up a solid knowledge base on the chemical composition of their products, for instance through further use of extended producer responsibility (EPR).

Finally, we would underline that prevention at source reduce or eliminate problems further downstream. The implementation of CiP information systems that enable downstream actors to factor in the content of chemicals (of concern) in their buying decisions will enable policy makers to harness the forces of the market to contribute to put pressure on the upstream chemical industry.

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1. Introduction

1.1 Background

Information on chemicals in products/articles has gained increasing attention in resent years. The reasons are several, such as legal requirements, consumer interests, product safety and control, opportunities for substitution of hazardous substances, user restrictions and end-of-life handling. It is clear that the interest and need for such information vary among product systems, stakeholders, parts of supply chains as well as countries and regions, but the attention is growing and spreading, not least due to globalised production systems and increased awareness of potential risks related to human health and the environment. However, the knowledge on what specific information on chemicals in products that is demanded, by what actor groups, and how such information potentially is communicated in order to meet the information needs is still weak. Most documented experiences appear to originate from industrialized regions.

In February 2009, UNEP Chemicals Branch and the Government of Sweden organized an Informal Workshop on Stakeholders' Information Needs on Chemicals in Articles/Products. In her opening speech, Ms. Forsberg expressed that "the overall aim of the workshop was to improve industry and consumer conditions to make more informed decisions when choosing and using articles". The workshop was a concrete step towards better information on chemicals in articles. Historically it had been difficult to obtain such information but there was increasing interest to obtain articles that did not contain chemicals that might have negative consequences to the manufacturers, or that might harm consumers or those involved in disposal. She said that in chemical products the whole function was linked to the chemical composition of the products, whereas the functions of articles are mainly linked to their shape and design.

The international policy framework "Strategic Approach to International Chemicals Management" (SAICM) was formed with the aim of promoting chemical safety and safe management of chemical globally. The second International Conference on Chemicals Management (ICCM2) in May 2009 adopted the resolution II/4 on emerging policy issues. It recalled the SAICM Overarching Policy Strategy goal "that information on chemicals throughout their life cycle, including, where appropriate, chemicals in products, is available, accessible, user-friendly, adequate and appropriate to the needs of all stakeholders" and agreed to "improve the availability of and access to information on chemicals in products in the supply chain and throughout their life cycle". The examples of "products and articles" presented in the background documents were not of the nature of chemical products. A project was implemented to:

> (a) Collect and review existing information on information systems pertaining to chemicals in products including but not limited to regulations, standards and industry practices;
>
> (b) Assess that information in relation to the needs of all relevant stakeholders and identify gaps;
>
> (c) Develop specific recommendations for actions to promote implementation of the Strategic Approach with regard to such information, incorporating identified priorities and access and delivery mechanisms.

UNEP was invited to report on the project to the Open-Ended Working Group of SAICM and to ICCM3 in mid 2012 for possible decision on cooperative actions.

1.2 Aim and objectives

The aim of this report is to conduct an international screening and overview of systems for information provision of chemicals in products (goods/articles)[2] and to describe stakeholders needs for such information. The objective is to describe what supply chain actors and other stakeholders in the product life-cycle require information on chemicals in products, what information systems for chemical in product information exchange exist, what kinds of information stakeholders need and gaps in accessing this information, and the (potentially) corresponding information provision systems in terms of their purposes, functions, quality assurance, interpretation guidance and clients.

The information systems are expected to be designed to meet information needs and demands among stakeholders. Thus, this part of the study was expected to contribute to the search for both the actor groups requesting information on chemicals in products as well as in what global product chains/product groups the information providing actors that handle raw materials, components and products and/or substances are to be found. The intention was to describe the needs and demands of information about chemicals in products, as well as how the information is provided, and the actors' views on suitable information provision systems. A directed study on certain product groups and stakeholders in selected regions was conducted after scoping consultations with UNEP Chemicals Branch.

Finally, a gap analysis between information needs and information provision was conducted.

The intention is to present and discuss the core issues of the focus area and thus providing a background document for decisions and contributing to further investigations and initiatives aiming for bridging gaps between information demand and information available.

1.3 Method and approaches

In the following section, short introductions are given to the methods and approaches employed. The working methods and measures are further outlined under each section and area of research. An international survey among the SAICM Focal Points for background information was conducted by UNEP.

1.3.1 The SAICM survey

One important source of information was a survey designed by UNEP Chemicals Branch with the aim of collecting international experiences on what stakeholders need information on chemicals in products, in what product groups that kind of information should be prioritized, and compile examples of systems for provision of information pertaining to chemicals in products.

The survey period was October and November 2009. The survey was distributed to the 247 SAICM Focal Points, the steering group and some NGOs by e-mail. The respondents were encouraged to collect information from other actors in his/her region/country. Thus, the survey is extensive with a full global spread and directed to responsible policy-makers and stakeholder organisations for the issues in many countries. The survey approach is thus more expert-oriented than systematic. A total of 43 filled out forms were returned by the end of the survey period. The findings are compiled and reported in Becker (2009). Later, additional forms were returned but not included in the summary of the survey.

1.3.2 Identification of information systems for chemicals in products

Systems for provision of CiP information were primarily identified through the SAICM focal point survey, questions to professional networks, stakeholder interviews and through using the answers with a snowballing technique.

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[2] The product concept is in this study defined as articles, goods, items and products that are not defined as chemical products, blends and mixes thereof, or preparations (see section Terms and definitions).

The systems indicated in the survey were examined from web sites of the systems, literature, industry representatives and contacts with local professionals.

Through-out the project, a trade-off discussion has occurred regarding whether to expand the search to also include systems that are designed to provide information to stakeholders outside the supply chain, such as government agencies, customs etc. Since government is a critical stakeholder in this context, it is, arguably, relevant to also consider lessons drawn from systems designed by/for government agencies for the provision of information regarding chemicals in products even though these may not entail a function which forwards such information along the supply chain.

Experiences gained through the course of the project also suggested that it is relevant to look for, and if not found, at least discuss, systems that provides complete information about the content of chemicals, so called "positive lists". We know that there are companies considering using this approach rather than approaches limiting or specifying the information content.

1.3.3 Identification of stakeholders

The stakeholders and stakeholder groups that demand/need/may need information on chemicals in products were identified through three paths; a) literature and reports on the issue, b) the targets groups of the previously identified information systems for CiP, and c) consultations and interviews with associations representing industries and other stakeholders along product chains of selected product groups and NGOs. The intention was to start with a bird's eye perspective and go towards individual companies/governments/other actors.

Information was gathered from web sites, documents, e-mail correspondence and personal semi-structured interviews.

1.3.4 Gap analysis

The needs for information were summarized for the different actors and stakeholders as well as product chains and groups. These summaries were compared with the relevant existing information systems pertaining to information on chemicals in products.

1.3.5 Scope and limitations

The project intends to provide an international overview of existing systems for the provision of information on chemicals in products and stakeholders' needs for such information in an exploratory approach. The approach built on literature searches, interviews and inputs from the SAICM survey. Due to the explorative methodological approach (in contrast to systematic search) may not all existing information systems or all stakeholders needs been covered.

Further, the definitions of concepts, such as information system, stakeholders in the targeted product chains elaborated in section 1.4 below were also used as limitations.

1.4 Terms and definitions

1.4.1 Stakeholder

In this study, the stakeholders include the suppliers and producers in the product chains for the specified product groups, their interest organisations, the trade handling the products, and actors in the end-of-life (EoL) handling including recyclers and final treatment. Investors and insurers were considered as important stakeholders to the firms.

Consumers and the public were represented by consumer and environmental NGOs. Interest organisations and NGOs do necessarily not share views with all actors they are supposed or intended to represent. In case of consumers and the general public, deviating views and opinions may be substantial

and changing over time. Yet, these organisations can serve as proxies for views and opinions of their members.

Other considered stakeholders were policy makers, enforcing agencies, and labelling and certification schemes.

1.4.2 Information needs

The information need on chemicals in products is considered as relevant information that the stakeholders require/consider important to access in order to meet own or others' demands and expectations for the protection from risks to human health and the environment, including:

- occupational health and safety in the production, handling and end-of-life management;
- product safety in the use phase;
- environmental protection throughout the product life cycle.

Thus, the stakeholders define what kind of information is needed but does not include information requirements for other purposes, such as trade barriers and manufacturers' confidentiality that otherwise may be the case.

1.4.3 Products/articles

There is no universally agreed definition of what is a product, in particular the boundary between chemical products and "non-chemical" products (articles). Within the EU this definition has been agreed upon within the REACH regulation where the key distinguishing factor is whether or not the function of the product primarily is delivered by the content of chemical composition or by its shape and design: *Article means an object which during production is given a special shape, surface or design which determines its function to a greater degree than its chemical composition (REACH Article 3(3)).*[3] Other definitions, for instance the one proposed by the Japanese Joint Article Management Promotion-consortium (JAMP), align with the REACH definition "*The term 'article' refers to an object to which a particular shape, appearance or design that determines the function of the end-use to a degree larger than what is performed by the chemical composition was given during manufacture*".[4]

In Resolution II/4 from the ICCM2 conference regarding the project on Chemicals in Products the conference recommends that: *proposals for cooperative actions should take into account the Globally Harmonized System of Classification and Labelling of Chemicals and avoid any duplication of efforts under that system.(SAICM and UNEP 2009, p.35)*

The scope of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS), is defined as follows: *The GHS applies to pure substances and their dilute solutions and to mixtures. "Articles" as defined in the Hazard Communication Standard (29CFR 1910.1200) of the Occupational Safety and Health Administration of the United States of America, or by similar definition, are outside the scope of the system.(United Nations 2009, p.18)*

The Hazard Communication Standard (29CFR 1910.1200) of the Occupational Safety and Health Administration of the United States of America defines an article as a: *manufactured item other than a fluid or a particle (i) which is formed to a specific shape or design during manufacture (ii) which has end use function(s) dependent in whole or in parts upon its shape or design during end use: and (iii) which under normal conditions of use does not release more than very small quantities, e.g., minute or trace amounts of a hazardous chemical (as determined under paragraph (d) of this section), and does not pose a physical hazard or health risk to employees.(OSHA)*

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[3] ECHA (2008) Guidance on requirements for substances in articles: Guidance for the implementation of REACH. [http://guidance.echa.europa.eu/docs/guidance_document/articles_en.pdf]

[4] Joint Article Management Promotion (JAMP) [http://www.jamp-info.com/english/faq/etc/what-is-the-definition-of-article]

In this report we have therefore followed the definition for an article proposed under the European REACH regulation, and thus excluded from our focus chemical products. One exception made is that we have included in our overview of systems, systems which also provide information regarding "cosmetics and personal care products".

1.4.4 System for provision of information on chemicals in products

Any type of systematic information transfer that is formalized and recurring that provides information regarding:

- relevant chemicals contained in products/articles;
- health and/or environmental performance of a product/article based at least in part on chemical content (in contrast to for instance energy use, resource depletion);
- any or all chemicals in products/articles, potentially together with a tool or guidelines for the interpretation of the information.

2. Information systems pertaining to chemicals in products

In the following chapter, we provide the reader with an overview of the bulk of identified CiP systems along with a discussion regarding how these may be categorized. The aim is to give the reader an overview of the different kinds of systems, short descriptions of similarities and differences in relation to actors involved, purposes and information conveyed. In addition we provide a more detailed description and analysis of two particular systems, *International Material Data System (IMDS)* used in the automotive industry, and *the IPC 1752 standard* which is a standardized material forms and electronic data exchange formats for the electronics industry. We chose to describe these systems more in detail since these were the most prominent information systems that were open to a broad range of individual actors and provides CiP information along several tiers of the product chain.

2.1 Methods for identifying relevant information systems

The kinds of information systems addressed in this study are not clearly defined. In order to follow the explorative intention of the task, the following interpretation of the concept was developed for the information system search: any type of systematic or structured information transfer between actors in the supply-chain that is formalized and recurring, designed to enable information about chemicals in products (articles) to travel downstream along the supply-chain from sellers to buyers. Such systems may be tailored for certain companies, initiated by industry sectors, authorities, etc.

The interpretation was used as guide, in particular in the searches conducted before the completion of the SAICM survey and later to prioritise among the systems and exclude information systems aimed for other purposes.

The search for information systems pertaining to chemical in the products/articles followed two main paths:

- Conventional information search through: Google searches, academic literature, central industry associations and standardised letter with request for information to global network of contacts in industry as well as governmental and non governmental organisations. A snow-balling technique was employed to identify additional informants.
- The international SAICM Focal Point survey. The systems reported through the survey were scrutinized and, in questionable cases, checked through the web sites of the systems and contacts with local experts.

A literature search on existing systematic transfer och exchange of information on chemicals in products demonstrated an apparent emphasis on Japanese, European and North American examples. In general, very little is reported from other regions. However, the geographical imbalance found in the literature should not be interpreted as such systems are fully implemented in the developed regions and absent in developing regions. There are substantial differences both between industrial sectors and the uptake and implementation among individual actors in each region. The differences could be explained by differences in (perceived) drivers and pressures, stakeholder capacities and priorities, etc. Even though most identified information systems originate in developed countries, also producers and suppliers in developing countries are influenced by them since they are parts of global product chains. In addition, initiatives like information requirements tend to spread, copied or inspiring similar domestic initiatives. Thus these systems may constitute interesting examples regardless geographical region, sector or actor group.

Information systems directly targeting chemical products, hazardous substances, pesticides, etc. have been omitted due to the special conditions and regulatory frameworks that mainly control these systems. In addition, in most cases, they only cover the first steps (typically chemical producer – substance users) of the product chains.

2.2 Categorizing CiP systems

Several systems were found and reported in interviews, literature and industry sources. The survey alone reported numerous systems. It should, though, be noted that not all of the reported and found systems were operational or addressing chemicals or products (as in the context of this study) and thus disregarded in the subsequent clustering. Some of the reported references addressed information needs as consequences of the implementation of various laws and directives.

The systems can be categorized in several ways. In this report, an actor – chain perspective was chosen since that corresponds to the scope of the study. The rational is to illustrate the different kinds of systems and their potential merits as prototypes for generic systems collecting, conveying and providing upstream information to downstream product chain actors. Moreover, the typology also provides insights in perceived needs for (kinds of) information directed to certain stakeholders.

The actor – chain perspective is described from the point of information sender and receivers, which could be few or several actors along the product chain, for instance in the supply chain, producer to customer, producers to end-of-life actors. The sending actors could also be actors in the chains and the receivers are outside the chain or the other way around from outside actors to the chain.

Some alternative starting points for categorization of information systems are listed below. These were however considered less suitable for the overall aim of the study but may serve as input for different kinds of analyses.

- Type of organisation initiating the system: government, individual companies, sector or private organisations, NGOs, etc. From the initiators we can further group the systems from their purposes, who is in need of information, influential strength by individual actors, etc.

- Nature of participation in the system: mandatory or voluntary participation may put different expectations on the systems in terms of coverage, contribution, and information needs.

- Availability of data: does the system present publicly available data or do the participants provide also secret information with limited access (proprietary data).

- Chemical scope: has the system a narrow scope including just a few defined chemicals/substances, describing certain properties of included chemicals/substances or "negative lists" – what the product does NOT contain, or including virtually all added chemicals/substances in what we mention as "positive lists" – what the product does contain.

- Nature of use of the information: if the system is proactive in terms of providing information in order to ensure that the appointed chemicals/substances do not end up in the products (or used in the manufacturing processes). The reactive use of the information is when the information is provided as warning to consumers to buy certain products containing appointed chemicals/substances.

2.3 CiP systems - a typology based on an actor – chain perspective

As indicated in the short description above, different sub-categories could be identified within each category. In the following section, different kinds of product chain actor coverage are further described as sub-categories. The suggested sub-categories of information systems are:

- Systems for inter-chain information exchange;

- Systems for producer – consumer/customer information;

- Systems for information from producer to end-of-life actors;

- Systems for information from external stakeholders to consumers/customers and the general public;

After the descriptive sections, comprehensive information on selected CiP systems is presented in tables 2.1 – 2.4 in order to provide examples for each sub-category.

2.3.1 Inter-chain information

The systems in this category are characterized by a structure where a few to several actors along supply-chains are connected and feed in information into the system in a stepwise process and thus aggregating the information to the next level, which in turn feed in information to the following actors. The coverage could be the supply chains only (down to final product manufacturers) but may stretch further including virtually all product chain actors.

These systems are often systematized and organized with well established rules of information provision, storage and formats of data handling.

The rationale for information supply and exchange tend to be external pressures such as legal requirements (such as ELV, RoHS), securing product safety, supply chain responsibility, etc. There are typically strong actor groups in the chains that can take on the responsibility to both enforce the information provision from other actors and organize the information flow.

The aim is primarily to safeguard exclusion or control of listed substances – both in components and products per se and in the manufacturing processes – in order to provide relevant information to downstream actors, traceability, identify critical components in product systems, and initiate substitution. The information can thus be both considerable in amount and complexity, which entails a certain level of competence among the participating actors.

Some individual companies manage their own systems operating in similar manner. We have however excluded them in this report since these private systems are designed and used by individual companies.

Some examples of Intra-chain systems are described in Table 2.1. The IMDS and IPC 1752 are further described in detail in sections 2.4 and 2.5

Table 2.1 Examples of inter-chain information systems.

International Material Data System (IMDS) in the automotive sector	
Information providers	Substance and material suppliers, OEMs in the supply-chains, vehicle manufacturers.
Information user and purpose	Vehicle manufacturers, recyclers and end-of-life actors. Access by permission. Trace hazardous/targeted substances, upstream substitution, product design, CMS, reach recycling goals, for instance the ELV directive.
Content of information	Basically all substances that can occur in vehicles, regulations on hazardous substances: -Global Automotive Declarable Substance List (GADSL) -List of Declared materials, -Application of Relevant Substances -Producers own lists, In all materials, components that make up the vehicles, reconstruct complete material flow.
Coverage and diffusion (number/share of	International system. Web based database that covers entire chains/all suppliers to EoL.

users, spread, etc.)	Estimated to manage information regarding 90 – 95% of all vehicles (cars, trucks, and busses) produced annually.
Responsible party/owner of information, information provision platform	See subsequent section.
Comments and sources	http://www.mdsystem.com/ http://h10134.www1.hp.com/services/imds/

IPC 1752 for producers of electrical and electronic appliances	
Information providers	PCB and electronics assembly industry
Information user and purpose	Manufacturers of final products and OEMs in the supply chain. Safeguard RoHS compliance for multiple countries, REACH
Content of information	The system has several lists from restricted substances to basically all added substances which can be selected due to level of ambition and need. Yes/no for content of RoHS substances, manufacturing information: substances used in manufacturing. Addressed substances listed in Joint Industry Guide (JIG).
Coverage and diffusion (number/share of users, spread, etc.)	International system. Database and a common template. Entire chain/all suppliers The standard that can be replaced by similar systems or company owned systems. One such example is J-Moss (Japan" and an acronym of JIS C 0950 title "The marking for presence of the specific chemical substances for electrical and electronic equipment).
Responsible party/owner of information, information provision platform	See subsequent section
Comments and sources	http://www.ipc.org/ContentPage.aspx?PageID=Materials-Declaration

Japan Automobile Manufacturers Association (JAMA) and Japan Auto Parts Industries Association (JAPIA)	
Information providers	Material suppliers and OEM:s in the automotive supply chains
Information user and purpose	Vehicle manufacturers, EoL. JAMA/JAPIA was the original response to ELV
Content of information	The datasheets comply with GADSL (used in IMDS) to meet domestic and international environmental requirements.
Coverage and diffusion (number/share of users, spread, etc.)	Used by part of the automotive sector (as alternative to IMDS).
Responsible party/owner of information, information provision platform	The manufacturers and industry associations made and develop the system. The information provision and exchange builds on Excel sheets that haromnise with IMDS and could be used for such application but JAMA/JAPIA datasheets do not have a common interface.
Comments and sources	http://www.japia.or.jp/work/2010/05/jamajapia2010.html

Joint Article Management Promotion Consortium (JAMP)	
Information providers	Suppliers of chemicals and mixtures, supply chain producers of materials, components and parts both receive and further information.
Information user and purpose	Downstream producers. Consumers are not included. JAMP aims to promote smooth transfer of information on substances in products/articles in supply chains. It helps safeguarding compliance with domestic and international chemical legislation, for instance REACH. The aim is to expand the scope to sound product management including LCA, DfE etc.
Content of information	The system builds on standardised MSDS and MSDSplus, which are information transmission sheets for information on chemical substances contained in product. The chemical contained in products/articles is reported in standardized Article Information Sheets (AIS) for the information transfers further down the supply chains. JAMP information sharing system only includes MSDSplus and AIS which bring information regarding JDS (JAMP Declarable Substances) chemical contents such as "names of legally regulated constituents contained in products" , "presence of a declarable substance" , "name of substance" , "CAS no." and "concentration". Those formats have no function for warning/notifying tags indicating declaration needs, restrictions or prohibitions for certain substances so far. But the JAMP MSDSplus/AIS input support tool provides some information about legal regulation of substances based on leading legal Japanese, European and industry requirements (incl. Chemical Substances Control Law, Industrial Safety and Health Law, ELV, RoHS, REACH, JIG, GADSL). JDS has been decided and maintained by JAMP technical committee.
Coverage and diffusion (number/share of users, spread, etc.)	JAMP is a generic system that could be used in and across many sectors, for instance chemical, petro chemistry, metal, nonferrous metal, rubber, paint, pharmaceutical, ceramic, plastic moulding, textile, plating, coating, parts, machinery, medical device, electric, electronics, household appliances, optical equipment, stationery, printing, packaging material, trade, and logistics. In 2009, JAMP had 357 members, among them major Japanese manufacturers and producers but also foreign companies in verification and control. No available information on diffusion or experiences from using the system.
Responsible party/owner of information, information provision platform	The system is based on payment and membership. JAMP-IT system has a common web based platform for data sharing and exchange. Member companies registered JAMP-IT system are able to exchange and share their own data such as MSDSplus and AIS by working in conjunction with their in-house IT system. This infrastructure of the system is called the JAMP- Global Portal. JEMAI (Japan Environmental Management Association for Industries) is in charge of the administration and operation for JAMP-GP. JEMAI is also functioned as JAMP Secretariat. Information on the system is available in Japanese, English and Chinese.
Comments and sources	http://www.jamp-info.com/english (Dr. Noriaki Santo, personal communications)

BOMCheck	
Information providers	Supply chain actors (OEMs). Suppliers can decide who should have access to the information.
Information user and purpose	Producers of final products are helped to manage REACH, RoHS, battery, and packaging compliance information and information related to other relevant substances.
Content of information	The declaration tool covers regulatory restricted and declarable substances. This list builds on the Joint Industry Guide (JIG) and also includes regulatory substance restrictions and declaration requirements which came into effect. It also includes substances which are restricted by Philips and other leading producers to comply with product safety standards in Germany and reduce severe environmental or health and safety impacts.
Coverage and diffusion (number/share of users, spread, etc.)	BOMcheck is relevant to hardware and electrical/electronic equipment (EEE) producers. It provides a declaration tool, including expert advice, to guide suppliers to generate and maintain their substance declarations in a database
Responsible party/owner of information, information provision platform	The BOMcheck initiative is led by the European trade association European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry (COCIR) and delivered by consultancy ENVIRON with technical support from web application specialist Blubolt. Thus, it's primarily an information management platform. The information providers are responsible for and own the information. A supplier account costs 300 Euros per year. Producers using the system for information management use it for free.
Comments and sources	The system has a European focus, not least due to the restricted substances, but has contact nodes in North America, Japan and Asian Pacific. http://www.bomcheck.net/, www.cocir.org)

2.3.2 Producer – consumer/customer information

This category is characterized by producers (actor responsible for the final product or placing the final product on the market) providing information to concerned consumers/customers/users. Thus, these systems have more limited chain coverage compared to the previous category though the producers can have their own systems for the collection of necessary upstream information. In most cases, the producers want to communicate certain features of the products to the customers or, the other way around, customers request information for the sake of upholding a minimum performance level or choosing among the better performing products in their purchase decisions. Since most systems of this sub-category aim to communicate environmental performance they also include other information than chemical compositions.

Typically, the drivers for these systems are consumer guidance, promotion and legal requirements. In other cases, mainly in green professional purchasing, customers request information from producers in order to select products with better environmental performances than the bulk of products in a defined product group/category. Often, the information exchanges consist of declarations the customers ask the producers to fill in. These declarations are then part of guides or tools developed for aiding professional purchasers in public and private organisations. When these tools are developed, screenings of environmental aspects, including commonly used hazardous substances, for each product category serve as the basis when the declarations are designed.

A general outline regarding the structure of the information provision is difficult since these systems are more diverse than the previous category. Producers may have their own systems, including third party verification or providing information upon request from the clients. The information transfer may include content of substances, exclusion of certain substances, superior environmental performance of

the product, eco-labels and symbols, declarations and more. Hence, the need for competence in chemistry among the information receivers varies substantially.

Table 2.2 Examples of producer – consumer/customer information systems.

California's Proposition 65 - Safe Drinking Water and Toxic Enforcement Act of 1986	
Information providers	Producers/ businesses active in the US state of California.
Information user and purpose	General public, consumers in the State of California. Producers/ businesses are consequently encouraged to substitute listed chemicals.
Content of information	Businesses must provide warnings, for instance as labels on the products, when exposing anyone to any of listed chemicals. The Office of Environmental Health Hazard Assessment (OEHHA) generates a list of chemicals with specified properties (carcinogenic, cause birth defects or reproductive harm). These chemicals include additives or ingredients in pesticides as well as common household products, food stuff, pharmaceuticals, dyes, or solvents. Listed chemicals may also be used in manufacturing and construction or be by-products of chemical processes. Currently, the list consists of about 800 chemicals. The system requirements build on exposure of any of the listed substances. An exposure that causes a significant risk of harm from a listed chemical through the use of a product would trigger the warning requirement, not merely the fact that a listed chemical is present in a product. Thus, there are no acceptable concentrations established for any listed chemical in any given product. OEHHA has established "safe harbor levels" for some, but not all, listed chemicals. Businesses that cause exposures greater than the safe harbor level must provide Proposition 65 warnings. If there is no safe harbor level for a chemical, businesses that knowingly expose individuals to that chemical would generally be required to provide a warning, However, producers that can show that the exposure poses no significant risk assuming lifetime exposure at the level in question for substances known to cause cancer, and that the exposure will have no observable effect assuming exposure at one thousand (1000) times the level in question for substances known to cause reproductive toxicity can be exempted from warning requirements.
Coverage and diffusion (number/share of users, spread, etc.)	Legally binding. However, small businesses with less than 10 employees are exempt from the warning requirement.
Responsible party/owner of information, information provision platform	The governor is responsible to publish the list. It is administrated by the Office of Environmental Health Hazard Assessment (OEHHA). The listed chemicals are identified either by independent scientific committees, authoritative bodies (e.g. EPA, FDA), state or federal government agency, or meeting scientific criteria and identified in the California Labor Code.
Comments and sources	http://www.oehha.org/prop65.html, List of chemicals: http://www.oehha.ca.gov/prop65/prop65_list/files/P65single100810.pdf The system has a built in structure for the enforcement through lawsuits.

Interstate Mercury Education and reduction Clearinghouse (IMERC) in the US	
Information providers	Producers of articles containing mercury must report to a database.
Information user and purpose	The public, policy-makers, consumers, recyclers, waste management/EoL
Content of information	Inform consumers at the point of purchase that the product contains intentionally added mercury and may require special handling at end of life, and identify the products at the point of disposal so that they can be properly handled.
Coverage and diffusion (number/share of users, spread, etc.)	IMERC covers a range of products such as various electrical and electronic products, toys, thermometers.
Responsible party/owner of information, information provision platform	IMERC, a co-operation of 14 US States, facilitate a web site were mercury containing products are displayed.
Comments and sources	IMERC has additional tasks, such as informing on the risks of mercury, provide technical assistance, etc. http://www.newmoa.org/prevention/mercury/imerc.cfm

Toy Safety Certification Program (TSCP)	
Information providers	A Hazard analysis and where appropriate, a risk assessment shall be performed for any products to be certified. The assessment is a responsibility of the applicant (for example, manufacturers, factories, retailers, importers and other stakeholders), who may perform the analysis/assessment in-house, or delegate this function to a qualified third party
Information user and purpose	Consumers, retailers, government agencies and others. The objective of the TSCP is to provide a sustainable system to enhance the public's confidence that toys are safe. The specific requirements are stipulated by the program and the US Federal Toy Safety requirements.
Content of information	Producers are responsible for meeting the basic requirements of the program, which are: 1) hazard analysis and/or risk assessment for toy product design, 2) factory process control audits and 3) production sample testing to validate that the factory is producing toys that meet the requirements of the Consumer Product Safety Improvement Act (CPSIA). The chemical risk is part of the overall assessment. In particular, lead and some other heavy metal, phthalates, etc. The products or packaging may bear a toy safety mark.
Coverage and diffusion (number/share of users, spread, etc.)	The program applies to toys that are produced for sale in USA. The Program considers information on the products in relation to the use phase.
Responsible party/owner of information, information provision platform	Toy Industry Association (TIA) initiated the public-private (consumer, government - manufacturer, retailer) partnership and has the final responsibility for the administration of the TSCP. TSCP is designed to be an open and global system, allowing any qualified organization worldwide to become accredited to be a toy certifying body, a factory process auditor and/or a qualified testing laboratory. Information about the program is also given in Chinese. Fees charged by the third-party service providers cover the operational costs of the program. An application fee paid by the applicant will cover the costs of administration, including the information systems platform.
Comments and sources	An applicant can make its test results open to selected viewers. www.toyinfo.org, www.toycertification.org, www.toyassociation.org/

Electronic Product Environmental Assessment Tool (EPEAT)	
Information providers	Producers of electronic goods, primarily desktops computers, laptops and monitors.
Information user and purpose	Professional purchasers and private consumers can choose EPEAT registered products or use the EPEAT criteria to put environmental requirements in the purchasing situations.
Content of information	Manufacturers declare their products' conformance to environmental criteria in 8 environmental performance categories, including reduction/elimination of environmentally sensitive substances and materials, such as heavy metals, flame retardants, plasticisers, PVC and address the EU RoHS directive. Products are evaluated in three classes (Bronze, Silver &Gold), from minimum level requirement to share of optional requirements. EPEAT regularly selects products from the registry and verifies that the declarations are accurate. The criteria build on the IEEE 1680 standard.
Coverage and diffusion (number/share of users, spread, etc.)	Worldwide, 49 producers in 40 countries have declared products in the EPEAT system. According to EPEAT, there are thousands of users of the purchase criteria in more than 40 countries (but the system is used in more countries). More than 80 million EPEAT registered products were sold in 2009.
Responsible party/owner of information, information provision platform	EPEAT is managed and operated by the Green Electronics Council (GEC), which is a program of the International Sustainable Development Foundation (ISDF) a non-profit organization. In addition to the producer – customer information exchange, the scheme addresses resellers and product manufacturers.
Comments and sources	http://www.epeat.net/, http://www.zerowaste.org/epeat/index.htm, and http://www.greenelectronicscouncil.org/ (Sarah O'Brien, EPEAT, personal communication)

Environmental Product Declarations Several systems and initiatives that build on analogous principles including self-declarations, certified EPSs, etc.	
Information providers	Producers
Information user and purpose	Mainly professional customers who want to evaluate/check environmental performance of products intended for purchase themselves
Content of information	Mostly quantitative information on several environmental aspects, often supplemented with information on hazardous substances in the products. Certified EPS communicate LCA information. There are both environmental product declaration systems built on common formats and accounting principles and declarations of free format.
Coverage and diffusion (number/share of users, spread, etc.)	Primarily aimed for producer – customer communication (B2B) but may also be aggregated by downstream actors. Environmental product declarations can be issues for any kind of product.
Responsible party/owner of information, information provision platform	Systems may be administered by scheme operators, though mostly provided by the individual producers. Some environmental product declarations follow standardized formats and are often available both as printed material and in digital media.
Comments and sources	Main page: http://www.environdec.com/

Building Material Declaration This is a version of environmental product declaration dedicated to building material	
Information providers	Producers of building material for sale in Sweden
Information user and purpose	Contractors, architects, developers, real-estate companies and other actors in the building sector. The system was introduced as a result of a voluntary producer responsibility agreement with between the sector and the government.
Content of information	Contains both quantitative and qualitative environmental information. Specifications for reporting on content on hazardous substances defined by their properties and given limit values.
Coverage and diffusion (number/share of users, spread, etc.)	Declarations of varying quality and format available for several thousand building products. It's estimated that 10 000 to 50 000 building products are used by the industry.
Responsible party/owner of information, information provision platform	The EcoCycle council, a co-operation organisation for all actors in the building sector in Sweden, defines the format and content of the declarations. The producers are responsible for their own declarations.
Comments and sources	http://www.kretsloppsradet.com/common/load_ext_file.asp?, Source=ext_pagesx&ContainerID=45786&id=17 Declarations also available at producers own web sites.

BASTA for the building material sector in Sweden	
Information providers	Building material producers of final products determine if their products meet the requirements.
Information user and purpose	Purchasers, architects, designers, contractors, real-estate firms in the building industry and private consumers. The aim is to reduce/phase out hazardous substances in the building material sector.
Content of information	Information on presence of hazardous substances (according to property criteria built on REACH) in the products. Information provision through colour signal scheme and declarations.
Coverage and diffusion (number/share of users, spread, etc.)	Currently, more than 30 000 building products from 5 000 supplier meeting the requirements are registered in the data base.
Responsible party/owner of information, information provision platform	Information provided in a free data base with a standardized format. The BASTA system is jointly owned by IVL Swedish Environmental Research Institute and The Swedish Construction Federation. They developed the system in a consortium consisting of the major Swedish construction companies (JM, NCC, Peab, Skanska) with support from the European Development Fund LIFE.
Comments and sources	http://www.bastaonline.se/

ÖKO-TEX	
Information providers	Producers of final products.
Information user and purpose	General public/private consumers as guidance for choosing chemically safer textile products.
Content of information	Third party tests for harmful substances according to the Öko-Tex Standard (list of substances) for all types of textile products. A logo or label indicating that the product has been tested against an Öko-Tex standard. Concerned

	consumers can find lists of chemicals, test methods, standards, etc from the Öko-Tex web.
Coverage and diffusion (number/share of users, spread, etc.)	There are currently over 9 000 textile and clothing manufacturers throughout the textile processing chain in more than 80 countries certified according to the Öko-Tex Standard. With over 82 000 certificates issued and millions of labelled articles in almost all product sectors. About 46% of all certificates are found in countries within the European market, 51% come from Asia. The remainder are spread between the Americas, Africa and Australia. The country with the most certificates is China, followed by Germany and Turkey.
Responsible party/owner of information, information provision platform	The Öko-Tex association test and certify products and producers and issue the information.
Comments and sources	www.oeko-tex.com

Eco-Labels (Type 1 according to ISO 14 024) Systems operating in similar ways in several countries and regions	
Information providers	Independent 3rd party eco-labelling bodies award the eco-labels to producers whose products meet the environmental criteria of the schemes. The producers provide information controlled by external verifiers and accredited laboratories.
Information user and purpose	Mainly used by private consumers and professional purchasers. The eco-label is a producer means of communication to consumers and customers that their products have environmentally better performances than the bulk of products within a defined product group. Eco-labels aim at guiding consumers and stimulating environmentally sound product development.
Content of information	Basically, the information consists of a logo or label indicating that the product is superior in the defined product group (yes-information). Mostly, the multiple environmental criteria requirements include other aspects than chemicals. The chemical requirements often relate to restricted or accepted substances relevant for the appointed product group. The criteria documents are available for those who want to know the specifications.
Coverage and diffusion (number/share of users, spread, etc.)	Most eco-labelling schemes cover 10 to 100 different common consumer product groups. The market diffusion varies substantially between different schemes and product groups from insignificant to a majority of the products in the range.
Responsible party/owner of information, information provision platform	The "information" is transferred from the producers to the users by the label attached to the product and does not provide specific inform about chemical features of the products. The value is embedded in the trustworthiness of the eco-labelling scheme. The eco-labelling bodies own the schemes, control the use and often provide information on eco-labelled products on their web sites.
Comments and sources	Chemical relevance for some but not all eco-labelled product groups. Differences in prioritization of chemical aspects in different schemes. For general information and entrances to most schemes: Global Ecolabelling Network http://www.globalecolabelling.net/, an overview at www.ecolabelling.org and web sites of individual eco-labelling schemes.

2.3.3 Producer to End-of-life information

The systems in this category provide easy to use information from producers of components and final products to actors in the end-of-life stage of the chains. They may be part of sub-category 1 or stand alone. In most cases, the information consist of symbols or short messages on for instance content of specified heavy metals or hazardous substances indicating special treatment or that the products should be kept separate from the ordinary product flow.

The information systems are mostly initiated as response to legal requirements (for instance cadmium in rechargeable batteries) or disassembly guidance. The aim is to separate the flow of hazardous substances from the main stream material flows and not contaminating recycled material or causing harm to human health and the environment.

In many cases, the information also target product users/consumers through guidance to safe disposal of obsolete products, etc.

Since there are several similar systems for the same purpose (for instance labelling of batteries) operating in different countries were suggested in the SAICM survey, only one system is described as a sample.

Table 2.3 Examples of producers – EoL actor information systems.

Association for Electronic Home Appliances (AEHS) Japan	
Information providers	OEMs in the supply chains, component manufacturers.
Information user and purpose	Recyclers, EoL actors. The purpose is to increase the efficiency of decomposition/segregation of home appliances at recycling plants
Content of information	Disassembling information and component content, such as specified plastic material, flame retardants, RoHS/J-Moss specified substances of JIS C 0950:2005, plasticizers, metals (such as gold, lead, mercury) also for metal items inside the components. Labels on components and products.
Coverage and diffusion (number/share of users, spread, etc.)	Air conditioners, CRT (cathode-ray tube) television sets, refrigerators, washing machines, freezers, liquid crystal/plasma-type televisions, and clothes dryers.
Responsible party/owner of information, information provision platform	The Association for Electric Home Appliances (AEHA) issue guidelines for the marking and labelling of components, issues a Product Assessment Manual and information on product recycling.
Comments and sources	http://www.aeha.or.jp/assessment/en/english_flame.html, http://www.aeha.or.jp/02/doc/PAM4S_ALL_E.pdf

EU Battery Directive (2006/66/EC)/Battery registers	
Information providers	Producers of batteries
Information user and purpose	Consumers, users are informed about disposal. EoL actors obtain information about battery content.
Content of information	Symbols including information on content of heavy metals.
Coverage and diffusion (number/share of users, spread, etc.)	The information covers the chain from producers to EoL.
Responsible party/owner of information,	Product labelling according to legal requirements.

information provision platform	
Comments and sources	The Directive (2006/66/EC) There are similar systems in several countries/regional areas.

EU Ecodesign Directive (2005/32/EC)	
Information providers	Producers of mercury lamps
Information user and purpose	Consumers, users are informed about disposal. EoL actors obtain information about the mercury content.
Content of information	Symbols and instructions for safe disposal.
Coverage and diffusion (number/share of users, spread, etc.)	Specified labelling for consumers, waste handling and EoL.
Responsible party/owner of information, information provision platform	Product labelling according to legal requirements.
Comments and sources	

2.3.4 External stakeholders to consumers/customers and the general public

Several actors outside the supply chain collect and present information exclusively or partly addressing chemical content in products. These actors are primarily NGOs and private organisations make the information public aiming at guiding consumers and to influence policy-makers and others. In general, these organisations have affiliated expert panels that gather and evaluate information and in some cases also test laboratories for actual measurements on the products. It could be noticed that most of these systems originate and operate in North America.

Mostly, the systems have been initiated from the notion that consumers need that kind of information for informed purchase decisions, insufficient information from producers and too weak legal requirements for the producers to do so.

Table 2.4 Examples of external stakeholder – consumer/customer and the general public information systems.

Arnika	
Information providers	The NGO Arnika in the Czech Republic
Information user and purpose	Mainly Czech consumers and the concerned public. The aim is to reduce the use of PVC and plasticizers and suggest alternative products.
Content of information	The data base points out products made of PVC and suggest alternatives.
Coverage and diffusion (number/share of users, spread, etc.)	For instance medical products, flooring, sports equipment, toys, teaching aids, food package, etc.
Responsible party/owner of information, information provision platform	The web site facilitated by the NGO is part of a campaign against PVC. It has been running in its present form since 2007 but PVC in healthcare products has been of concern since 2002. The NGO has also conducted chemical analyses (presence of hazardous PVC related substances) in certain products for
Comments and sources	Campaigning against the use of PVC. http://www.pvc.arnika.org/

GoodGuide	
Information providers	The GoodGuide is a "for benefit" company that collaborate with several non-profit organisations in assessing and rating consumer products.
Information user and purpose	Primarily directed to private consumers in the US. The mission of the GoodGuide is to help consumers make purchasing decisions that reflect their preferences and values.
Content of information	The system is rating product performances from a set of health, environmental and social metrics (on a scale 0 to 10) according to a standardized method. The product chemical assessment, which is one of several aspects, regard potential hazards associated with the use of the products – not risk assessments of the products and chemicals. The GoodGuide also assess and rate the performance of the producers.
Coverage and diffusion (number/share of users, spread, etc.)	The database contains information on more than 2 000 toys, 16 000 food products, 47 000 personal care products and 3 000 household chemicals. In any new product category, GoodGuide strive to achieve greater than 80% market coverage of all products in the category. GoodGuide has received millions of visitors and continues to receive hundreds of thousands of new visitors every month. Most of them from the US.
Responsible party/owner of information, information provision platform	Information provision through a web sites operated by the GoodGuide. Also information access via mobile phone applications, for instance barcode screening gives specific product information. The iPhone app is expect to hit a half million users shortly.
Comments and sources	http://www.goodguide.com/ Josh Saunders, GoodGuide Inc, Personal communication

Healthy Stuff	
Information providers	The US non-profit organization The Ecology Centre makes tests/analyses (so far, more than 15 000) of the actual products. The organization thus serves as a third party.
Information user and purpose	Guidance to consumers and advocating campaigning directed to the policy-makers regarding stricter regulations on hazardous substances in consumer products. There is an apparent focus on the US market. Information provided in both English and Spanish.
Content of information	Products tested and rated due to detected levels of chemicals of concern (lead, cadmium, mercury, arsenic, chlorine/PVC, bromine/flame retardants, antimony, tin, and chromium (detected by XRF technology). Consumers can also get guidance to products with less/no content of concerned chemicals.
Coverage and diffusion (number/share of users, spread, etc.)	The Healthy Stuff database contains test results for more than 5 000 products in the categories apparel and accessories, cars, toys, pet products, products for kids.
Responsible party/owner of information, information provision platform	The Healthy Stuff database is operated by the Ecology Centre. Beside the database, information can be accessed through various mobile phone applications, SMS text messages, Facebook, Twitter and more.
Comments and sources	It is clearly stated that the ratings do not provide measures of health risk or chemical exposure associated with any of the individual products. http://www.healthystuff.org/

Pharos Project	
Information providers	Pharos Project, which is a project of the Healthy Building Network.
Information user and purpose	Commercial buyers are helped to evaluate product content, certifications and other relevant data about building materials against key health, environmental and social impact benchmarks. The aim is to assure that the materials that are used in buildings are good for our health and good for the environment.
Content of information	Evaluations, scoring and LC information about a product's impacts. Pharos provides comparative, multi-attribute analyses of these impacts in the form of numerical and colour-coded scores. Chemical aspects are included in a larger set of environmental impacts.
Coverage and diffusion (number/share of users, spread, etc.)	Pharos was piloted in 2009 and is still under development. It primarily addresses North American market actors.
Responsible party/owner of information, information provision platform	Pharos is providing the information in a web based database open for subscribers. Pharos Project gathers data and information from the producers. The information and scoring is presented in a standardized format in the database.
Comments and sources	The Pharos Project is a project of the Healthy Building Network and a number of actors in the American building sector. http://www.pharosproject.net/, http://www.healthybuilding.net/

Skin Deep	
Information providers	System operated by the Environmental Working Group (EWG), a US based non-profit organisation hosting scientists, engineers and policy experts. EWG examines products based on information from producers, literature and own analyses.
Information user and purpose	Information to consumers and the public in the US. Influence US federal policy makers for a shift towards more sustainable policies.
Content of information	The Skin Deep database reporting their scoring of cosmetics and personal care products (in particular for children). Products are evaluated regarding content of hazardous chemicals. Hazardousness is categorized into the general hazard categories: cancer, developmental/ reproductive toxicity, neurotoxicity, endocrine disruptions, allergies/immunotoxicity, miscellaneous, restrictions & warnings, organ system toxicity (non-reproductive), persistence & bioaccumulation, multiple/additive exposure, mutations, cellular/biochemical changes, ecotoxicity, occupational hazards and irritation. In addition, there is a list of products to avoid (containing severe chemicals).
Coverage and diffusion (number/share of users, spread, etc.)	In 2007, the database contains assessment and rating of over 60 000 safe products, more than 2 000 brands and companies, and almost 8 000 substances. It has about one million page views per month.
Responsible party/owner of information, information provision platform	EWG provides the database for free to the public.
Comments and sources	www.cosmeticdatabase.org This system covers products that may not fall within the scope of this study but is included since it is a good example.

Another system which is similar to GoodGuide and Skin Deep, is the Household Products Database (http://hpd.nlm.nih.gov/index.htm) which is administered by the US Department of Health and Human Services. The database provides information regarding chemical content and associated effects of different chemicals and covers over 10 000 consumer brands of chemical products in the following categories:

- Auto Products,
- Inside the Home
- Pesticides
- Landscape/Yard
- Personal Care
- Home Maintenance
- Arts & Crafts
- Pet Care
- Home Office

2.3.5 System like initiatives for communication between external stakeholders and chain actors

In addition, there are several system-like initiatives for information provision and exchange between chain actors (mainly OEMs and producers of final products) and external actors. Typically, these actors are authorities, industry associations and organisations, and bodies of expert knowledge.

In many cases, the initiatives are aimed as aid and guidance for producers to ask for information and identify hazardous substances through lists of sector-relevant or prioritized substances. The chain actors may have their own systems for compiling upstream information or simply use in-house knowledge and report product composition or seek expert council in order to build up necessary capacity for the management, prioritizing and substitution of hazardous substances. These lists of relevant chemicals can serve as important components in producers' own information provision and exchange systems for their suppliers.

In terms of the information exchange influencing substitution of hazardous chemicals in products (and not mere reporting) are tailor-made assistance programs, design guides assisted with case-specific guidance typical arrangement.

Another strand of this sub-category of systems is chain actors reporting to the public, for instance authorities, when deviations from normal production of certain products or components for one or other reason have been changed and hazardous substances been introduced. These reports are aimed to spread information to other market actors and thereby make it possible to remove the products from the shop shelves.

In the following text, we will introduce and describe examples of such initiatives and elaborate on their possible connections to CiP information systems.

ChemSec's SIN list

The international NGO Chem Sec has issues a list of 356 substances Chem Sec considers as SVHC prioritized for substitution. The initiative is called the SIN list from "Substitute it now". The properties of the substances have been identified from the REACH criteria.

The SIN List is aimed to be a tool for legislators, businesses and NGOs for the identification of hazardous chemicals according to the REACH criteria, substitute these substances with better alternatives and push the REACH process forward. The project focuses particularly on chemicals that consumers might be exposed to. This includes chemicals used everywhere in our daily life, such as in detergents and paints, in electronics, in residential buildings, toys, apparel and clothes. In addition, investors can use the SIN list to analyse companies and avoid hidden risks.

The list is available in an open database updated and operated by ChemSec
[http://chemsec.org/list/sin-database]

Restricted Substance List and Toolkit of the American Footwear and Apparel Association

American Footwear and Apparel Association (AFAA) compiled the Restricted Substance List (RSL) from internationally regulated or legally restricted substances related to finished home textile, apparel, and footwear products. The toolkit aims at helping producers of such products and their suppliers to control hazardous substances and proper chemicals management. There is also a Chinese translation of the Toolkit available.

The RSL contains information on chemical identification, restrictions and limits in finished product/component, test methods, and the country(ies) that set the restriction/limit. The scope of the

information is substances that may occur in finished products but the coverage is the entire supply chain.

The list is developed and updated by a task force commissioned by AFAA. They make all material available on-line free of charge.
[http://www.apparelandfootwear.org/Resources/RestrictedSubstances.asp]

Chemicall

Swerea/IVF, a private research institute, has compiled a databas for actors in the textile industry. The database contains searchable information regarding chemicals (dyestuff, pesticide, flame retardant etc.) of relevance to textiles, and material (cotton, polyester, leather etc.) as well as processes used in the sector. There is also information on common test methods, substitutes, legal restrictions, voluntary restrictions, etc.

Swerea/IVF owns the data base open for members. Swerea/IVF updates the database continuously and evaluates and include substances upon request from members. [www.extra.ivf.se/chemicall]

US EPA Design for Environment Program

US EPA offers help to industries in chemical substitution and to choose safer chemicals in the design process and/or advice on safe chemicals use and management in a closed consultation process with invited experts. The programme primarily addresses producers in the sectors of household chemicals, cleaning agents, electronics, cables & wire, furniture, printed circuit boards. The aim is to protect human health and promotion of sustainable chemistry.

Producers of household and cleaning products can communicate their participation in the program to the public/consumers by the use of a DfE label. Currently, about 2 000 product carry the label.

The EPA provides the services through a network of experts. The firms and the experts communicate in-between without specified protocols or systems. There is thus no defined chain coverage for the expert consultation services though the end producers communicate with consumers through the label. For additional information: http://www.epa.gov/dfe/index.htm

RAPEX – EU Rapid Alert system for dangerous non-food consumer Products

RAPEX is the EU system for systematic and structured information provision on hazardous consumer products (excluding food, pharmaceuticals, and medical devices) on the market from 30 National Contact Points (NCP) to the European Commission. The product hazard could be related to chemicals but also other aspects of concern. The national authorities receive weekly notifications on dangerous non-food consumer products to take measures to prevent or restrict the marketing or use of alerted products.

RAPEX is connected to EIS ChemRisk, the European Information System "Risks from chemicals released from consumer products/articles"

The system rely on voluntary reporting from producers and distributors, thus include information from the product chains. Producers and distributors aware of dangerous products shall report to the system. For further information:
http://ec.europa.eu/consumers/dyna/rapex/rapex_archives_en.cfm

Green Procurement Guides and Manuals

The green procurement guides and manuals are tools used by professional purchasers that search environmentally benign alternatives for their organisations. These tools are not aimed as CiP information systems but have in some cases similar features. Often, the tools are developed to address significant environmental aspects for individual product groups. In product groups where potentially hazardous properties of chemicals are considered such an aspect, vendors are consequently asked to declare presence/content of pre-defined chemicals. Frequently, the procurement tools use general RSLs as background material supporting information requirements. Hence, the green procurement tools stimulate information exchange between actors.

Green procurement guides and manuals are used by public organisations in many countries that have adopted GPP as a policy instrument as well as by private organisations that include their purchases in their environmental management.

2.4 A closer look - International Material Data System (IMDS) for the automotive sector

The IMDS is the automotive industry material data system (MDS). Meeting the known regulatory requirements for materials declaration for automotive industry is a big challenge as their products are highly complex – as each vehicle has an estimated 50 000 parts, there are hundreds of vehicle models each with several variations, and thousands of other materials are used to manufacture parts – supply chains involve numerous parties from a very wide spectrum of sectors. It should be noted that the users can browse the system according to different parts or components but the system is not designed to serve as an index of car components.

Before the IMDS, some auto manufacturers collected chemical content data for the constituting parts against their own internal restricted substance lists resulting in following drawbacks:

- Suppliers were only required to report on parts containing restricted substances
- Suppliers did not effectively analyze the chemical makeup of supplied parts and materials
- Much of the data was low quality, if given at all.

The car industry realized the need of jointly addressing this issue that posed a serious challenge across the board. Thus, in its origin companies like Audi, BMW, Daimler, Ford, Opel, Porsche, VW and Volvo have got together to realize the joint aim – the collection of materials data – and formed IMDS in 2000. The parent companies and subsidiaries of the members have also been integrated into the system. Further manufacturers have meanwhile joined the community and talks are being held with others regarding their participation in IMDS.

IMDS steering committee, composed of representatives from car manufacturers, hired a consultant to set-up an internet-based system. This system has an interface on the net that allows all registered users to submit relevant information and the user to retrieve information that is of interest to themselves.

IMDS provides a common system for archiving and maintaining a database of materials used in vehicles. It provides an entire system for archiving and maintaining the data of all materials used in vehicles, in one database. With its use the automotive industry is able to reconstruct the complete material flow for their vehicles.

Currently, the system serves as the basis for ensuring that OEMs and their suppliers are in compliance with international and national standards, laws, regulations. In the future, the database could facilitate the recycling of end-of-life-vehicles.

2.4.1 Description of the users/clients of the system

What started out as a European-based project has rapidly developed into a global standard in the automotive industry. IMDS is used by 22 of the most famous car manufacturers –including Aston Martin Lagonda, BMW, Chrysler LLC, Daimler, Fiat, Ford, Fuji Heavy Industries, GM,, Honda, Hyndai, Isuzu, Jaguar Land Rover, Mazda, Mitsubishi, Nissan, Nissan Diesel, Porsche, Renault, Scania, Shanghai GM, SSangyong Motor company, Suzuki, Toyota, Volvo (trucks) – covering 45 brands. All American and almost all European and Japanese producers of cars and trucks, making up 90 – 95% of all vehicles produced annually, are currently using the system. (James Lundström, IMDS reporting, Volvo, personal communication)

A number of original equipment manufacturers (OEMs) serving the vehicle manufacturers (VM), and a wide range of other suppliers are also among the users of the system. Currently (March 2010), the IMDS has acquired more than 160 000 registered users in approximately 77 000 companies, (IMDS Newsletter XXII 16.06.2010, Issue 2 / 2010). The system has generated more than 22 million data sheets and its database continues to grow daily (http://h10134.www1.hp.com/services/imds/).

The development of the IMDS relied above all on a legislative background, namely:

- Laws & Regulations on hazardous substances: Initially, it was a matter of being prepared for upcoming legislation and the ban of four heavy metals that OEMs must eliminate from the supply chains.

- End-Of-Life Vehicles Directive (ELV): It forces car manufacturers to improve their recycling rates. Therefore all suppliers must deliver accurate material information.

- Later on, the introduction of REACH has emphasized the need of prioritizing issues related to chemicals in the products (James Lundström, IMDS reporting, Volvo, personal communication).

2.4.2 Type and Format of Information Provided through the system

Before IMDS many of the vehicle manufacturers had their own system for tracking chemicals, and some took a long time to join IMDS as they have made big investments into their own solutions. However, they realized that IMDS offered a more efficient way of dealing with the challenge (Frank Nottebom, EDS)

All material information in IMDS is based on a list of basic substances. A Chemical Service is responsible for the regular maintenance of the "list of basic substances".

For vehicle manufacturers, it is not enough to say that "their products do not include the banned substances"; they have to prove it. This system allows for this. Further, the system is not limited to the reporting of banned materials (chromium 6, mercury, and more) and instead requires the declaration of all substances in the material data sheet (MDS) at the level of 1 gram or better. That is why substances and materials of products must be known in detail. Material information on parts is later delivered from the OEMs to dismantler companies attached to the data system in order to achieve the goals of the ELV Directive. There are different reporting possibilities offered by the system and the system is supposed to track all components and substances that end up in the final product.

Currently, the list of basic substances of the IMDS contains about 9 000 substances with their names and CAS-numbers. These are the ones primarily relevant for the sector. The list is growing with some 20 substances every month. (Peter Müller, personal communications) There are also many pseudo substances (for instance "acrylic resin" and "cotton-fibre". – substances that are considered more generic according to ISO 1043.

All material information in IMDS is based on a list of basic substances. As a subset of these substances the IMDS user can select one of the following substance lists:

- GADSL (Global Automotive Declarable Substance List) – default substance list used by the system. The substance attributes "duty-to-declare" and "prohibited" are always displayed according to this list, independent of which substance list the user selected. Further information about GADSL is available at the end of this section.

- VDA 232-101 (List of Declarable Materials in Automobile Manufacturing)

- Appl. rel. subst. (Application relevant substances)

The users can also communicate their own list of chemicals that needs declaration via the system – e.g. Renault has such a customized list called BGO. The reporting is dominantly based on standard lists of chemicals, like GADSL. But the system allowed for including lists of particular manufacturers. These lists are available in the system and users can decide which one to use.

Because it is a computer-based system, IMDS recognizes hazardous substances by comparing the entered data with the lists of substances that should be declared, are prohibited or both. Hence OEMs can trace hazardous substances back to the source and eliminate them. Users can also use the lists above as display filters in the ingredients screen and for MDS/module analysis. This substance list allows the IMDS user to set up a management system for dangerous substances for his products to query the current status. This is as important during the design phase as for the end-of-life phase. Once the latter has been reached, the IMDS data can contribute to achieving the recycling level of 95 per cent required from the year 2015.

If the users need to track a substance not on the list, and have done a thorough search by name as well as CAS number, then send an email with the CAS number and Substance Name to the IMDS Service Center. The requested substance will be compared with the basic substance list and the definition of a basic substance and, depending upon the results of the analysis, added to the list for free. This takes usually a minimum of two work days

It is the responsibility of the 1st tier suppliers to submit the necessary information into the database. These in turn require necessary information from other suppliers upward in the chain. Each supplier is required to register with the system prior to using the system. And the suppliers can decide which other users can see the information they provide. The structure of information flow in IMDS is presented in figure below.

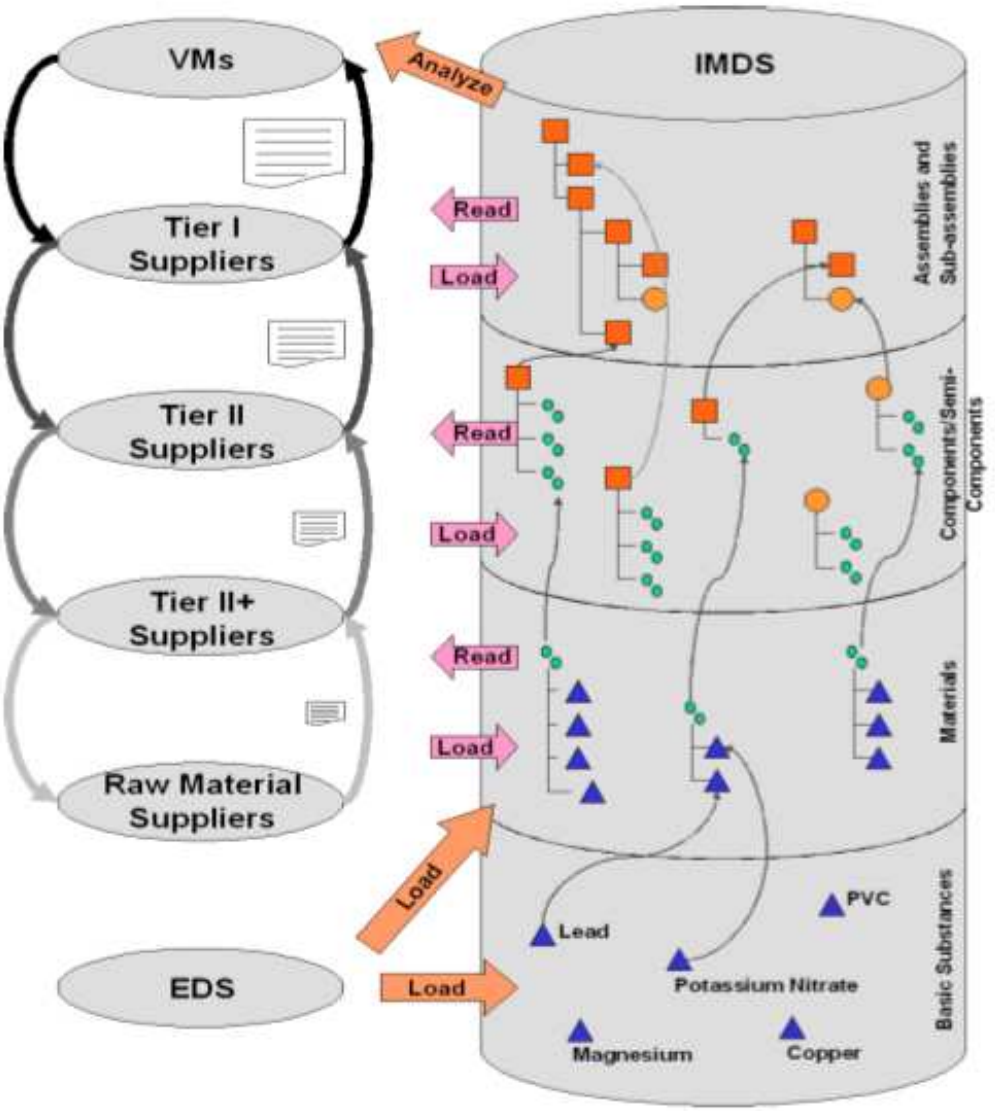

Figure 2.1: Structure of information flow in IMDS. VM: Vehicle Manufacturers, EDS: Electronic Data System, i.e. the software platform. (source: MDSMap, Producer Responsibility and Product Stewardship Services for Industry)

The users can then see the information through an "ingredients screen", which is illustrated in the sample below and also make certain analyses.

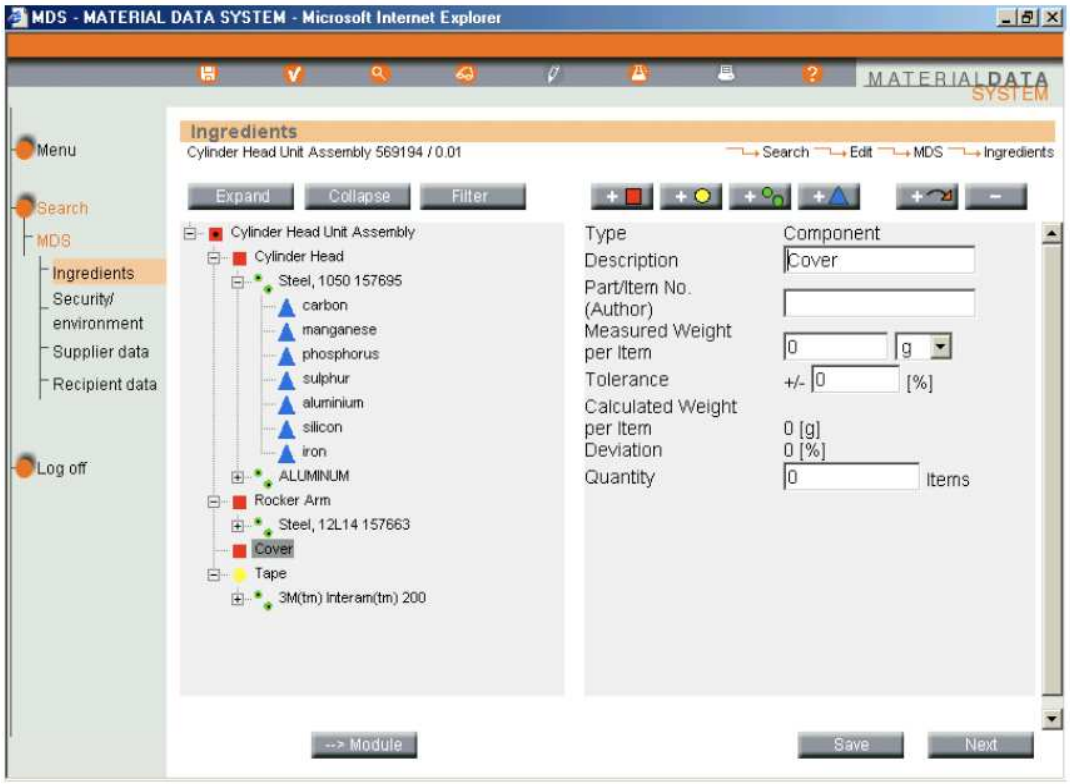

Figure 2. A sample "ingredients" screen displayed to user. (source: MDSMap, Producer Responsibility and Product Stewardship Services for Industry)

An important aspect of IMDS is the way confidentiality is handled. Propriety information, and thus confidentiality is of utmost importance for some of the suppliers – and in particular polymer industry. The system allows for two sets of measures to address this. First, the suppliers can decide who can see the information they provide – they can either make it public so that everybody can see it, or they can make it visible only to those users of their choice. Next, the suppliers can account up to 10% of the weight of a particular component as "confidential" or "miscellaneous" – provided that no banned or restricted substances are included in this 10%. In certain cases, however, the OEMs want to know the exact composition, including the chemicals used during manufacturing. For such cases, the suppliers are allowed to share information that can be seen by only one person from an OEM.

2.4.3 Ownership

The system is owned and updated by IMDS – a consortium of vehicle manufacturers. The actual development and running of the information system is sub-contracted to EDS – a subsidiary of HP.

OEMs have to pay an annual fee – ranging between 100 000 to 500 000 €[5] – to EDS to have access to the system. This amount is used to maintain, upgrade and further develop the system. The overall cost of maintaining and further developing the system is estimated to be in the range of 6 million €/year. In addition to this, car manufacturers have to pay a one-off fee of 100 000 € when they join the system. This also gains them a seat in the steering committee.

[5] This value is dependent on the volume of production and varies among companies. The cost for truck manufacturers starts from 30 000 €, as they have much less components in their products (Frank Nottebom, EDS)

The suppliers can use the system for free. Only if they want to have additional services that allow them to integrate their in-house information system with IMDS, then they have to pay EDS for such solutions.

The steering group of IMDS, with representatives from different car companies, decides upon the changes and future development direction on the system. This system does not include representatives from suppliers. Suppliers, however, have their own forums – such as CLEPA (European Association of Automotive Suppliers), AIAG (Automotive Industry Action Group – from North America), JAMA (Japan Automotive Manufacturers Association) – which provide feedback for IMDS. The final decision, however, always resides with the IMDS steering committee.

2.4.4 Verification

The system has several in-built functions that help the verification process. In addition to color coding substances – red for "forbidden" and blue for "restricted" the system displays warnings if too much of particular substances that might be of concern – e.g. VOCs – are reported to be present in the component. There are also analysis made available that compares the calculated weight – obtained by summing the weight of all constituents of a component – with the reported weight.

The system has a rather clever verification process. As shown in Figure 1, the information request starts with vehicle manufacturers and is communicated by the 1st tier suppliers. These then request relevant information further up in the supply chain. As the information starts flowing on the other direction, it is the responsibility of the recipient further down in the value chain to accept or reject the information provided by the previous actor further up. In this way, each actor in the value chain also acts as a control node.

These are, however, not enough to ensure that the data is correctly representative. To ensure reliability, receivers of information occasionally perform their own "content analysis" on the parts obtained from suppliers.

2.4.5 Surround activities

At the earlier stages, a considerable amount of training is required for suppliers – level varying according to their capabilities – so that they can start using the system properly.

The use of the system does not require the companies to develop an extra information management system – though they may do so to fulfill their customized reporting needs. Also, the web-based system is suitable for integration with commonly existing information management systems – but the companies will have to pay to have such integration arranged.

2.4.6 Feedback from users

The advantage of IMDS is reported to include the following:

- It offers a standardized report method and data format – suppliers learn one system and could use that for many clients.

- The system is accessible world-wide due to internet availability – allowed access to all suppliers regardless of location.

- Complete Reporting and Accountability: Requires suppliers to account for every part and material (as well as most chemicals) which forces them fully investigate the material and chemical make-up of parts.

- Library building: information input for one customer can be used for reporting to another.

- The system is flexible and can be adapted to new legislations or other requirements.

- The initial supplier resistance against the system (due to expected additional workload) has largely changed, when it gradually was found that the information and the information management was useful for them. (Peter Müller, HP IMDS Helpdsk, Personal communication)

Disadvantages of the system include:

- It is time consuming: data for complex parts of companies producing numerous products may be too slow to be practical

- Difficult: IMDS is not an intuitive system: it's requiring some training by most users.

- Limited functionality: no drag and drop and limited copying possibilities.

- Requires users to buy or build another database – initially only the interface for the information upload was available.

- There are still no standardized lists of reportable substances used by all OEMs – some companies still have their own lists:

- The consideration given to propriety concerns is not seen adequate by some suppliers;

- Reporting format was developed by OEMs with little input from suppliers.

- Reporting requirements vary from year to year – this was more of an issue in the early stages of development where there were up to three new releases every year. Though the frequency and content of changes are no longer as much, there are still changes taking place that require suppliers to adopt. These, however, seldom require any new reporting routines.

2.4.7 More about the Global Automotive Declarable Substance List

The GADSL is the result of a year-long global effort of representatives from the automotive, automotive parts supplier (tier supplier) and chemical/plastics industries who have organized the Global Automotive Stakeholders Group (GASG). The GASG's purpose is to facilitate communication and exchange of information regarding the use of certain substances in automotive products throughout the supply chain. This approach is a voluntary industry initiative designed to ensure integrated, responsible and sustainable product development by OEMs and their supply chain. Its purpose is to minimize individual requirements and ensure cost-effective management

In recent years many individual declarable substance lists were developed to exchange information regarding the material and substance composition of automotive parts. The experience gained by the above industries in using these multiple lists has shown that the declaration process could be improved upon and this was a key reason for developing a single, globally harmonized list with clear criteria and a transparent process to manage future versions of the GADSL. (http://www.gadsl.org/).

The GADSL covers declaration of certain information about substances (regulated, projected to be regulated, or for – by consensus within GASG SC - it is scientifically demonstrated that their presence may create a significant risk to human health and/or to the environment) relevant to parts and materials supplied by the supply chain to OEMs. The information is applicable to the use of these parts or materials in the production of a vehicle up to its usage and relevant to the vehicle's re-use or waste disposal. The GADSL only covers substances that are expected to be present in a material or part that remains in a vehicle at point of sale. That is, the system does not allow for the transfer of information regarding chemicals used in production – only those that are on the products. If any chemical that is

classified as processing chemical is reported on the product, this needs to specified as residue, impurity, or intended use.

In GADSL the substances are classified into three categories:

P: Prohibited in all applications

D/P: Prohibited in some applications and declarable in all other cases.

D: Substance must be reported if the threshold limits are exceeded, however the substance is not prohibited to be used in automotive parts.

All REACH-SVHC (Substances of Very High Concern) relevant for the automotive industry will be added to the GADSL. Therefore, the GADSL category and the flag for REACH-SVHC will be displayed collectively in the IMDS. Producers of articles ("components" in IMDS terms) containing such substances have to fulfil certain reporting duties. In the ingredients screen, REACH-SVHC substance names will always be underlined in the product structure tree, regardless of what filter is selected.

The REACH Candidate List is updated twice a year. All Candidate List substances will be added to GADSL. Each update requires the article producer to recheck his material reporting in IMDS to see if any of his substances replaced by a wildcard or marked confidential is now on the Candidate list. If so, the article producer is required to resend an updated MDS to his customer. The IMDS system will also run a check of the database when the list is updated to see if any SVHCs are marked confidential and notify the client manager of the company of the need to update the Material Data Sheet. (https://www.mdsystem.com/magnoliaPublic/en/public/list/REACH-SVHC.html)

2.5 A closer look - IPC 1752 standard for electronic goods

IPC stands for Institute for Printed Circuits and is a global trade association serving the printed circuit board and electronics assembly industries. IPC 1752 establishes standardized material declaration forms and electronic data exchange formats for the industry. It provides an underlying XML schema for the forms, based upon a UML model. The forms are designed to be compatible with Adobe Acrobat Reader 7. The intent is to facilitate electronic reporting for suppliers and customers alike, along the entire supply chain is a standard template that is used for communicating data on materials compliance. (RSJ, Technical Consulting - http://www.rsjtechnical.com/WhatisIPC1752.htm)

The system was originally developed to respond to European Union's RoHS regulations. But as more legislative bodies established regulations for more materials, the committees decided revisions of the standard needed to address these new requirements. RoHS requirements from multiple countries are now included, as is the REACH regulation that currently includes 15 substances. Next anticipated update will make it simpler for the committee to respond when new materials are added to the lists compiled by legislators

2.5.1 Description of the users/clients of the system

It is a standard template that is used by actors linked to the production chain of electronic goods. The user base of the system is very broad and includes various producers of electrical and electronic products – products like mobile phones or computers and including companies like Philips, Sony-Ericsson, Motorola – and suppliers of different hardware components – circuit boards, processors, transistors, capacitors, etc. - that end up in such products.

Producers of the electronic equipment are on the receiving end of the information and increasingly use this template when they request material declaration information from their suppliers that supply them with different kind of hardware components that end up in their products. Thus, such companies

usually trigger the process of requesting information through the use of this template. Request from producers is communicated to 1st tier suppliers to submit information using IPC 1752. If the 1st tier supplier needs to go further up in the chain, they do so with or without using the IPC 1752.

As mentioned earlier, the standard was initiated to track substances listed in the RoHS list. It is then developed to include substances listed on JIG. Some of the companies interviewed mentioned that the upcoming REACH requirements were the chief reason for them to adopt the system. Recent updates of the standard not only allow the tracking of chemicals listed as candidates on REACH, but will also provide the flexibility to the system to include additional substances as they become part of regulatory requirements.

2.5.2 Type and Format of information provided through the system

The standard is currently being revised undergoing a major revision and it is in the process of being balloted. Assuming it is approved in the balloting process, it is projected to be released in first quarter of 2010. The major revision consists of using an xml schema rather than a pdf schema (because of many limitations surrounding the use pdf). Excel format is regarded as a more user-friendly format and this transition will allow the information to be entered and processed with more commonly applicable software – like MS Access. The content itself is also going to be changed considerably, reflecting on the content from the new Joint Industry Guide (JIG 2nd Ed) (Albert Tsang, Dell).

The standard allows for minimum standard reporting – through the use of IPC-1752-1 – and custom and full disclosure reporting – through the use of IPC-1752-2. These forms are identical, but the IPC-1752-2 allows entry of information about substances not identified by RoHS or JIG.

The IPC-1752 is designed to solicit four different types of information. Customers may request one or more of these types of information depending upon their manufacturing or marketing needs:

- Yes/No for RoHS compliance: Presence of any of six RoHS prohibited substances is reported6. Compliance is computed as a percentage of each homogeneous material in the part certified/simply states whether or not the part contains any of the six RoHS banned substances or qualifies for a RoHS exemption. The threshold level for disclosure is parts per million for a homogenous material.

- Manufacturing information: Information regarding the chemicals used during the manufacturing processes.

- JIG-A, B and C substances at the part level. Information is provided as weight and ppm for all JIG Level A, B, and C substances present in the part. Compliance is computed as a percentage of the weight of the total part. The threshold level for disclosure is parts per million for the entire part. Substances that are intentionally added must be disclosed regardless of ppm. Substances must be disclosed even if they qualify for a RoHS exemption.

- JIG-A, B and C substances at the homogeneous level

In using the IPC form, the customer can choose one of six declaration classes, or types of request, depending upon the combination of information that is needed. Class 1 and 2 may be requested with either IPC-1752-1 or IPC-1752-2. Class 3 and 4 require the IPC-1752-1 (which provides for part-level

---

6 A **substance** is a chemical element or compound that is identified by an assigned CAS number. A material is made up of one or more substances. **Homogenous** materials have a uniform composition throughout and cannot be separated by mechanical action (such as unscrewing, cutting, brushing or grinding).

reporting of JIG substances). Class 5 and 6 require the IPC-1752-2 (which requires JIG substance reporting at the homogeneous material level). The six classes are:

> Class 1: Involves reporting RoHS compliance at homogeneous material level in Yes/No format
>
> Class 2: Is the same as Class 1 but includes the addition of manufacturing information.
>
> Class 3: Involves reporting RoHS compliance at homogeneous material level in Yes/No format and reporting of JIG-A, B and C substances at the part level
>
> Class 4: Is the same as Class 3 but includes the addition of manufacturing information
>
> Class 5: Involves full disclosure - reporting RoHS compliance at homogeneous material level in Yes/No format and JIG-A, B and C substances at homogeneous material level
>
> Class 6: Is the same as Class 3 but includes the addition of manufacturing information

So, the standard allows for reporting information in the "presence/absence" basis, as exact quantities, or a combination of both.

The detailed structure of the IPC forms is as following:

Page 1 of the forms contains identifying information that is related to:

- Declaration class – Here the customer selects one of the six classes described above. After the selection is made, the form automatically changes to provide blanks for the type of information requested.

- Requester (optional) - the customer enters the customer's company name, request date, a contact name, contact phone and email, customer's item number, manufacturer's part number, and other identifying information as desired.

- Supplier - the manufacturer enters the manufacturer's company name, the response date, a contact name, contact phone and email, the manufacturer's authorized representative (the person signing the certification), and the certifier's phone and email. There are fields to clarify the part number and name, the revision date, the effective date of compliance, and the weight of the part.

- Manufacturing process (Optional) – This involves fields for terminal plating or grid array material, terminal base alloy, J-STD-020 MSL rating, peak process body temperature, maximum time at temperature, and number of reflow cycles. Additional information may be added in comments.

Page 2 of the forms contains the Yes/No fields for RoHS compliance certification:

- RoHS declaration – Here the manufacturer selects a suitable statement: that part is either compliant, non-compliant, non-compliant but exempt, or compliant except for lead used in solder. Options also exist to indicate that the part is obsolete or unknown to manufacturer.

- If the statement includes a reference to exemptions, the form automatically changes to provide a list of exemptions. The manufacturer should check the exemption that is applicable.

- Digital signature of manufacturer's authorized representative

Page 3 of the 1752-1 contains a list of every JIG-A and B substance. Manufacturer indicates whether the substance is present above the defined threshold level, and if so provides the total weight (or ppm) of the substance in the part and its location in the part.

Page 4 of the 1752-1 provides a place for the reporting of C-list substances as defined by the customer.

Page 3 of the 1752-2 is titled Homogeneous Material Composition Declaration. The presence of any JIG-A, B or C substance in the part must be declared, even when the amount is below the defined threshold level or was not intentionally added by the manufacturer:

- Sub-Item - the manufacturer enters the subpart and homogeneous material in which the substance is located and the weight of the homogeneous material.

- Substance - the manufacturer enters substance name, CAS number, category, JIG level, RoHS exemption (if applicable), and the weight (or ppm) of the substance.

- Requestor substances - This is the "C list" of substances that are of special interest to the customer. Substances on this customer generated list should be identified by name, CAS number and category. (RSJ, Technical Consulting http://www.rsjtechnical.com/WhatisIPC1752.htm)

Producers must retain appropriate technical records to document their compliance for at least 4 years after their product is placed on the market.

The clients require such information from suppliers on the basis of different components. Every time there is a change in the component – even if it is a software change – a new IPC based declaration is required.

The IPC form is solely a carrier of information – where the component name as well as the supplier details is available – that accompanies supplied components. There is no standard practice regarding how the recipients handle the information. The companies can install a third party information management system, to make use of the information provided through IPC; for example to report regulatory compliance or to prepare environmental declarations accompanying the products – in the case of Sony-Ericsson such reports are available on company's web-site. Several companies – including Siemens, a PTC – provide IPC integration solutions for companies.

As mentioned above, the system already automatically work with regards to RoHS and JIG compliance. Although work is reported to be underway to allow for reporting substances for REACH candidates, this is not operational yet. However, the system allows for substances to be reported through their CAS-codes. Presence of the CAS codes significantly eases the possibility of tracking any chemical that can be restricted or banned by any type of regulation – and such screening is often offered by third party information management providers.

2.5.3 Ownership

The standard is owned by IPC, who is also in charge of updating and further developing the standard. Companies from the sector can become members – at an annual expense of around 5 000 USD (Albert Tsang, Dell). The forms, however, are freely available to anyone who wants to use them – only a registration through IPC web-site is required.

IPC has its own standardization workgroup that decides the form and shape of the template – basically deciding its suitability to ease reporting according to different restriction schemes. Industry representatives sit on that standardization workgroup, and further consultations continuously take place in further developing the standard. Increasingly, however, the template has been evolving towards offering flexibility for customization by users.

Information regarding the resources required for developing and maintaining the system is not obtained at this stage.

2.5.4 Verification

Two types of verification are stated to be built into the system. The first one is qualitative in nature and is linked to the CAS numbers for chemicals. The system checks whether the substances are reported correctly and can be integrated to track the presence of any substance that is subject to different regulatory demands. The second is more quantitative and works by comparing the reported weight of the component to the calculated weight – obtained by summing up the weight of different substances reported to be present in the component. If there is more than 1% difference, the system rejects the form automatically.

Any other form of verification and control has to be performed by the involved parties in the chain. One producer stated that they try to verify information through performing their own "content analysis" on the received components and if there are large differences they request clarifications from the suppliers.

2.5.5 Surround Activities

At the initial phases of using the form, the suppliers often require training on how to fill in the forms. This requires resources, depending on the capabilities of the suppliers. One of the suppliers interviewed stated that it took them the whole year until they learned properly how to use the system.

Both the users and providers need additional IT infrastructure to make use of the forms. We have encountered cases where suppliers use information provided in a separate system and manually enter to the IPC form and where IPC forms are integrated with custom-made IT software allowing automatically generation of reports.

2.5.6 General Feedback

There are conflicting information regarding the feedback. In general, both users and providers of information that have adopted the system think that IPC is a helpful system and they believe that the number of parties adopting the system is increasing every day. Particularly the component suppliers are happy about a standardization based on this system, because currently they have to respond to a diversity of requests coming from different customers – e.g. Nokia uses its own Excell based system to collect information. For such customized demands, the suppliers have to convert the information one more time – taking extra resources. With this system the suppliers can upload the information directly to the system of the customers – if such a system is in place.

According to a large electronics manufacturer, most players in the sector have not switched over using IPC and there are a couple of reasons for that. These are:

- The whole declaration requirement was triggered by RoHS, which came into force in 2006. Most companies developed their own system to respond to the requirement of RoHS. IPC was too late in bringing a solution to the market – by that time most companies had their own solutions:

- The standard is seen too slow to respond to the very rapidly changing regulatory landscape – a new version of the standard was announced to be out in June 2009, but still not out yet. Expected for first quarter of 2010.

- It is too complicated and not user friendly;

- It requires an additional information system to provide info and to make sense of provided information.

The fact that the file sizes increase drastically, even with the provision of basic information, is stated to be one of the down-sides of the system. It is also stated that there is a need to make the forms more user-friendly to ease data entry.

A major improvement to the system is stated to be the possibility of making "family declarations" – for components that have large number of parts, in which case currently an individual form is necessary for every part.

2.6 Concluding remarks

There are just a few examples of systems or structures that cover most of or the entire product chains. The good examples are to be found in the automotive and electronic sectors. These information systems are systematically fed by the raw material and component suppliers, aggregated by final product manufacturers. The weak point is that they do not automatically provide consumer/customer and actors in the EoL phase with this information. However, in many cases do producers add a tag on the product package that it is in RoHS compliance but they may also provide RoHS declarations or information on where additional information can be found on the Internet. In these, the systems have been triggered by various legal requirements of similar kinds in different part of the world. The product systems are also characterized by international actors and final product manufacturers of certain strength and visibility, which probably was an advantage when finding acceptance among the suppliers.

It's likely that similar systems may emerge in the toy sector since new and substantially stronger requirements have been developed and are under implementation in Europe and the US. There are activities going on aiming for finding the structures for systems suitable to meet these requirements.

Several large brand owners, often seen as well-know and visible companies, selling product of many kinds, want to safeguard the product safety in particular for the users – their customers. They build up proprietary information systems more or less visible in the public domain. These systems facilitate information provision from their suppliers in several tiers for instance regarding chemical content in products and traceability of products to the manufacturing units. Thus, it's possible for them to take fast corrective actions when the chemical compositions deviate from set specifications.

Information systems collecting information from upstream actors are also initiated by producers/sales companies for the sake of excluding certain substances. In contrast to the previous group, these companies often lack the same capacity to build and enforce their kinds of strict systems, which could be explained by less strict driving forces (for instance CSR ambitions and good citizenship requirements induced by pressure groups in the countries of sale).

It's obvious that all these systems share the need of sophisticated computer systems in order to manage the data and strict protocols for the data entering and display.

3. Stakeholders need for information regarding Chemicals in Products

This study, as well as several previous studies (KEMI 2005; Massey, Hutchins et al. 2008; Becker 2009), have established that a wide range of stakeholder groups, across the globe, recognise the presence of chemicals of concern in products, as an issue of concern. There is also no shortage of individuals and organisations saying that they need (more) information regarding the content of chemicals in products and confirming that the lack of information on chemicals in products is a barrier to sound decision-making. (Becker 2009)

The general underlying argument motivating this need, is of course the recognition that products are vehicles through which chemicals travel through our societies, and when these chemicals have hazardous properties they may cause harm to human health and/or the environment at one, or several, places along the path that the product travels during its life cycle. Ultimately CiP information should *enable,* and contribute to *motivate*[7], actors along the product chain to make informed choices about the design, selection, use, disposal and end-of-life management of products. (Informed choices, here meaning choices that will serve to reduce the risks and negative impacts associated with chemicals in products.) Arguably, enabling actors to factor in the hazard properties of chemicals in these types of decisions, will contribute to reducing the negative impacts of chemicals of concern on human health and the environment.

One significant challenge on the way to defining what a system for providing CiP information should look like is to define what type of information it should deliver, to whom, and in what form. As a starting point for that work it is important to understand what type of information different stakeholder groups need. In this chapter we will address that very question.

3.1 Method

In the collection of material for the description of Stakeholders needs for information, the material collected through the SAICM survey has been a starting point. The survey responses provides input, from more than 50 organisations representing different stakeholder groups around the world, and is a rich source of information regarding their respective perspectives on the question: Which information do you propose should be included in a future chemicals in products information system?

In the survey, under the heading - *type of information needed,* respondents were given six general information categories; manufacturing related information, chemicals related information, supply chain related information, use and handling related information, end-of-product-life related information and other. For each category they were asked to provide their views on the following:

- Specify what type on information is needed.
- Who would need this information?
- Explain the stakeholder's need/use of the information.

In addition to the survey responses the overview of stakeholders needs, is also informed by the range of interviews with stakeholders performed during the course of this project (see full list of interviewees).

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[7] It is important to recognize that information is often not a motivator in its own right. Information can motivate desired behaviour if the message is packaged in a way that is motivating to the receiver. However, while information certainly is a prerequisite for *enabelling* informed choices, the issue of what can triggers a change of behaviour in individuals and organization, is a question of a complex nature and experience have shown that information must often be paired with other activities seeking to influence people, such as education and the provision of different types of incentives, in order to generate a desired change in behaviour.

In these interviews we have prioritised speaking to representatives from industry and from the end-of-life sector, as the responses in the SAICM survey came mainly from the government and the NGO sector. A search for and review of relevant literature has also provided input to this discussion, as has pervious research performed by the authors.

The information collected provides insights into stakeholders needs from a wide range of stakeholder groups, (both such that are directly involved along the product chain, and such that can affect and/or are affected by the operations in the production chain and the product itself, but do not directly take part in production, use or EoL management), from a wide range of countries, representing a wider range of sectors. It must be noted however, that the results should be read as an overview of identified needs. With the collected material we can not draw any statistically valid conclusions with regards to whether a perceived need for a certain type of information is common or uncommon within a certain stakeholder group. Even so, the result serves as a good departure point for a continued discussion and exploration of the need for CiP information along and outside the product chain.

3.2 Outline of this chapter

In the following text we will start by discussing who, or what type of actors, can be defined as a stakeholder in this context. That is, the individuals and organisations that can affect, or are affected by, the content of chemicals in products and thus have, or could have, an interest in knowing (more) about chemicals in products. While stakeholder groups can be defined and categorized in any number of ways depending on the level of detail one is looking for and the selected characteristics based upon which categorizations are made, it should be noted that our discussion in this report will remain on a generic level where we make distinctions between stakeholder groups purely based on their place along, or in relation to, the product chain.

Before discussing each identified stakeholder group, we provide the reader with an overview of the different types of information that stakeholders have asked for when asked to identify their needs for CiP related information (in the SAICM survey as well as in conducted interviews, and in other reviewed sources). The ambition here is to illustrate all the different types of information that a system may be required to carry if it should cater to the needs of many different types of stakeholders.

After this discussion, we will move on to discuss each stakeholder group in a little more detail, starting by exploring what type of information may be of use to each particular group. In order to get at this question we explore why they need information; what questions do actors in this stakeholder group seek to answer, and what type of base data, and interpretation, is required to provide answers? It is clear the level of chemical expertise will vary significantly between, and often also within, different stakeholder groups. It is important to look at all of these elements when discussing the need for CiP information, and when discussing the needs of stakeholders who are not chemical experts, it is relevant to make a clear distinction between:

- The type of information needs expressed by each stakeholder group (e.g. an answer to a question such as - *is product X safe for the environment in the use and end-of-life phase?).*

- The baseline data or facts that is required to generate the desired information (e.g. a list of substances present in the product).

- The interpretation or evaluation of baseline data that is required to meet expressed information needs (the work of translating basic data regarding chemical content to information that is useful for a non-expert e.g. – *product X does not contain any chemical substances currently know to be harmful to the environment, so yes it is safe for the environment with respect to the risk of negative impacts of chemicals.)*

As a complement to the discussion regarding the information needs of different stakeholder groups we also discuss relevant characteristics of each stakeholder group that may influence their ability and motivation to produce, convey, verify, solicit and interpret information regarding chemicals in products. We argue that this is a relevant discussion in this context as any system for information regarding Chemicals in Products will be reliant on the ability and willingness of different actors to produce, store, convey and use information in the form and format provided by the system.

3.3 Categorizing stakeholders

In the following text we will start by discussing whom, or what type of actors, can be defined as a stakeholder in this context. That is who have, or could have, an interest in knowing about chemicals in products? Looking at the responses to the SAICM survey it is apparent that the answer to this question will include a very wide range of types of actors including, but not limited to, the following:

- Individuals, in their capacities as consumers, parents, employees and citizens
- Private enterprises, across all sectors
- Non governmental organisations, with an interest in consumer safety, labour rights and protection, environment, health, development and trade
- Governmental agencies, including agencies working with issues related to chemicals, environmental protection, consumer protection, health, trade and customs.
- Public sector organisations including health and emergency response services

To start off the most simple distinction to make is to distinguish between actors who are in some way directly engaged with the product along its life cycle, in any of the three generic life cycle phases; production, use and end-of-life, and actors who may still have an interest in CiP information even though they are non directly handling the product in any phase of its life cycle. In the continued text we will refer to the former group as *stakeholders along the product chain* and the latter as *stakeholders outside the product chain.*

In both these broad groups we find that actors express a need for CiP information related to specific products (e.g. information regarding what chemicals are present in product X, in what concentrations, etc.), as well as aggregated CiP information (e.g. information that will allow estimations of total flows of chemical substances through different product groups, or the probability of finding certain types of substances in a specific product group.)

In the group of stakeholders along the product chain (producers, distributers, users, recyclers and waste handlers) we find actors who may need information in order to make some form of decision that influence their action in relation to a specific product. In this group we find individuals, and organisations, that may need information regarding the content and properties of chemicals in order to answer question such as:

- *How should I design product X?*
- *What components should we select and put in product Y?*
- *Should I buy product Z or should I choose an alternative?*
- *What precautions do I need to take when working with product X?*
- *How should I dispose of product Y?*
- *How do we sort and categorise the different fractions of waste after dismantling product z?*

Stakeholders outside the chain may of course also affect, and be affected by, the content of chemicals in products. This group represents different societal interests and includes government agencies, NGOs and the public at large. In this group we also find actors who express a need for information regarding the chemical content a specific products, (e.g. for the purpose of determining compliance with local regulations or for the purpose of evaluating the health or environmentally related characteristics of a product and providing this information to others that are concerned).

However, it is relevant to stress that in both groups stakeholder have also expressed a need for aggregated CiP data, not just information regarding each specific product on its own but aggregated information that would for example serve as a means to understand the volumes and types of chemicals that enter an eco-system and the product groups who are the main sources. For private enterprises, and other organisations along the product life cycle, aggregated data may be useful, for example to assess the probability of finding a particular chemical in a particular type of product or component, this type information can be very useful when establishing routines for testing products/components for chemical content (as it may answer questions such as *what chemicals should we test for, at what intervals?*).

While stakeholders outside the product chain may involve a wide rage of different types of actors,[8] however, for the purposes of this report we have focused primarily own two broad groups; government (including both policy makers and enforcing agencies), and NGOs. We assume that information regarding Chemicals in Products will be of relevance primarily to government agencies and NGOS concerned with issues related to environmental protection, consumer protection (including consumer health and safety) and occupational health and safety. However we also recognize that agencies, and NGOs addressing other issues such as trade, commerce, and even poverty reduction, may also have an interest, perhaps not necessarily in the specific information regarding chemicals in products, but in the nature and characteristics of systems for providing such information and its effects on e.g. trade or on the competitiveness of small firms.

Given the broad scope of the report, where no limitations has been made with respect to geographical boundaries, and the only limitation with regards to products, is that chemical products (e.g. solvents, pesticides) should be excluded, the actors qualifying as stakeholders operating along the supply chain will per definition be tremendously heterogeneous. In the following section we take some time to discuss this broad group of stakeholders, and their relation to each other more in detail. Our ambition is partly to illustrate some of the complexities of the systems that provides and distributes products and those that collect and mange waste, but also to explain the choices we have made with respect to categorizations among actors within this broad group.

3.3.1 Stakeholders along the product chain – illustrating the complexities of systems for provision and end-of-life management of products

To illustrate the life cycle of a product, the concept of the *product chain* is sometimes used. Each part of the chain represents not only a phase in the product's life cycle, but also the actor controlling that particular phase and the chain-like links between actors that move the product from the cradle to the grave (of in the best of situations to the new cradle).. On a very generic and simplistic level such a chain would include the following elements: raw material extraction/production, chemical processing, component manufacture, product manufacture, use and end-of-life management, with some form of transportation occurring between each phase. (See Figure 3.1.)

[8] Including research institutions, the insurance sector, investors, banks and the media.

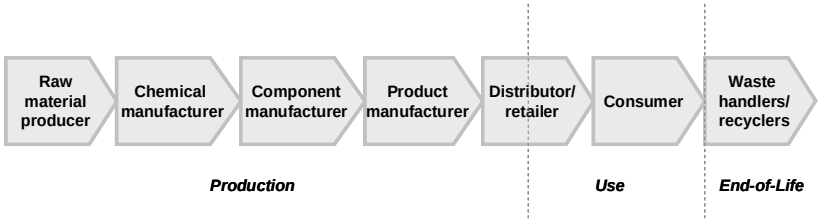

Figure 3.1. Simplified diagram of a product chain

If we take an example using a very simple product, a cotton T-shirt, and focus only on the production phase the product/supply chain could be illustrated as in Figure 3.2 below.

Figure 3.2: The production phase of the product life cycle of a T-shirt

Drawing a picture of a product chain, or at least using such a picture as a mental model, is very useful to analyse and to illustrate where major environmental impacts occur, in this context with a focus on understanding where chemicals enter the product. In this particular case chemicals are added to the product in the wet processes of fabric dyeing and finishing, but one may also find residues from pesticides added to the cotton fibre during cultivation as well as chemicals added to protect the material or the finished garment during storage and transportation.

However, it is important to acknowledge that the reality of business is seldom organised like this. A company hardly ever sells one type of product exclusively, and even if we did find a company, which only sold one particular type of product, it is still likely that previous steps of the product chain would include more than one actor, and thus the straight chain will start to branch out.

In order to have a realistic discussion regarding systems for conveying information through the product chain, we therefore need to introduce the supply chain concept into these discussions. When we discuss a supply chain we do not take the product as our starting point, but a company.[9] The supply chain can be defined as a: "Network of organisations that are involved, through upstream and downstream linkages, in the different processes and activities that produce value in the form of products and services in the hands of the ultimate consumer" (Christopher 1992). Why is the distinction between product chain and supply chain important? Because, whereas the product chain for a carton of milk might not be too complex, the supply chain of the grocery retail chain who sells the milk, along with all the other things you can find in a supermarket, may be very complex.

In the figure below we return to the previous example of a simple product, the T-shirt. The final stage before the T-shirt reaches the consumer is usually a clothing retailer. Figure 3.3, provide a very rough idea about the complexity of the supply chain of a very large multinational fashion retailer, a company that among many other things, sell a lot of t-shirts.

[9] It should be noted here that: "The supply chain metaphor" is used in many ways], but three meanings dominate the discussion: (1) the supply chain from the perspective of an individual firm (as in "ZipCo's supply chain"); (2) a supply chain related to a particular product or item (such as the supply chain for beer, or cocaine, or oil), and (3) "supply chain" used as a handy synonym for purchasing, distribution and materials management" (New, 1997, p. 16). In this report we use the term in the sense of the first suggested meaning.

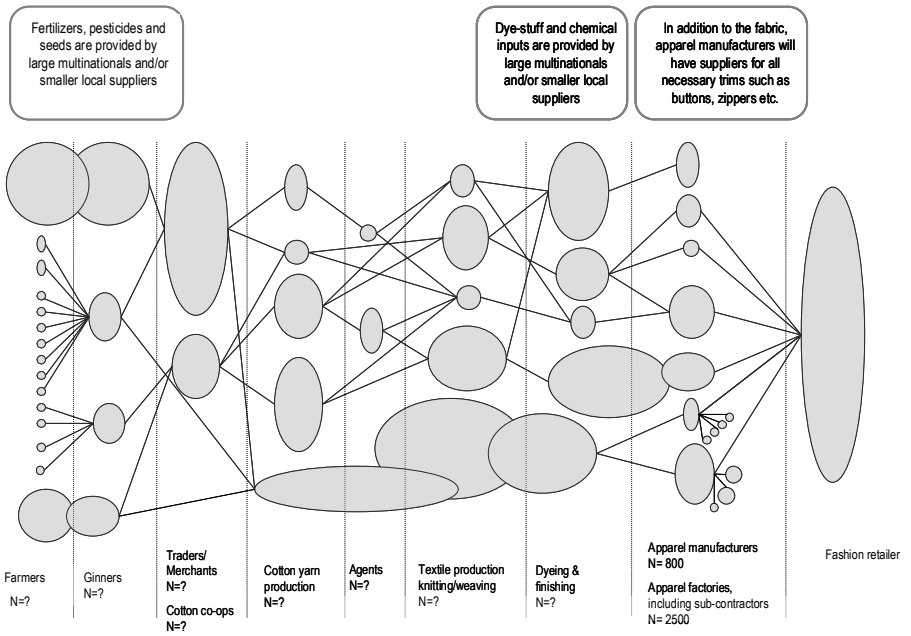

Figure 3.3. A rough illustration of the complexity of a large fashion retailer. (Kogg, 2009) (Please note that this image only includes the cotton alternative in the fibre producing stages of the supply chain.

This picture only begins to give an idea of the complexity of a full-scale supply chain, but it serves to illustrate some of the complexities present in many supply chains. One of the complexities lies in the sheer number of actors who are involved. If we take the example above, the company has 800 suppliers in the first tier; these in turn subcontract part of the production involving an additional 1 700 factories in the manufacture of garments. What lies beyond the first tier is less certain; surely there will be overlaps, with one apparel manufacturer using the same fabric supplier as another supplier, but to what extent we do not know, nor do the retailer in the example used. Still it is safe to assume that if we should trace all actors of a supply chain for a company that is near the end-consumer in the product chain, we will often end up with a large number of individual companies, even if the range can be considerable, from below ten to, possibly, millions, depending on the size and the nature of the company we take as our starting point. The different sizes of the circles in figure 3 are an attempt to illustrate that companies of very different sizes are part of the same supply chain, indeed even within the same tier of a supply chain. The circles overlapping are there to illustrate that vertical integration is present in the supply chain. However, far from all actors are integrated over several production stages, and the opposite may also be present, where one stage is further removed from the next stage by the addition of agents acting as intermediaries.

The complexity of supply chains is also present on other levels not possible to show in a static figure. There is the element of change and dynamism due to the fact that individual suppliers are added and dropped according to the evolving needs in the supply chain. Dynamism also arises as a result of changes within companies that are part of the supply chain, such as a change in ownership or management. The fact that many supply chains cross national boundaries also adds an element of complexity. Also from a CiP perspective, as this means that parts of a product, or indeed the final product, can be produced in a country with one set of regulations and commonly accepted norms for what is acceptable, but sold in a country with a completely different set of regulations and norms. Finally, we have an additional element of complexity related to the nature of dyadic relations between buyers and sellers along the chain. These relationships can look very different in different sets of dyads, even within the same supply chain, ranging from highly integrated to arm's length, and from collaborative to adversarial in their nature.

In short we can say that supply chains are, more often than not, complex and dynamic structures involving many different organisations located in several different countries.

In the example presented in Figure 3.3, the retailers supply chain is complex partly due to the fact that is sells large volumes and a wide range of products. However, it should be stressed that the t-shirt is an extremely simple product comprised of merely three "components" (excluding the packaging and added tags); the fabric, sewing thread and labels, complex products such as cars or buildings includes thousands of different components and parts.

Looking in the other direction starting when the consumer discards the product as waste, this is a process that is often illustrated as one single step in simplified illustrations of the product chain such as in Figure 3.1. Elaborating slightly it is possible to distinguish between three generic paths that a discarded product can take Figure 3.4.

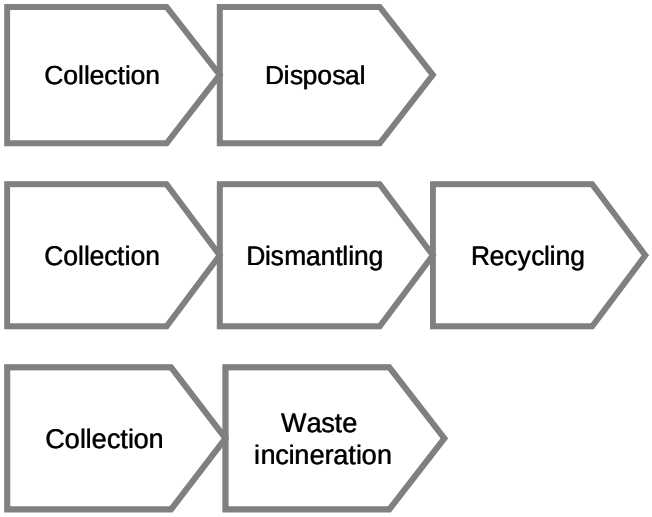

Figure 3.4. A simplified diagram of three generic paths of waste.

As in the case of the production phase of the product life cycle also the end-of-life phase is far more complex when we look at specific examples and try to map out who is involved. Such pictures will, of course, look hugely different depending on what type of products we are talking about, and depending on what country we are talking about. To give one example though, we have included the following picture that illustrates the different actors involved in the flow of end-of-life home appliances in Japan.

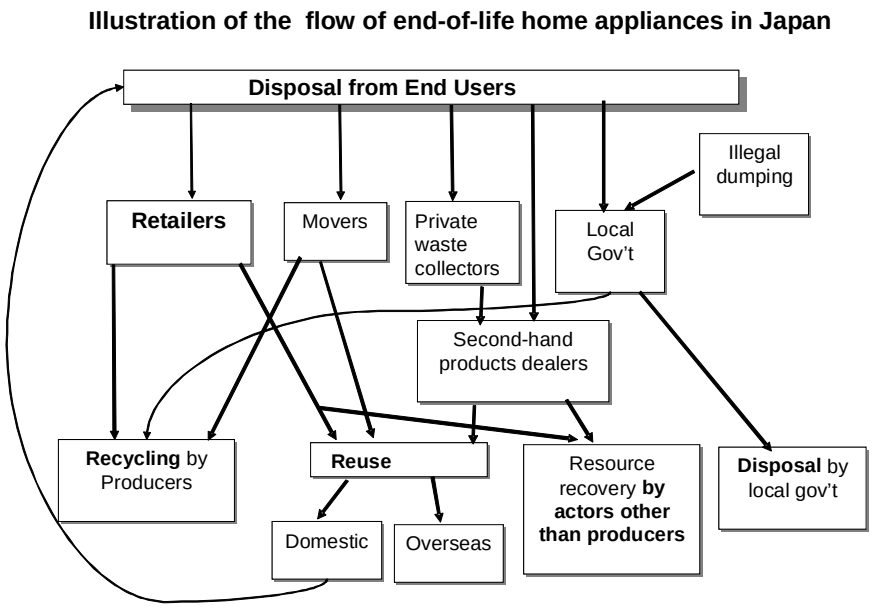

Figure 3.5. Illustration of the flow of end-of-life home appliances in Japan. Adopted from van Rossem (2008, p. 224)

In this setting categorizing is not necessarily a simple task, and it is clear that individual companies and persons within each category may not necessary share the same idea of what type of information they need. The perception of needs will be coloured by the specific context in which each actor is operating, but also by their internally held norms and their understanding of the problems and risks that may be associated with chemicals in products, as illustrated in Figure 3.6.

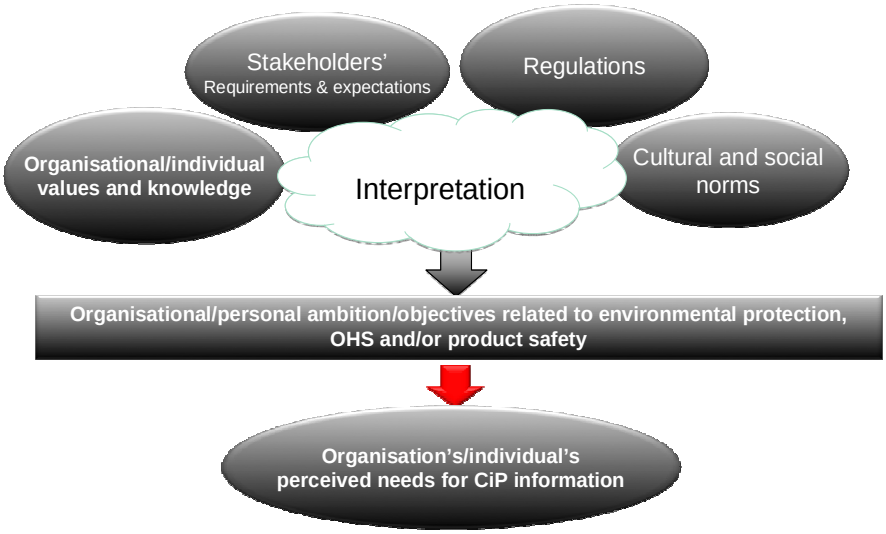

Figure 3.6. On the level of individual actors (organisations or persons) the perceived need for CiP information will vary, according to the influence of many different factors.

While collecting and analysing expressed needs for information regarding chemicals in products we have deliberately kept the stakeholder categories very broad as we feel that this is best suited for the scope and the purpose of this report. In the following discussions about stakeholder needs for CiP information we distinguish between three groups of stakeholders operating *along* the supply chain:

- **Producers of non-chemical products, (producers hereafter):** Here we include all actors involved in *production, distribution and sale of products* with the notable exception of producers of chemical products and raw material producers. We do not make more detailed categorisations, such as e.g. distinguishing between component producers and OEMs, or between OEMs and retailers, the reasons for this is two fold, partly it is related to the fact that companies often do not fit these descriptions very neatly. A company may fit in many different categories e.g. being both an OEM and a retailer, or both a wholesaler and a retailer. The second motive behind deliberately keeping this category very broad is related to the nature of the data collected through the SAICM survey. The survey does not provide guidance to the respondents with regards to classifications of different type of actors within the production chain, and although some respondents make distinctions, it is often possible to make different interpretations with regards to what type of actor they are referring to.

- **Consumers:** Which may of course be individuals, but is can be relevant to highlight that organisations and states are also large consumers in their own right.

- **End-of-life actors:** Here we include all types of organisations involved in the collection, sorting, dismantling, processing, transport, recycling, incineration and final disposal of waste.

In addition we will, as noted earlier, devote some time to discuss two broad groups of stakeholder operating *outside* the product chain:

- **Government agencies and policy makers**, and

- **NGOs.**

3.4 CiP information – an overview of identified needs

It is clear that individuals and organizations may solicit information regarding chemicals in products for many different purposes but, leaving issues related to product characteristics, quality and price aside, it is possible to argue that CiP information is relevant in relation to three major areas of public, and private, interests; product safety for the consumer, environmental protection with respect to impacts caused through out the products life cycle, and occupational health and safety for people handling or using the product in their work, in production and distribution, at the point of sale and in the end-of-life management of products.

While occupational health and safety issues in relation to chemicals is commonly associated with the use of chemicals in their pure form or in chemicals products such as paints or solvents, it is relevant to stress, that also chemicals in products may have an impact on the people that handle them in their working environment. When the worker/employee is using a product in his work, such as a computer or a cellular phone, the issue of occupational health and safety is of course identical to the issue of product safety. However there are situations when these issues are distinct. This is perhaps most notable in the end-of-life sector, and it is important to note that products that are considered safe for use, may still pose a occupational health and safety risk for people who work with dismantling and recycling at the end of the products life.[10]

[10] One prominent example where this is the case is the electronics sector, in particular when the waste is handled under less controlled working conditions, which is a typical situation in countries that dismantle a very large part of the world's old

The fact that information regarding chemicals in products is of relevance to all of these three areas (environmental protection, consumer protection and OHS) is very much reflected when we collect and analyse the type of information that stakeholders have expressed a need for. Below we provide an overview of information that is desired by different stakeholders together with information regarding who might need this information and for what purpose.

As mentioned in 3.1, data for this overview is collected from the responses to the Survey of SAICM Focal Points on the Need for Information on Chemicals in Products, complemented with the interviews made for this report and previous studies made on the topic. In the following discussion we will use the following categories as a base to account for the identified information needs. (Here we follow roughly the same information categories that were used in the SAICM survey, although with slight modifications in the headings.[11]):

- Producer related information
- Supply chain related information
- Chemicals related information
- Information regarding precautions for safe use/handling and disposal
- Information related to the end-of-live management

3.4.1 Producer related information

Respondents to the SAICM survey have not been given a common definition for the term producer to abide by, but the answers generally reflect two different alternatives; i) the producer as being the organisation responsible for final assembly of a product and ii) the producer as being the organisation responsible for putting the product on a defined market. In the following we will discuss the two alternatives separately.

Expressed need for information related to the producer responsible for putting the product on the market

With respect to information related to the producer responsible for putting the product on the market most respondents in the SAICM survey state that they want a *name and contact details of the producer* responsible for putting the product on the market. The motivation given is frequently related to ability to trace the product for the purpose of being able to contact the producer to request more information if needed, but also to ensure an ability to monitor and enforce compliance with regulations and liability. It is worth noting that more than one respondent to the SAICM survey have specifically stressed that a responsible person must be named and that this information be made available to authorities, importers and consumers.

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electronics. Studies of workers health under such conditions have indicated very high exposures to dangerous chemicals know to cause damage to DNA and a variety of health ills. Wen, S., F.-X. Yang, et al. (2008). "Elevated Levels of Urinary 8-Hydroxy-2-deoxyguanosine in Male Electrical and Electronic Equipment Dismantling Workers Exposed to High Concentrations of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans, Polybrominated Diphenyl Ethers, and Polychlorinated Biphenyls." Environmental science & technology. 42(11): 4202-4207.

11 Please note that we have changed the names of the categories slightly to make them more self explanatory and to fit with the terminology used throughout this report.

Expressed need for information related to the producer responsible for final assembly of a product

While many respondents also want the *name and contact details* for the producer responsible for final assembly of a product, (notable motivation here includes the ability to trace the product upstream in order to be able to request more information, but also the ability of customers to make purchasing decisions based on e.g. country of origin), a number of respondents however, go much further than this and are asking for detailed information regarding the producers facility. One respondent, representing government, asks for all *relevant information regarding production, including used chemicals and amounts*. The respondent argue that access to such information would enable both authorities and buyers downstream to distinguish if problem arise by mistake "a bad production line", or if it is a general problem with the product. Other respondents have listed similar information needs, primarily related to production methods and chemicals used and *date of production*.

3.4.2 Supply chain related information

With regards to information related to the structure and details of companies involved in supplying input materials, components or products to the company or organization responsible for placing the product on a defined market, the list of required information to follow a product quickly branches out and becomes quite complex. Respondents have expressed a need for the *names and locations* of all actors involved in the supply chain, as this would enable them to find relevant actors in the chain if more information regarding a product or a specific component of the product is needed. One respondent, representing government, argues that *a description of the supply chain* of the finished product would enable them to identify possible hazardous substances reaching their country through the supply chain. Also here respondents have asked for *manufacturing dates of products and components,* and some respondents have expressed a need for more detailed information regarding the different actors involved in the supply chain, including information regarding *production methods, manufacturing date and batch number*. Motivation for requiring such detailed information includes the ability of enforcing agencies to ensure compliance and the ability of consumers to make informed choices.

In addition to names and locations of production facilities (for chemicals, materials, components and products) along the supply chain, a few respondents have expressed a need for the *names and locations of shipping facilities and warehouses,* arguing that this would enable retracing the chain of production.

3.4.3 Chemicals related information

Information related to the content of chemicals in the product and any potential hazards and risks associated with this content.

In the SAICM survey we find respondents expressing a need for information regarding *chemicals in a product* and respondents expressing a need for information regarding *chemicals of concern in a product*. The distinction is of course important and will have significant consequences for the design of a CiP system, but it is not necessarily clear from the survey responses, if respondents have made this distinction deliberately nor is it fair to make any statistical assessment on the preferences for one or the other, based on this material.

It is interesting to note that the list of stakeholders that survey respondents have listed as needing this information is very extensive including; actors in the End-of–Life sector (dismantlers and recyclers), consumers, producers, industrial workers, transporters, NGOs, government and enforcing agencies, and health care professionals. The motivation includes ability to minimize risk, safe use and handling, the ability to identify products that are not in compliance with legal restrictions and the ability to identify products containing chemicals of concern.

With respect to chemicals contained in the product respondents note a need for information about *generic* and *trade names,* as well as *CAS numbers*. Less frequents, but also expressed is a need for information regarding the *weight* or the *percentage* of the chemical makeup in the products.

In addition to information about the identity of the chemicals found in the products, respondents have also expressed a need for information regarding *hazard classes following the GHS system*. In relation to hazards, respondents have also noted the need for information *enabling the assessment of risk* such as the migration of chemicals from the product, and the *quantity of contained hazardous chemicals*. Some respondents also ask for information with regards to the *risk* associated with the product to be provided within the CiP system.

Other examples of information asked for by respondents, at a less frequent basis, include *information regarding the analytical methods used,* and that *content of hazardous substances* that are named *in different international agreements*, should be specified.

In the survey responses there are some comments with regards to the appropriate level of details when it comes to information regarding chemical content. Several respondents have pointed out that information needs to be presented at an adequate level of details, though there is not necessarily a consensus with respect to what is an adequate detail level. It also appears that the appropriate level of detail may be dependent on the type of product in question.

For example with regards to hazard information, we find several respondents arguing for the need to differentiate information to fit the needs and competences of different stakeholder groups. The distinction is typically between consumers and other stakeholder groups. For examples we find stakeholders asking for relevant *Safety Data Sheets* to be accessible for actors with adequate technical competence, whereas *"easy to understand" information* should be made available to the end users. Another respondent argue along the same lines but clearly suggest that hazards should be communicated to consumers by means of warning signs.

3.4.4 Information regarding precautions for use and disposal

Here respondents have identified the need for the following type of information:

- Information on safe use and storage of products
- Information regarding what to do in case of accident/exposure/injury
- Recycling, remanufacturing and reuse information, including information regarding producer take back schemes
- Information on how to safely dispose of products (waste category)

A key stakeholder group for this information is consumers and motivations include the ensuring to safe use and disposal for consumers but also that this information can enable consumers to make an informed choice. This information would arguably enable consumers to actively deselect / reject products that require particular precautions to be taken during use and/or in disposal.

Other stakeholders identified as needing this type of information includes other types of users and handlers of the products, and organisations representing such users/handlers including: professional users, and individuals handling products in the supply in storage, shops or in transport, and their trade unions.

Other frequently identified stakeholder group for this type of information include government and enforcing agencies, (here it can be relevant to particularly notice enforcement agencies responsible for judging the validity of reclamations of products) and NGOs. For NGOs it is mentioned that this type of information is useful in relation to advocacy work and awareness raising efforts.

Respondents to the SAICM survey have noted a problem with many users' manuals not being translated into their local language, and respondents have also noted that such information needs to be presented at an adequate detail level appropriate for different stakeholder groups. One respondent, representing government, have particularly pointed out the need for such information to be available on the actual product.

3.4.5 Information related to the end-of-life management

Here we find expressed needs for information, instructions and precautions with respect to how to handle the waste product. That is, information of particular relevance for stakeholders to the end-of-life phase of the product.

Respondents have listed the need for information regarding *chemical content, concentrations, location of substances in the product and hazard classes as useful information*, but also *specific information regarding appropriate waste segregation after dismantling the product and precautions for the safe management of the waste*, both with respect to workers health and safety and with respect to environmental protection.

Primary recipients of this information are organisations and workers in the end-of-life management of products but also other stakeholder groups have been noted such as government and enforcing agencies as well as NGOs and consumers.

3.5 CiP information needs - a stakeholder perspective

Below we will take a closer look at the five broad categories of stakeholders identified in section 3.3. For each of these categories we will synthesize the collected data with regards to expressed needs for information. We will also discuss the reasons why a particular type of information is needed by looking at the following questions: What are CiP related questions that this stakeholder group seek to answer? What type of base data and what type of interpretation are required to provide relevant answers?

In addition we will also venture in to a brief discussion addressing significant characteristics of, and variations within, each broad group which that may influence their ability and motivation to produce, convey, verify, solicit and interpret information regarding chemicals in products. As noted in section 3.3, we believe that this is a relevant discussion in this context as any system for information regarding Chemicals in Products will be reliant on the ability and willingness of different actors to produce, store, convey and/or use information in the form and the format stipulated by the system.

3.5.1 Producers and distributors of non-chemical products

The first, admittedly very, broad group of stakeholders to discuss, includes all organisations involved in the production of non-chemical products. Here we include all actors involved in production, distribution/sale and sale of products (including actors involved in production, distribution and distribution/sale of components and materials that later become part of more complex products) with the notable exception of producers of chemical products and raw material producers.

Producers and distributors of non-chemical products - drivers behind the perceived need for CiP data

Producers of non-chemical products need chemical information for a number of reasons, including legal compliance (including Extended Producer Responsibility (EPR) legislation), and a need/desire to respond to requirements and demands for information from customers and other stakeholders. However it should also be noted that producers may also be pro-active looking for information even though there are not legal requirements or any other stakeholder pressure exerted on them to do so. Companies may look for chemical information as such information may be critical in order for them to achieve, and assess performance in relation to, defined objectives related to product safety, product and process focused environmental management, and OHS. Here is should be noted that these types of objectives will most likely reflect regulatory requirements as well as expectations and requirements from salient stakeholders, but it should also be acknowledges that they may also go beyond those requirements and expectations reflecting the internally held values of an organisation.

In this report we have not sought to assess the relative importance of different drivers but it can be noted that for companies the need to safeguard product safety and, consequently, buyer/consumer trust is of vital importance, as a failure in this respect can have significant direct and indirect costs associated with it. Direct in terms of cost of withdrawing the product from the market and settling any

claims that the buyer may have, and indirect in terms of the costs associated with damages to the image of the brand.

It should also be noted that regulation appear to have a significant impact as CiP systems and company and sector specific Restricted Substances Lists developed by producers typically reflect current, and sometimes anticipated, legal requirements on relevant markets.

Producers and distributors of non-chemical products – identified needs for information

Representatives from all types of stakeholder groups responding to the SAICM survey have indicated that producers need information regarding content, location and concentration of chemicals (of concern) in products (and components, materials and chemical products). It is also identified that producers need SDS or alternative sources of information regarding the hazardous properties of included chemicals of concern and the risk of hazardous emissions during storage, handling, use and waste management. With regards to, in particular, waste management, it should be noted that when talking about complex products such as cars or electronics it is also of relevance to provide information regarding where in the product are hazardous chemicals to be found.

It has been stressed by industry representatives, that CiP systems should consider both hazard and exposure information, and that the risk of exposure should be considered when evaluating what information should be communicated.

Producers very often recognise the need to have information regarding the content and hazardous properties of chemicals in products, as this information enables them to ensure compliance with regulation as well as the ability to respond to stakeholder (including customers) requirements and queries and to avoid the risk of problems associated with product safety and associated damages to brand reputation. It is relevant to note here that interviewed producer representatives who have contributed to this report frequently stress the need for guidance with regards to "relevant chemicals". Since the task of soliciting and verifying information about chemical content in components, materials and products, can be both complex and resource intensive, individual companies (as well as sector initiatives such as the Joint Industry Guide: Material Composition Declaration Guide for Electronic Products and the American Apparel & Footwear Association Restricted Substances List) reduce complexity and thus cost by narrowing and, in cases where sector initiatives exist, harmonizing the list of chemicals which should be avoided and/or reported if present in the product.

The process of narrowing the list generally involves finding the answer to the following types of questions:

- What chemicals are currently defined as harmful?
    - By regulation in relevant markets
    - By salient stakeholders
    - By independent experts (a method of anticipating forthcoming regulation)[12]
    - Through own evaluation according to GHS criteria or similar
- Which of the chemicals identified as harmful can we possibly find in a specific product category? (This eliminates the need to solicit and verify information about chemicals that are not used in the particular product category)

[12] Several proactive companies seek to anticipate coming legislation and future stakeholder needs as the process of integrating new chemicals in their CiP systems may take as long as up to a year before fully implemented.

The answers to the questions above will produce a list of chemicals that are of concern and that may be found in products of a certain product category.

In addition, companies are also looking for information and guidance (harmonization) regarding commonly accepted testing methods related to each relevant chemical substance. In order to increase efficiency in the management of chemicals in products, companies may also need information with regards to the probability and frequency of use of each chemical identified as relevant, as this will enable the company to develop appropriate routines for testing frequency.

It is also worth noting that producers have also expressed a need for information regarding safe(-er) substitutes to harmful chemicals.

It should be acknowledged that in order to produce this type of guidance a certain level of chemical expertise as well as information regarding regulation and requirements (current and forthcoming) from salient stakeholders, is required and that this type of resources may not be present in small and medium sized companies. In the light of this it is not surprising that we have seen several sector initiatives being developed that provides guidance and harmonization for producers in a certain sector.

Producers and distributors of non-chemical products – characteristics and variations of relevance

Given the complexity and size of many supply chains it must be recognized that any CiP system may need to be able to handle and structure large amounts of data, allowing many different actors to feed in and access information. In this context it is relevant to recognize that the IT infrastructure of different companies will vary significantly in terms of sophistication and capacity, as will the IT competence available within the organisation. Here we can expect to find significant differences between developed and developing countries, but experience shows that there are also significant differences between companies within the same country or region.

When discussing this group of stakeholders, it is important to note that producers come in many different shapes and sizes, the products that they make differ along several different parameters such as complexity in terms of ingoing materials and components. Testimony from downstream actors closer to the consumer, such as retailers, have shown that information regarding chemical content in product is far from always readily available or known by the producer of a product. Getting this data may require substantial efforts related to soliciting information from actors further upstream or, alternatively, comprehensive testing for chemical content. It should also be noted that even if a producer has information regarding the content of inputs, unforeseeable chemical reactions may occur in production that creates new substances. Essentially it is important to acknowledge that producers need to produce data about chemicals in a product. This information it is not something that systematically flows from sellers to buyers.

3.5.2 Consumers

Again, here we are talking about a very heterogeneous group of stakeholders and differences in perceived needs as well as the ability to utilise CiP information will vary significantly across and within nations and regions. Thus the discussion below illustrates different types of needs that have been identified, but on an individual level there will be big variations in perceived needs.

Consumers - drivers behind the perceived need for CiP data

On a general level it can be said that consumers may seek information regarding chemicals in products out of a desire to:

- buy safe products that carry no risk to, and possibly, contribute to personal health (an expression of concern for their individual wellbeing and that of their close relations),

- reduce environmental impacts associated with personal consumption (an expression of concern for the environment,
- contribute to the protection of the health and safety of people handling the product along the products life cycle (an expression of concern for the well being of others).

However there can be several different underlying reasons behind individuals' interest in environmental protection.

On an individual level, the perception of what is safe and what is hazardous (both in terms of health and in terms of environmental impact) varies from person to person. This will have a direct effect on the exact type of information desired. Such variations are of course partly rooted in personal values, but may also reflect differences in level of trust of regulatory frameworks and enforcement (for consumer and environmental protection), as well as personal knowledge with respect to chemicals and their impacts.

Consumers – identified needs for information

Principally consumers need CiP information to assess whether a product complies with their individual ambition related to product safety and/or to environmental protection. In practice this need can be manifested in various ways.

It is plausible to think that there are consumers that have no particular interest in chemicals in products as a result of having no personal objectives related to product safety or environmental protection.

Other consumers will assume that product safety and/or adequate environmental protection is safeguarded by producers they deem as trustworthy, or by enforcement of governmental regulations. Such a consumer will also not perceive that they have any need for CiP information.

At the next level there are consumers who may want reassurances with regards to product safety and/or the environmental impact associated with the product, but who may be satisfied by a simple statement, for example a guarantee from the producer saying that the product is safe/cause no harm to the environment.

There are also consumers that desire more detailed information, or that may have questions with regards to how, and who, have made the assessment regarding whether or not the product is safe or harmful. Within this group we will find all sorts of variations with regards to what level of detail of information is necessary, whether or not information should be externally verified, and with regards to the definition of which chemicals and which products are harmful and which are safe.

Obviously, these groups or levels are dynamic; for instance alarming headlines in newspapers draw attention to the issue of chemicals in consumer goods and often lead to increased demand for one or another system that guarantee product safety, health aspects, workers conditions or environmental protection. Consumer may also demand guidelines (from trustworthy sources) with regards to what are better choices from CiP perspective.

In addition to this kind of information, that primarily is relevant in the purchase situations, consumers also need information and precautions for safe use and for appropriate disposal of the product when is no longer of use.

It's been stressed by many that information provided to consumers need to be in a language that they can understand. But clearly getting the message across is not only related to the language. It's also a question of how the messages are interpreted in the local cultural context. Thus the messages need to be adapted to the skills of the receiver, meet the needs of/being adjusted to his/her level of ambition, and be sent in a format that the receiver can access.

Consumers – characteristics and variations of relevance

Because products may have a reasonably long life-span, it is important to acknowledge that information that reflected the knowledge available and showing the product was safe at the time it was produced is not a guarantee that it would be considered safe if it would be produced twenty years later. Our understanding of the impacts of chemicals is growing from day to day and as a result of this, new chemicals are continuously being identified as hazardous.

In general any efforts related to providing CiP information to consumers must address the challenge associated with diversity of consumers in a global perspective. An illustrative example is the GoodGuide system, which through its I-phone applet[13] allows consumers to access detailed CiP information as they are standing in the store with the product in their hand. This is a practical solution of conveying data in countries where many people interested in this type of information also have access to an advanced mobile phone. Else it would not work at all for people who don't have this kind of equipment.

3.5.3 EoL

Also with respect to the category of stakeholders related to the EoL management of products, it is a considerable challenge to seek to understand and summarize the needs for information in a group of stakeholders that in reality is extremely heterogeneous. The EoL sector involves several different types of actors (see 3.3.1) including waste collectors, dismantlers and recyclers of material as well as organisations managing final disposal and/or waste incineration (with or without energy recovery). These tasks are distinct from each other and therefore the need for information may vary between actors involved in different types of activities. However, it also important to note that the type of organisations involved in different activities related to EoL as well as the technology and methods employed vary greatly between different parts of the world.

EoL - drivers behind the perceived need for CiP data

An important driver behind the need for CiP information in the EoL phase is the need to ensure occupational health and safety for the workers involved in its operations. Other important drivers include the fact that chemical content may have direct financial consequences for the actors in this field, as the content of chemicals in a product may affect the cost of processing the waste (including the potential interference with the processes by some chemicals), but also the potential value of the processed waste stream. Legal requirements e.g. with regards to banned substances, targets for recycling rates, Extended Producer Responsibility, OHS and environmental protection have also been noted as an important driver, as is demand for information from authorities and other stakeholders. Finally the desire to ensure correct and efficient recycling, treatment or disposal paired with the desire to optimise operations and maximise recovery volumes and purity/quality of sellable substances and materials is also a driver behind the need for information for actors in the EoL field.

EoL – identified needs for information

As noted above, in the discussion of drivers, EoL actors have a need for information regarding the content and hazardous properties of chemicals in the product. This information serves several different purposes:

- It enables them to establish a sound management system of handling the waste

[13] An applet is small application or computer program that runs in the context of another program such as a web browser or and I-phone.

- It enables them to ensure appropriate protection for workers health
- It enables them to ensure that appropriate measures are taken to protect the environment
- It is of relevance when determining (and subsequently and pass on information with regards to) the content of hazardous chemicals in recycled materials and to ensure that banned substances does not re-enter the product chain through the use of recycled materials
- It is also of relevance in the assessment of the cost associated with a managing a particular waste product, as well as the potential that it may generate in terms of sellable recovered or recycled materials.

In particular with relation to the last point, the need to have detailed information regarding the weight and/or percentage of the chemicals present in the product has also been identified.

Another type of information frequently mentioned both by respondents in the survey but also by the EoL actors interviewed for this report is the need for information regarding name and contact details of the producer responsible for putting the product on the market. The common motivation being that this enables the EoL actor to contact the producer and solicit more detailed CiP information if required

Here it has also been mentioned that EoL actors may need the name and contact details for suppliers of ingoing components and/or materials, and it is relevant for e.g. dismantlers to know where in the product hazardous chemicals may be found, and the contact details for producers of parts of complex products will allow them to make inquiries for detailed information regarding constituents and components of the product if needed.

While the access of appropriate information regarding chemical contents may reduce the need for contacting producers it is relevant to note that contacts between producers and EoL actors can be beneficial in many respects. Such contacts can not just yield information for the EoL actor with regards to the content of chemicals, but it may also provide EoL actors the opportunity to give producers important information with respect to the recyclability of their products.

Respondents to the SAICM survey have also remarked that actors within the EoL sector have a need for guidance and precautions with respect to appropriate methods of waste segregation and management, and with respect to ensuring a safe working environment.

In contacts with actors in the sector it also becomes clear that they have a need for aggregated data with respect to products and the chemical content in products – as such information is relevant when planning capacity and making decisions about scale and focus of facilities.

Most respondents, representing stakeholder groups outside the EoL category, argue that there is a lack of information available for actors within the EoL sector, and that such information is important. It is worth noting, that while the actors (representing the EoL field in North America and Europe) that have been contacted in the process of working with this report agree that information regarding chemical content of products is important the do not express an urgent need for more or better information. One respondent argued that it might have been useful, but expressed doubts with regards to whether they would be able to cope with large amounts of specified data in the real time pace of their operational practice.

EoL – characteristics and variations of relevance

As noted in the introduction to this section (3.5.3) this stakeholder group is very heterogeneous along several parameters and on an actor level the need for information will be very different. If we take the example related to the need for guidance and precautions with respect to appropriate methods of waste segregation and management, it is reasonable to assume that this may be much more relevant for small-scale low-tech actors in the EoL sector as compared with advanced facilities with considerable in-house expertise. In the latter example, information regarding chemical content (and possibly associated hazard

information) would be sufficient as they would be in a much better position than any stakeholder operating outside this field to determine the appropriate methods for managing the waste in a way that is safe for the environmental as well as the health of their employees.

Clearly the advantages of improved collection, recycling and treatment of waste streams are manifold. Products containing hazardous substances can cause significant damage to health and to the environment if not treated appropriately at the end of the products' lifecycle. It is also important to remember that waste streams also contain valuable resources. To provide an example, it has been reported that modern electronics may contain up to 60 different elements, including base metals like copper (Cu) and tin (Sn), Special metals such as antimony (Sb) and cobalt (Co) and precious metals e.g. gold (Au) and palladium (Pd), many of these are valuable and some of course hazardous.(Schluep, Hagelueken et al. 2009) Failure to collect and recycle these resources effectively also means that we fail to reduce the need for primary resources, and consequently the adverse environmental impacts associated with primary resource extraction.[14] *"Essentially, the environmental footprint of a fridge, a computer and other electronic devices could be significantly reduced if treated in environmentally sound managed recycling operations, which prevent hazardous emissions and ensure that a large part of the contained metals are finally recovered for a new live in a new (electronic) device."(Schluep, Hagelueken et al. 2009)* To a larger or smaller extent this is true for many product groups.

It is therefore relevant to explore what role (improved) information regarding Chemicals in Products may play for the ability of EoL actors to appropriately and effectively manage the recycling chain, including all stages from collection to end-processing, in order to reduce hazardous emissions and maximize recovery of contained resources. It is reasonable that for some actors within this group information may be instrumental for achieving such improvements but arguably there will also be other actors which will need more than just information to be able to change and improve their operations. A curb-side recycler burning cables to retrieve copper may be aware that this is harmful to his/her health but may have little choice with respect to stopping this practice, if this is the only source of income and the means to improve the method of recycling is unavailable.

3.5.4 Government and enforcement agencies

While CiP information arguably is has a strong link to the policy areas of environmental protection, consumer protection and occupational health and safety, it is worth noting that the responses to the SAICM survey have identified a wide range of different types of governmental bodies and agencies that may need CiP information, including environmental protection agencies, consumer protection agencies, commerce agencies and customs agencies. Other areas of the public sector identified as a stakeholder needing CiP information include the health care sector and emergency response providers.

Government and enforcement agencies - drivers behind the perceived need for CiP data

CiP information is of relevance for policy development and enforcement in the area of product safety, OHS and environmental protection (throughout lifecycle of product). CiP information is of relevance for enforcement of regulation, as well as collection of a knowledge base for future regulation. In addition CiP related knowledge enable authorities to develop information and other policy initiatives designed to stimulate substitution of hazardous chemicals as well as, when needed, taking appropriate action to inform the public regarding CiP related risks or hazards.

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[14] Even if the resources contained in each unit may be preciously small, the total volumes become significant. A recent UNEP report states that: *The combined 2007 unit sales of mobile phones and personal computers already add up to 3% of the world mine supply of Au and Ag, to 13% of Pd and to 15% of Co.* Schluep, M., C. Hagelueken, et al. (2009). Recycling - Fram E-Waste To Resources. Paris, United Nations Environment Programme & United Nations University: 1-90. p. 7.

Government and enforcement agencies - identified needs for information

- Name and contact details of the producer responsible for putting the product on the market
  - Used for: monitoring legal compliance, for being able to contact the producer to get more detailed information, for ability to hold responsible party liable for any harm
- Name and contact details for actors along the supply chain
  - Used for: traceability of products and actors responsible for putting them on the market, for the purpose of being able to getting more information as well as ability to exercise influence over the relevant actors
- Manufacturing date and batch number
  - Used for: product monitoring and ability to identify batches that have been contaminated by harmful chemicals (by mistake)
- Identification of chemicals in products and their hazard properties
  - Used for: facilitating monitoring of compliance with relevant regulations, rapid identification of products containing chemicals of particular relevance/interest, a source of input information to risk assessments, facilitate & enable awareness raising activities. Enable and facilitate the development of potential exposure scenarios and/or the identification of exposure path ways, and related to this to enable aggregated assessment.
- Weight and/or concentration of each chemical (of concern) present in the product
  - Used for: Input to risk assessments, legal enforcement
- Migration of chemicals from the product:
  - Used for: Input to risk assessments
- Precautions regarding safe use and disposal.
  - Used for: May be of relevance to authorities responsible for determining issues related to reclamations. To develop material for special stakeholder groups that may need particular guidance as a result of cultural habits.

The majority of respondents from the government sector were asking for information regarding the content of chemicals in products. This is not surprising as such information, if readily available will not only enable other stakeholders to make informed decisions but also significantly facilitate enforcement and control related to product safety. It is relevant to stress that there is also a very high demand for information related to the name and contact information details of producers where demanded by respondents from the government sector as was information that could enable the identification of specific batches of products such as manufacturing date, and batch number.

3.5.5 NGO

NGO's need for CiP information will be directly related to their purpose and agenda, and their chosen strategy for achieving this agenda. On a general level it is however arguable that CiP information is instrumental for organisations carrying out work in the fields of consumer protection, environmental protection and the protection of labourers.

NGO - drivers behind the perceived need for CiP data

While NGOs need for information will be defined by the organisations purpose one identified driver is the perception of the organisation that the regulative framework and/or the enforcement of regulation not to be adequate for protecting e.g. human health and/or the environment from risks associated with chemicals in products, and the perceived need to assist or influence stakeholders to make informed choices with respect to chemicals in products in order to address the perceived problem. Essentially information enables NGOs efforts related to advocacy work and awareness raising.

NGO – identified needs for information

In the SAICM survey respondents identified name and contact details of the producer (and supply chain actors) as being relevant for NGOs. The motivation being that this enables general advocacy work but also that it allows the NGO to actively seek to influence the producer to substitute harmful chemicals with safe(-er) alternatives. In addition information regarding content and hazard properties of chemicals in products and information with regards to precautions for safe use, disposal and handling in the EoL phase was identified as being of use to NGOs with the same motivation that this enables advocacy work and awareness raising in relation to relevant stakeholders.

It is relevant to note that NGO's can be both users and producers of CiP information. Several NGOs search and compile information with regards to chemicals in products, but there are also examples of non governmental organisations that actively produce this information by using different testing techniques to identify chemicals in a product.[15]

While discussing potential future CiP systems, it is not only relevant to understand what type of CiP information that NGOs have a need for, but it is also relevant to factor in the important job that many NGOs performs in this context. Not only in terms of compiling and analysing CiP related data, but also in terms of communicating this information to different stakeholders thus contributing to enable these actors to make informed decisions that can be of critical importance for their own health and/or the protection of the environment. There is a widely recognised need to adopt CiP information to different stakeholders and to actively ensure that information reaches relevant actors, in particular those who may not actively look for it. Here NGOs can, and do, play an important role as interpreters and conveyers of receiver friendly CiP information.

3.6 Concluding remarks – a picture of broad strokes

In an overview like this one we have focused on finding general patterns, and it should be highlighted that the picture that we have painted is by necessity a picture of very broad strokes. With a scope of this nature it is virtually impossible to cover the finer details with regards to the exact nature of information asked for and the multitude of variations that exist within each broad stakeholder group. In the following chapter we will however reflect upon what the existence of such variations means for the process of designing a harmonised system for the provision of CiP information.

[15] Examples of the latter include US based organizations GoodGuide and Healthy Stuff.

4. Conclusions and reflections

In this final chapter, we bring together the findings regarding the identified needs for CiP information with the findings regarding the identified systems that provide such information. We seek to illustrate that while there are different types of systems, for the collection and the provision of CiP information, in place in many industrial sectors; stakeholders still perceive a big lack of information. It is evident that existing CiP systems do not carry all the required information that different stakeholders indicate a need for, nor do they make gathered information (readily) accessible to all interested parties.

We can conclude that there is a perceived need for more information regarding the chemical content of products than what is currently accessible. It also seems likely that there is a reasonably significant group of stakeholders who may not *perceive a need* for CiP information, but who would arguably benefit from having such information, if it was presented in a format that would enable them to make decisions that would be beneficial to individuals' health of and/or to the environment.

This recognition that there is a need for more accessible information regarding chemicals in products is of course the motivation behind the resolution by the second session of the International Conference of Chemicals Management (ICCM2) to implement a project on Chemicals in Products. Below we discuss the findings of this report and offer a few final reflections that we believe to be of relevance in the continued work with the CiP project.

4.1 CiP information – the gap between identified needs and systematically provided information

4.1.1 Stakeholders' needs – heterogeneous and continuously evolving

It is clear that representatives from a very wide group of different types of stakeholders perceive a need for CiP related information. Stakeholders with an interest in CiP information includes actors that operate at all stages along the product chain (from cradle to grave/cradle) but also actors outside the chain, including governmental agencies, NGOS' the research community and public service providers such as emergency response and the health care sector.

In a global perspective, considering the broad focus on all (non-chemical) products that has been the scope of this report, this group of stakeholders will per definition be tremendously heterogeneous. Heterogeneous in all respects; including the resources, skills, priorities, and values of the individual or organisation, as well as the cultural, social, environmental and regulatory context in which they operate.

It is therefore not surprising that the question – *What type of CiP related information do you need?* - has generated a range of different answers. This is partly a reflection of the heterogeneity of the stakeholders, but it is also an important reminder that CiP information is used for many different purposes. Different stakeholders seek answers to different types of question (e.g. *is the product safe for the user, is the product safe for the environment, how do we need to treat this product to prevent negative environmental impacts at the end of its useful life etc.).*

Another important element to consider is the different levels of relevant expertise or knowledge that different stakeholders possess. To the expert, information regarding chemical content may be very useful information, but to the layman this may not be helpful at all. The layman will also need help and guidance with respect to how to interpret this information. Consumers are often given as an example of a stakeholder group where many actors have very limited chemical expertise, but it is important to point out that it is not uncommon that professional buyers (who are not part of, or direct customers to the chemical industry) also express a lack of skills and knowhow when it comes to chemicals. While it is common for larger companies to ensure that they have chemical expertise in the organisation, we have also seen many examples of people in private and public organisations perceiving their lack of knowledge regarding chemicals as a problem.

We have established that information regarding chemicals in products can be required for many different purposes and is used, by people of very differing levels of chemical expertise. To complicate matters even further we must also keep in mind that different stakeholders will have different ideas about how to answer the same question, and as a consequence there will also be differences with respect to what type of information is required to provide answers. One example is the fact that different stakeholders (e.g. industry and environmental/consumer protection groups) often have differences of opinion with regards to acceptable criteria for determining whether a product is safe for use and/or for the environment.

Still, when looking at the responses to the survey and the interviews made for this report on an overarching level, it is possible to find patterns with respect to the type of information that is asked for, and it is clear that the need for information goes beyond information regarding the chemical content in a product. It therefore becomes relevant to discuss what type of information should be provided through a CiP system and what type of information lies beyond this scope.[16]

The SAICM survey asked the respondents to indicate what type of information a system for CiP information should include. In our opinion, some of the indicated information needs, such as detailed information regarding production methods and specifics regarding the organizations along the product chain may be beyond the scope of what a CiP system necessarily should convey. However, there are other types of needs, above and beyond information regarding the chemical content, that are important to consider in any discussion regarding a CiP system. To enable non-experts to interpret the information regarding chemical content, information regarding hazards and risks are desired and, associated with this, information regarding precautions for safe use/handling and disposal. In addition a significant number of respondents have indicated that they want information that enables them to trace the product upstream. Again, we find several reasons motivating the desire for this information, it may be motivated by the need to identify the actor with legal responsibility for putting the product on a market, but it is also a way to ensure the ability to identify and contact actors, one or several tiers, upstream in the product chain, e.g. if there is a need to get additional information or a need to influence these actors to change the chemical composition of their output.

As an addition it is also worth noting that stakeholders in industry, government and the NGO sector have all indicated the need for general and aggregated CiP information, not specifically related to the chemical content of a specific product (or its components). This type of information is for example useful for industry as it can assist and guide companies in their work with addressing the issue of Chemicals in Products. Examples include the need for information regarding what chemicals have been identified as harmful and should be avoided, which chemicals are commonly found in certain categories of products, what are suitable substitutes for harmful chemicals, appropriate testing methods and limit values etc.

In this report we show the variety of *categories of information needs* that different types of stakeholders have expressed. However, within the scope of this study, we have not been able to assess, how frequent or common it is, within each particular stakeholder group to express or perceive a need for a specific type of information.

Still in designing a CiP system there is of course a need to define exactly what type of information the system should provide. Here we would like to argue that while any discussion about CiP systems certainly need to reflect upon expressed needs for information, we would also like to stress that stakeholders' perceived needs for CiP information is coloured by the context in which they operate, as well as by the individual stakeholder's current knowledge and values. It is for instance reasonable to

[16] While it is clear that there is a need for many different types of information, it may not be practically possible, or even appropriate, to create one system that will cater to all identified needs. While the findings of this report may generate a basis for a discussion regarding what information to include in a CiP system the final scope must of course be a reflection also of political objectives, legal context and practical realities.

assume that stakeholder' perceptions with regards to their own need for detailed CiP information will be coloured by their perception and beliefs about the effectiveness of the legal framework and enforcement mechanisms that are in place to protect human health and the environment. If I believe there are adequate and effective legislation in place to protect consumers in my country, I might not perceive a need for detailed information regarding chemical content. In addition to the existing heterogeneity in the presented snapshot of currently expressed needs, we must also factor in the *evolution* of needs and recognise that as knowledge regarding the issue of chemicals in products grows and spreads, across and within, different stakeholder groups; the perceived needs for information will evolve and change as well.

In light of this, we propose that in the process of designing a CiP system one must not only reflect the information needs that are explicitly expressed by different stakeholder groups, but also the values and position of government on this issue. While it is a useful exercise to ask stakeholders – *What information do you need?* –it is also important to be consider the political goals and ambition with relation to OHS, consumer protection and environmental protection, and with this in mind look at experiences and research that may help us answer the question: *What type of CiP information, conveyed to what type of stakeholder groups, in what type of format, through what type of channel, has the potential to enable and/or motivate these stakeholders to make decisions that would be conducive to reducing negative environmental and health related impacts associated with chemicals in products?*

4.1.2 Many systems – patchy information and patchy accessibility

In this study we have found several systems providing some sort of CiP related information, however, there are only a few systems that are broadly adopted and convey information along several tiers of the product chain, most notably the IMDS and the systems following the IPC 1752 standard. By comprehensive we refer to systems that cover information regarding a wide range of substances and transfer information along the chain including several different actors. By broadly adopted we refer to systems that have many users in each tier of the product chain. As a contrast there are also plenty of initiatives that provides limited/narrowly defined CiP information e.g. info regarding the content of one or a few particular substances of concern, as well as systems that provide one-way information from one sender to a specific stakeholder group, such as NGO or government initiatives for providing information for consumers. Third party eco-labelling and product certification schemes are also of relevance in this context, as the criteria for such schemes often include restrictions with regards to residues, and/or migration, of specified hazardous substances in/from the product.

It is clear that availability of systems providing CiP information is unequally distributed over different industry sectors. Comprehensive and broadly adopted systems for conveying CiP information are primarily found in the automotive and electronic industries. However, initiatives for comprehensive systems have been found also in other sectors for *individual countries*, such as for building materials in Sweden. Other sectors where there are several different, but less broadly adopted systems in place for the provision of CiP information includes textiles and apparel and emerging initiatives in the toy industry. Hygiene and personal care products are a special issue, as many countries require a declaration of content on the product packaging (still several stakeholders point out that these declarations of contents often are far from exhaustive and complete). thus making information available. It is interesting to note the initiatives such as GoodGuide and Healthy Stuff, which uses this type of information (along with information from additional sources) to provide guidance for consumers regarding which products may be of concern from and environmental and health perspective.[17]

Beside the common systems in operation in the mentioned sectors, several large companies (often in the retail business) run their own proprietary systems for tracking and controlling hazardous substances in the products they offer. (It is relevant to note that many automotive companies had such systems before most of them joined the IMDS system common for the sector.) The prime aim of these systems

[17] We would like to remind the reader that we have excluded chemical products in this report, see 1.4.3.

is generally to ensure product safety, legal compliance and to be able to trace back products and producers who do not comply with the set standards. The spread and application of such systems is difficult to evaluate due to their proprietary character, though information found in newsletters and other public sources indicate that these type of company specific initiatives are broadly adopted for instance in the textile sector in Europe and North America.

It is worth noting that identified CiP systems are primarily initiated by actors located in Japan, USA and Europe. However, users and providers of information into these systems may be located throughout the world as a result of globalised product chains.

Even though there are sectors where large systems are in place, or where several companies are running individual initiatives, we have not in this study been able to assess to what extent these systems cover all actors in a sector and/or in a region. We expect that there are considerable variations, depending on sectors, region, the output market, size of individual organisations etc.

4.1.3 Gaps between expressed needs and provided information

When going over the list of identified systems it becomes apparent that some form of system for provision of CiP information exists in practically all sectors as illustrated by the table below.

Table 3. Examples of CiP related systems for selected product categories

Sector	**Some examples of existing systems for provision of CiP related information to actor in one or several tiers of the product chain**
Clothing & apparel	Öko-tex, Eco-labels, Healthy Stuff. Proprietary systems based on company or sector RSL initiatives.
Children's products, including toys	Ecolabels, Healthy Stuff, GoodGuide, Toy Safety Certification Program, Arnika, Systems according to the IPC 1752 standard (for electronic toys). Proprietary systems based on company or sector RSL initiatives.
Computers, cellular phones & electronic goods + Electrical goods and household appliances	Systems according to the IPC 1752 standard, BOMCheck, EPEAT, Environmental Product Declarations, AEHS. Proprietary systems based on company or sector RSL initiatives.
Batteries	BOMCheck, Eco-labels. Information systems designed to meet legal requirements for information provided on the product, such as EU Battery Directive.
Building materials	BASTA, Pharos, Building Material Declarations, Eco-labels, Environmental Product Declarations
Furniture and bedding	Eco-labels, Öko-Tex. Proprietary systems based on company or sector RSL initiatives.
Food Containers and food packaging	Arnika. Proprietary systems based on company or sector RSL initiatives.
Automotive sector	International Material Data System (IMDS), JAMA/JAPIA, JAMP, Healthy Stuff. Proprietary systems based on company or sector RSL initiatives.
Paper and printed materials	Eco-labels
Non-food packaging	BOMCheck, Eco-labels, Arnika. Proprietary systems based on company or sector RSL initiatives.
Cosmetics and Personal Care Products	Skindeep, GoodGuide, Healthy Stuff, legal requirement regarding declaration of content on the packaging of the product
General/Unspecified product groups	California Proposition 65, IMERC, Environmental Product Declarations

However, it is very important to note an overview like this one can be deceptive as most of these systems are limited in terms of who they reach and/or in terms of the information that they carry. As mentioned previously we have only identified comprehensive and broadly adopted CiP systems in the automotive and electronics sector.

Also in cases where systems are in place some stakeholders have also expressed a content related gap. That is they have expressed that they are not receiving all the information that they perceive a need for. Stakeholder may, for instance, want information regarding more substances than what is currently declared through the system. In addition stakeholders want more guidance with regards to how to interpret and make use of the provided information regarding contained substances in the products. In addition there are stakeholders how argue that they do not only need to know what substances a product contains but also the level of migration from the product during use and/or the end-of-life phase. This information is of course highly relevant in order to determine whether a product is safe for handling, use and the impacts associated with end-of-life treatment.

Regional gaps:

It is clear that most of the initiatives to develop and establish specific CiP information systems and information exchange, identified in this study, originate in Japan, North America and Europe. Responses to the SAICM survey and interviews made also indicate that more information is available to stakeholders in these countries compared to other regions of the world. This does *not* however mean that information regarding chemicals in products are broadly accessible to all actors in these regions, *nor* that stakeholders in other regions don't perceive a need for CIP information. On the contrary, the SAICM survey shows that CiP information and associated capacity-building is requested in other regions. Existing systems originated in developed countries are adopted internationally. We have also seen examples of country and region specific CiP systems are under development in developing countries, such for automotive and toy industries in China.

Given the current global nature of many product chains, the needs and requirements for CiP information have already had global implications. In systems such as the IMDS, producers from all parts of the world are part of the system. It appears that the trend is that legal and stakeholder requirements for CiP information is disseminating into virtually all regions of the world. However, we have not been able to ascertain whether this also translates into an increased flow of CiP information to consumers and the end-of-life sector also in the developing regions of the world.

Actors' information gaps:

Based on the SAICM survey, complementing interviews and earlier reports (Edlund, Peck et al. 2004; Massey, Hutchins et al. 2008) it is clear that many stakeholder groups perceive a lack of information related to chemical content of the products they handle. While this indicates that CiP information is not available, one should also account for the possibilities that information is available but not readily or easily accessible to the stakeholder, or that the information is readily available but the stakeholder is not able to understand or make use of the information.

In general, we found that there is an expressed demand for better CiP information from representatives in all discussed stakeholder groups. It is relevant to stress that even in cases where information is available to a certain actor in the product chain it is not necessarily conveyed through the chains to actors in subsequent tiers. This type of break in the chain of information is perhaps particularly noticeable when the product moves to the consumer. With the exception of chemical products, including cosmetics and hygiene products, producers are rarely legally required to provide information regarding the chemical content of a product. (Although such legislation is being introduced in certain countries e.g. the European REACH regulation.) During the interviews made for this study we have noted a break in the chain of information for instance in the textiles and the furniture sector. Where the company selling the product have, more or less, comprehensive information but this is not transferred

with the product. In these cases it is not uncommon that companies publish information regarding the chemical restrictions employed, which means that customers may find information regarding what is *not* in the product by actively looking for this information. However active communication from company to final consumer with regards to chemicals in products is often held very general, the message typically being; "we have procedures in place to ensure that our products does not contain chemicals that are deemed as hazardous". It is interesting to note that there are other actors outside the chains, typically NGOs, that have set up systems to fill this gap and to make CiP information and guidance readily available to concerned consumers (e.g. the Good Guide, Healthy Stuff, Pharos and Arnika)

It is interesting to note that EoL actors rarely are included in the identified CiP information systems, (with the notable exception of labelling on the product such as information regarding heavy metals in batteries and fluorescent light sources). It is well known that the chemical content in waste products is an area of great concern not least in developing countries[18]. In this study we have mainly had input from EoL actors based in Europe and the US and here the messages regarding the information needs among the EoL actors are mixed. Some actors operating modern facilities claim that they know which products and components (may) contain hazardous substances and sort them out, while others claim that there is a huge information gap. Again, it is worth stressing that beside the developed EoL sector which is using modern treatment methods, there is the informal EoL sector, particularly in many developing countries. There are frequent reports of poor or miserable work, health and environmental conditions on these sites.

4.2 Closing the gap

It is obvious that designing CiP systems is a challenging and complex task including considerations of disparate and sometimes conflicting interests, levels of ambitions, etc. One central challenge facing those involved in the project of developing the CiP system, is the need to balance an overwhelming complexity and heterogeneity of expressed needs for information (needs which the system should potentially satisfy), with strong preferences for harmonisation.

While it is possible to find common ground regarding the need for information and general principles with respect to the nature of information that a system is desired to deliver, it is clear that a CiP system can not be built on consensus regarding the general directions. This requires agreements regarding detailed specifications related to several issues such as what type of information that should be conveyed, format for the information exchange and technical platforms, among other things.

Several informants, including respondents to the SAICM survey, have stressed the need for CiP information to be user friendly, harmonized and appropriate for the needs of different types of stakeholders.

The dilemma is to reconcile the need and desire for a harmonized CiP system with the need to adapt information to different stakeholders. Considering the wide range of stakeholders and the wide range of purposes for which CiP information is used, it is clear that the idea of one system delivering the desired information, in a user friendly format, to all types of stakeholders seems utopian.

To get around this dilemma we think it is important to stress that the challenge faced by anyone who seeks (or should be encouraged) to make a decision taking into account the impacts of chemicals in products is two fold:

- The first challenge is to know what substances are present in the product or able to migrate from it. If this information is not provided by a, trustworthy, informant getting this information may require costly testing procedures. Here it is worth noting that many stakeholder groups can not be expected to carry out such tests.

[18] See for instance "Solving the e-waste problem" initiative: [www.step-initiative.org]

- The second challenge is to interpret and evaluate the information to serve one's purpose. Since the purposes may vary, there is an important component of knowledge for drawing reasonable conclusions.

In accordance with these challenges mostly CiP information systems contain components of information and knowledge in two distinct tiers:

- Tier 1: Information on what chemicals there are in the product, and possibly also what chemicals that can migrate from the product in which life cycle phase of the product;
- Tier 2: Information on/interpretation of what the chemical content means, how this should be evaluated and, sometimes, instructions for actions.

The often very different expressed information needs should be acknowledged when developing CiP systems. We perceive that one path that could satisfy many of the needs builds on a CiP information system supplemented with tailored support functions provided by stakeholders and stakeholder groups sharing similar needs. Thus, we would argue for a system that harmonize the tier 1 information but leave the tier 2 kind of information to be adjusted and harmonized by and for certain groups of actors. The rationale is the following:

Harmonizing tier 1 lead to more easily accessible information since both information sources/access points and information formats would be standardised. Clarity regarding where to go to obtain the information may lead to a more common knowledge on its accessibility and hence increase the manufacturers' knowledge on chemical composition of materials and components their products consist of. We assume that this will provide a solid stepping stone for other actors and stakeholders to tailor information for certain needs.

The rational for several kinds/sets of adjusted tier 2 kinds of information connected to harmonized tier 1 information is simply the multitude of functions and needs for that kind of information.

First of all, the chemical content information could be used for a wide range of different purposes, including:

- Producers need to safeguard that the products are safe for the consumers; either through the inherent features of the product or by instructions for safe use of it. This particular need includes several aspects, such as knowledge on different risks related to various potential (consumer) uses of the products for instance by adults and children, different risk assessments for surface coatings and built-in components, etc. There may also be different perceptions and interpretations of the risks/risk assessments.
- There may are needs for safe OHS handling and management of different risks associated to the handling of the products by chain actors, not least the EoL actors. Actors may also need adjusted information on safe and appropriate disposal of obsolete products and discarded components.
- Different actors along the product chains also process and evaluate the chemical content information for the sake of potential needs for substitution of substances, materials, components or products. Thus, there is need to both identify substances, etc. that should be substituted, suitable alternatives as well as information on how to do it.
- Product designers may need other kind information in order to proactively design products without hazardous substances, devise recycling schemes, user information, etc.
- Policy-makers may use the information for development of policies and strategies in the area of chemicals and products. Similarly, also corporate managers may want to develop their corporate environmental policies based upon better CiP information.

The expertise and knowledge to use, process and evaluate chemical information vary both between individual actors and (in general terms) between sectors and groups of actors and stakeholders. Consequently, there would be very different demands on the tier 2 information.

In case the tier 2 information requires risk assessments, including assessments of hazard and exposure, the complexity of conducting appropriate exposure assessments should be acknowledged. The complexity related to an exposure assessment of a single product/article is generally high, and that multiplied by the number of products/articles under consideration makes the task of generating risk assessments for them all almost overwhelming. Hence, it appears more productive to decide whether CiP information should target/balance hazards or risks in order to meet specific needs in dialogue processes. Moreover, dialogue processes could be used for setting scope for and tailor the risk assessments for standardised applications.

We also notice that different actors and stakeholders have different risk perceptions and views of acceptable risks. Typically consumer and environmental NGOs do demand more information and highlight chemical risks higher than the legal requirements. In our compilation of CiP information systems there are several such examples (e.g. GoodGuide, Arnika, BASTA) However, there are also significant differences between actors within the same groups, when some want to go further and being more precautionary in their evaluations than others. Typically, the difference is a matter of if a substance should be proven to be harmful or if it should be proven not harmful.

Furthermore, the demand on tier 2 information is related to technology making the information accessible. For instance, consumers and the informal sectors may need information provided through other channels than databases or mobile phone application programs.

Finally, we perceive different a propensity to actively seek and make use of information among actors and stakeholders. The system for provision of tier 2 information may need to be designed and delivered in order to trigger the desired reactions among the actors that are supposed to take up the information for sensible decisions.

The need to make CiP information user friendly is sometimes used as an argument against making information regarding chemical content available. Typically the argument is that actors, in particular consumers, will not know how to interpret and make informed decisions based on such information. The argument is valid in the respect that different stakeholders do need adapted information. However, it is important to recognize that the bases for all adapted information is knowledge about content thus making this information available should be seen as a critical stepping stone for making "user friendly" information available. In this context, information regarding the chemical content, in product categories where such information is more readily available, we have seen several initiatives where organisations use this information to evaluate products based on their chemical content and provide this information in a user friendly format to stakeholders (e.g. Pharos, Healthy Stuff and Good Guide).

Based on content information, a CiP information system could be further developed by inclusion of additional information modules in a stepwise process as the uptake of the information and the knowledge of its use evolve among the users. This is a development pattern we have observed in existing CiP systems and the few insights in proprietary CiP-like systems we have gained experiences from.

It is also important to emphasize that making CiP information available triggers important learning and development among actors who are exposed to this information. Thus we can expect that a CiP information system with information regarding chemical content of products will contribute to developing and increasing the knowledgebase regarding chemicals in products and their impacts. Experience from the automotive industry and IMDS system shows that such learning occurs and that it is appreciated among participants to the system.

4.3 Challenges ahead

If we assume that a potential future CiP information system would be built on harmonized tier 1 information (content and migration) and that tier 2 information (interpretation, evaluation, etc) would be adjusted and tailored by different actors for different stakeholder groups, harmonization would still be a complicated process including decisions at several levels.

There are still several issues which must be addressed in such a process. One fundamental decision for providing information regarding chemical content is if the system should build on:

- full disclosure of all contained substances; or
- disclosure of substances limited/defined in the system, such as agreed restriction lists of declarable substances or legally restricted substances.

There are considerable challenges associated with both pathways, but arguably they will be slightly different in their nature.

For a full disclosure, some of the key challenges are:

- Legal protection of companies' composition of products, proprietary materials and trade secrets (Paska 2010);
- Difficulty in defining what full disclosure actually means since new substances may be formed through chemical reactions in the manufacturing process or through decomposition of added substances;
- Presumably, at least initially, more resource intensive for actors expected to provide data of sufficient quality than if they are asked to provide information regarding a list of predefined substances.

For disclosure of substances limited to listed/pre-defined substances, some of the key challenges are:

- Agreeing on which substances that should be declared in the system, including deciding on the process of selecting them;
- Agreeing on and maintaining the process of updating the lists as knowledge and legal requirements evolve;
- Important information may be lacking for old/historical products.

Establishing sector specific lists of declarable substances may reduce the obvious risk of conflicts when negotiating substances subject for disclosure. For instance in the electronic sector, CiP systems following the IPC 1752 standards can facilitate information on contained substances at different levels, from legal requirements only to (almost) full disclosure. However, sector specific lists may also cause conflicting interests when individual upstream actors are part of product chains of several sectors, for instance a textile company providing goods to consumers, aviation and automotive industries.

In the choice of any of the two paths for chemicals/substance disclosure, we realise that the process of developing CiP system(s) would entail considerations of the following issues:

- **Rules and principles**: on substance level regarding rules and principles on how and what specific information to report into the system, including naming/numbering of substances, concentration threshold values (cut-off points), principles for giving account for parts and sub-components, such as coatings, glues and adhesives attached to the product, etc.
  We have observed that similar accounting principles for threshold values are used in several systems. These principles appear to be influenced by the rules applied for MSDS according to GHS and its precursors, REACH, ELV and RoHS.
- **Information access**: regarding if the CiP information should be open to all, certain stakeholder groups or selected actors as well as who is in power of deciding, giving access and

is the owner of the information. Alternatively, should the information be restricted or open at certain stages of the product chains, for instance for consumers.

In existing supply chain CiP information systems each manufacturer is the owner of his information and has the right to give or deny access to it. Apparently, this principle is sufficient for the supply chain actors but at least some consumers/consumer representatives find the restrictions unsatisfying and thus set up CiP systems for the good of the public and private consumers. The issue of information access is also tightly connected to the disclosure issue and proprietary information of the producers.

- **Control and verification**: if individual producers are responsible for the quality of the information they provide as a kind of self-declaration, some actors may demand for third-party information quality control and verification.

  Thus, there is a need to consider if such control and verification should be employed, who should be responsible for doing it and how the procedures for that should be organised. Among certain actor groups, in particular consumer related ones; there is distrust in self-declarations and call for better control. We realise, however, that new problems may arise if the responsibility for the information quality is transferred from the producers to other controlling bodies.
- **Sanctions**: if there is a need to use sanctions in cases no or false information or information of insufficient quality is conveyed by individual actors. Sanctions may be a useful tool for the ultimate enforcement of a CiP system but may be difficult to implement in practice.

  We have not found any examples or road models of how sanctions can be put into effect in a CiP system but the issue may be voiced when/if new CiP systems are designed.
- **Information format**: the considerations include the format (structure/template/lay-out) of the information in order to provide a user-friendly interfaces (which is connected to the technical platform channelling the information flow), traceability of both components constituting the product as well as upstream information providers.
- **Technical platform for the conveyance of the CiP information**: the choice of technical system for the transfer of the information is also determining the function and subsequent success of the CiP system. The information could either be attached on the product, managed through web based electronic data systems (EDS) or combinations of the two. Web based EDSs have the capacity to connect users (with Internet access) regardless where they are situated geographically. There is a promising technical development allowing for new applications, such as RFID tags and micro chips to be attached to the individual product that can carry the information. These techniques are however not yet in common use for CiP systems.

  There are examples of web bases CiP information systems (e.g. JAMP, BOMcheck, IMDS) that appear to be both flexible and able to manage huge amounts of information. Typically, the capacity to operate such web based EDSs is sourced from specialised consultants. Mostly, users need education/training to upload and retrieve data from them.
- **Legal status of the system**: when introducing a new CiP system, one should consider if it should be based on voluntary principles or being more or less mandatory for the chain actors.

  The CiP systems in operation are in most cases consequences of legal requirements (e.g. the American IMERC and California's Proposition 65, RoHS and ELV). Also proprietary CiP systems appear to safeguard legal compliance but primarily with consumer safety requirements as rationale for the implementation. The voluntary CiP systems are mainly run by external actors processing information aiming to provide consumers with appropriate information.

4.4 Final reflections

It appears like policy-makers have different and crucial roles in order to design incentives for producers and other chain actors to participate in designing and joining CiP systems and to facilitate the further development and evolvement of such systems. Such roles and interventions may contain:

- Defining and shaping requirements on producers to take on the responsibility for building up a solid knowledge base on the chemical composition of their products. Possible approaches may include further use of extended producer responsibility (EPR), with a certain focus on the responsibility to know and being able to provide other actors with relevant information. Furthermore, the product issue and the use of hazardous substances could be given increased

attention in environmental permit processes as supplement to conventional aspects such as acceptable emissions levels.

- Policy-makers may also consider voluntary agreements with major and influential producers in manufacturing and trade.
- Stricter requirements on information of good quality on chemical composition of products could both increase and ease recycling of discarded products and reduce the environmental impacts from waste and create incentives for the adoption of CiP systems.
- The process aiming at identifying and updating the public knowledge on hazardous properties of substances would serve as a continuous driver for the further development and justification of potential CiP systems.
- Furthermore, policy-makers have a role to build and improve the knowledge and capacity among actors in industry and trade to process and make use of information on chemicals in products. Such capacity building can be channelled through industry sector associations, education and on-the-job training, etc.

At last, we would like to underline that prevention at source reduce or eliminate problems further downstream. While it is critically important that recyclers take precautionary measures to protect the environment and the health of their employees, it would have been preferable if chemicals with the potential to cause harm had not entered the product in the first place. It is therefore important that the society at large and policy makers in particular, maintain a high pressure on the chemical industry to ensure the safety of the chemical products that they put on the market, as well as to help facilitating safe use of them.

The implementation of CiP information systems that enable downstream actors to factor in the content of chemicals (of concern) in their buying decisions, whether it is a company buying components or an individual buying a product, or (in the case where EPR legislation exists) a recycler putting a price on the waste product or the service of recycle it, will enable policy makers to harness the forces of the market to contribute to put pressure on the chemical industry.

The essence we would like to emphasize is the critical importance of a well-designed policy mix addressing both producers and users of chemical products as well as actors further down the product chains and the products they process, produce or consume. Such a policy mix includes for instance permits and bans, restrictions and phase-out initiatives, economic and market based instruments, extended producer responsibility, informative instruments and knowledge creation.

Early information on chemical compositions of materials, components and products would support preventative strategies both for confirming safe practices and for systematic chemical risk reduction. The launch of systems for information on chemicals in products is a policy measure contributing to such preventative strategies in the area of chemicals and products.

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Abbreviations

CiP	Chemicals in Products
CMS	Chemicals Management Systems (structured system for the handling of information on components, products, content of (hazardous) chemicals, and suppliers)
DfE	Design for Environment
EDS	Electronic Data System
EPR	Extended Producer Responsibility
EoL	End-of-life
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
ICCM	International Conference on Chemicals Management
NGO	Non governmental organisation
OEM	Original Equipment Manufacturer (mostly seen as producers of finished products)
OHS	Occupational health and safety
ppm	Parts per million
SDS	Safety Data Sheet
REACH	Registration Evaluation and Authorization of Chemicals
RoHS	Restriction on Hazardous Substances
SAICM	Strategic Approach to International Chemicals Management
SVHC	Substances of Very High Concern