



# Chemicals in Products

– Challenges and approaches

# KEMI

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# Summary

- We are surrounded by products, at home and at work. The number of products is increasing every year and this growth means use of larger volumes of chemicals.
- Today's products are more complex than they used to be. They contain many components, materials and chemicals. Chemicals are used in the manufacturing of materials such as plastics and synthetic fibres, and various chemicals are added to these materials to give them the functionality and appearance that we desire.
- Since chemicals are present in almost all products, the flow of materials in society is also a flow of chemicals. The market for products is global. Products are produced in one part of the world, then transported, used and turned into waste – often on other continents.
- We lack information on properties of many chemicals and on the hazards associated with these. We need to improve this information.
- There is a general need for improved communication between actors in a product's life cycle. Producers and retailers need information on chemicals in products to be able to comply with applicable legislation and to make informed choices.
- Information on chemicals in products during their entire life cycle would enable the recycling of more material and ensure greater safety when it is reused in other products, which is key to achieving resource efficiency and a circular economy.
- In order to protect human health and the environment, use of the most hazardous chemicals in products needs to be avoided.

# Challenges

## We are surrounded by products and chemicals

We are surrounded by chemicals in various forms, at home and at work. They are an integral part of our daily lives. There is hardly any industry where chemicals are not used, and they are used in a wide variety of products and processes. The number of products is increasing every year, and so are the volumes of chemical substances and mixtures.

Chemicals are used in the manufacture of products and many of them are still present when the products are placed on the market. Hazardous substances in the products may pose health risks for those producing the products, those using the products and those working in waste handling and material recycling. Hazardous substances may also be spread into the environment during production, use, waste handling and material recycling.

## The use of chemicals today

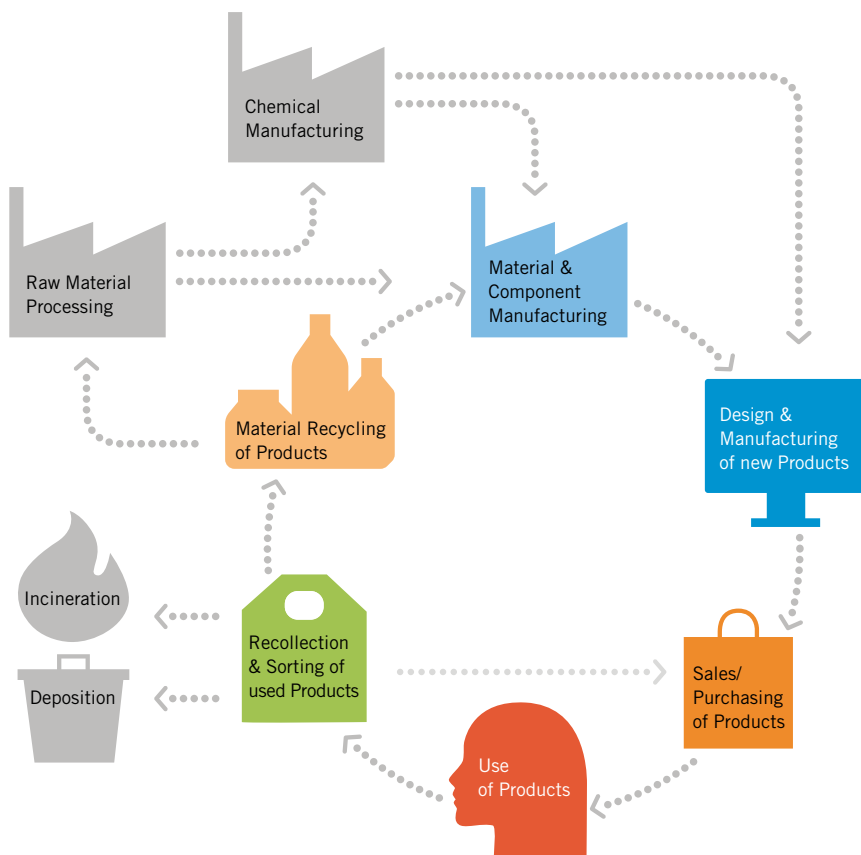
Society's use of resources is growing rapidly. During the 1900s the extraction of material resources in the world increased approximately thirty-five times over. Today every EU citizen consumes on average about 16 tons of material per year, and throws away 6 tonnes per year.<sup>1</sup>

Chemical production and the chemical industry have grown substantially over the past fifty years. From 1950 to 2000, the annual world production of chemical substances increased from about 7 million tons per year to about 400 million tons per year. This is a fifty-seven-fold increase.<sup>2</sup>

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<sup>1</sup> Roadmap to a Resource Efficient Europe, COM (2011) 571 final

<sup>2</sup> Chemical industry from an economic perspective – development trends in the world, the EU and Sweden 2010. Swedish Chemicals Agency, Report 5/10.



Simplified illustration of the product life cycle, showing chemicals and products flows.

An exact figure on the huge number of substances on the global market is not available, but more than 143,000 chemical substances are pre-registered under the EU Chemicals Regulation REACH. So far approximately 13,400 substances exceeding volumes of 100 tons/year have been registered as being placed on the EU market.<sup>3</sup>

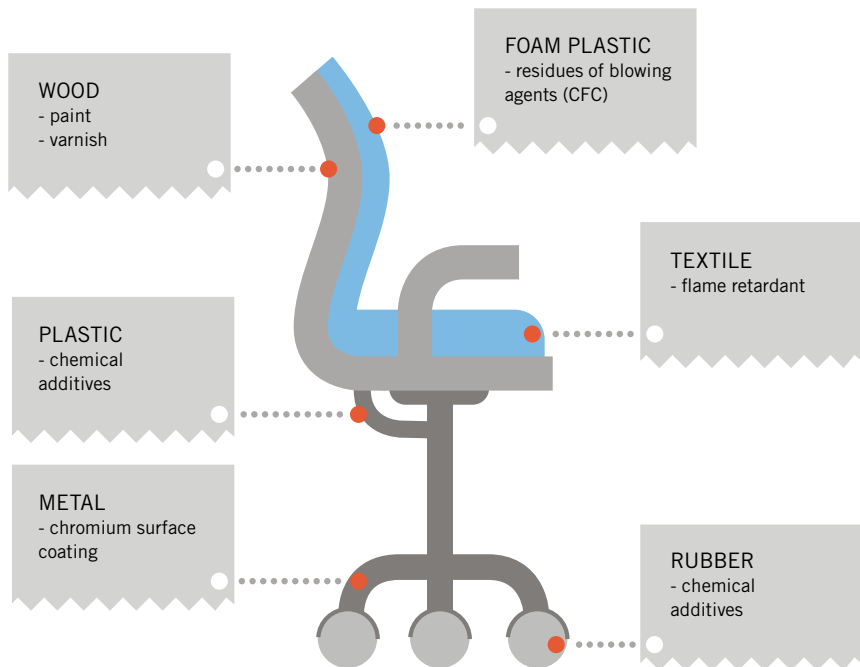
<sup>3</sup> ECHA website, October 2015.

## Hazardous substances in products

Today's products are more complex than they used to be and chemicals are used for numerous reasons. Chemicals are used in the manufacturing of materials, such as plastics and synthetic fibres, some chemicals are added to give materials and products specific functions or features, such as substances making surfaces water-repellent, plastics softeners, flame-retardants or dyes giving the material a desirable appearance. Products can also be coated with paints and varnishes. They may also contain residues of substances used in the manufacturing process but which no longer have a role to play, such as for example lubricating oils. This means that chemicals are found in almost all products and eventually in the waste when the products are scrapped.

Hazardous substances are used in many materials and can cause serious effects on human health and the environment; for example, substances which are carcinogenic, endocrine disrupting, toxic to reproduction or persistent in the environment. The diffuse exposure to hazardous substances in toys, textiles, kitchenware etc. can be harmful to human health and the environment. Children and young people are often particularly sensitive. And in the case of some hazardous substances even very small contents and limited exposure can cause severe health and environmental effects.

Not all substances are hazardous and many are present only in so small quantities that they are not likely to affect human health or the environment. But for many chemicals we do not actually know if they pose any risks, as there is a considerable lack of knowledge about properties and the hazards associated with chemicals, and there is even less knowledge about the combined or so called cocktail effect of all these substances. We are exposed to a huge mix of many different man-made and also naturally occurring substances. Experience shows that problems can be discovered long after a substance has been placed on the market and is widespread in many products.



Example: An office chair – it contains many components, materials and chemicals.

## Current situation

### Gaps in information exchange

Today there is a lack of information concerning which hazardous substances can be found in products and therefore also in end-of-life products. The information available on chemicals content is rarely passed on from manufacturers and importers to the brand owners and users, and even more rarely to waste managers and recycling services.

The lack of information on chemicals in a product's life cycle makes it difficult to reuse materials from products in a safe way. An interview study conducted in Sweden shows that companies face difficulties in finding recycled material which meets their quality requirements.<sup>4</sup>

### Recycling of hazardous substances

While recycling is necessary and on the increase, there is a risk that hazardous substances are re-introduced into product life cycles if recycled materials are used without reflection on their chemical content. Hazardous chemicals may eventually end up in products where they should not be and thereby causing possible harm. This can potentially also weaken the market for recycled material, if there is cause for consumers to regard products made from recycled materials as being a less safe choice.

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<sup>4</sup> Material Recycling without Hazardous Substances – Experiences and future outlook of ten manufacturers of consumer products, PM 14/12, Swedish Chemicals Agency.



Information on chemicals content in articles is rarely passed on from manufacturers and importers to the brand owners and users.



A common situation where there is insufficient information about the quality of the recycled material and the presence of chemicals in it. As a consequence, it is difficult for designers and producers to choose recycled materials.

## Examples of hazardous substances found where they should not be

Brominated flame-retardants, banned internationally as Persistent Organic Pollutants (POPs), were detected in thermo cups and kitchen utensils on the European market due to the use of recycled plastic.<sup>5</sup>

Inspectors in Sweden often find the following hazardous substances<sup>6</sup>:

- Phthalates (for example, DEHP) in articles such as toys made of soft PVC plastic
- Short-chained chlorinated compounds (SCCP) in articles made of soft plastic (PVC)
- Lead in the solder in electrical articles
- Arylamines from azo dyes in textile and leather articles
- Cadmium in articles and packaging made of PVC plastic
- Lead in articles made of PVC plastic.

Perfluorinated substances (PFAS, PFOA) have been detected in drinking water in a number of municipalities in Sweden.<sup>7</sup>

Studies from the National Food Agency in Sweden show that breast milk and serum from the blood contain different types of pollutants.<sup>8</sup> For banned or restricted substances the levels are slowly decreasing. Levels are however increasing for other substances, which have replaced the ones now banned. Mercury and PCBs, which have been restricted or banned nationally for a long time, are still being found.

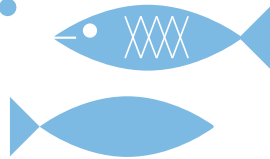
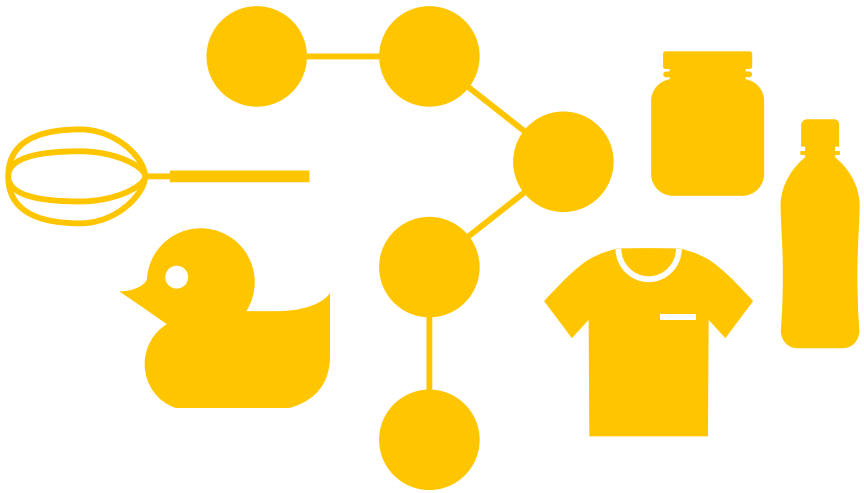
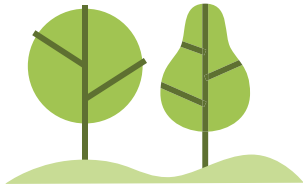
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<sup>5</sup> Samsonek J, Puype F (2013) Food Additives & Contaminants.

<sup>6</sup> <http://www.kemi.se/global/tillsyns-pm/2014/tillsyn-6-14-analyses-2008-2013.pdf>

<sup>7</sup> <http://www.slv.se/sv/grupp3/Pressrum/Nyheter/Pressmeddelanden/Information-till-Sveriges-vattenproducenter-Hall-koll-pa-lackage-av-kemikalier-fran-brandovningsplatser>

<sup>8</sup> <http://www.slv.se/modersmjolk>



# Approaches

In order to protect human health and the environment, it is important to avoid or as far as possible reduce the amount of hazardous substances in products. It is also important from a recycling perspective, since this will enable a more efficient and sustainable use of natural resources and a circular economy.

Hazardous chemicals should be avoided right from the outset. Preventive chemicals control is crucial and the choice of chemicals and materials has to be considered as early as in the design stage of the products. Materials which are free from hazardous substances will enable the safe use of more recycled material and keep to a minimum the material that ends up as final waste. It is also important to make sure that hazardous substances are removed from the circulation of materials, during waste management and material recycling.

There are several ways to reduce problems related to hazardous chemicals in products, and a combination of different approaches is believed to be the most efficient way to reach the goal.

## Restrictions on chemicals in products

### Regulations of substances and specific product groups

Basic regulation of chemicals makes it possible to control the spread of substances with hazardous properties at an early stage in the supply chain. Substances of very high concern may be subject to regulatory action well before they become dispersed in society and spread far out of control. Regulating chemicals early in the supply chain is cost-effective and of great benefit to society. Another way to limit the use of hazardous chemicals in products is to regulate specific chemicals in specific product groups where the risk of potential harm is considered to be high. Some of the most hazardous chemicals in products are regulated through international conventions. These need to be implemented nationally.

### Stockholm Convention on POPs

The Stockholm Convention on Persistent Organic Pollutants (POPs) addresses a number of hazardous substances that are or have been commonly used in products (such as PFOS in textiles, PCBs in electrical equipment and brominated flame retardants in various electronic devices). Since these substances are dispersed throughout the world and remain intact in the environment for long periods rules which apply only in individual countries are not enough to protect human health and the environment. Therefore, these substances are subject to global elimination or restrictions in order to protect human health and the environment from harm. Recycling of these substances is not allowed and must be considered in the material recycling of products.

### Minamata Convention on Mercury

The Minamata Convention on mercury includes actions to control the anthropogenic releases of mercury throughout its entire life cycle, from mining to final disposal. The Convention includes regulations on mercury mining, the trade in mercury, control measures on air emissions, artisanal and small-scale gold mining, and the use of mercury in products as well as waste management.

## Improved information exchange

Knowledge of the presence of hazardous substances in products is crucial for the proper management, including sustainable recycling and disposal of these products. Greater access to information and knowledge of flows, risks and the management of chemicals in products will improve the possibilities for substitution of hazardous substances and enable producers, suppliers and consumers within the supply chain to make informed choices.

### The Globally Harmonised System for Classification and Labelling (GHS)

The United Nations has adopted a Globally Harmonized System (GHS) for classification and labelling of substances and mixtures. GHS means that globally agreed criteria will be applied for assessing the physical, health-related and environmental properties of substances and mixtures. In addition to the criteria for assessment of the properties, GHS contains requirements regarding the transfer of this information to users of chemicals, through labelling and safety data sheets. In this way GHS will help to improve chemical safety and it will also facilitate global trade in chemicals and products.

### Chemicals in Products (CiP) Programme

The Chemicals in Products (CiP) Programme is a global programme for information on hazardous substances in products, that has been developed within the framework of the UN Strategic Approach to International Chemicals Management (SAICM),

The CiP Programme is aimed at businesses, organizations and other stakeholders who are involved in a product's life cycle and are seeking to introduce improved and efficient procedures for the exchange of information on chemicals in products. The goal of the CiP Programme is that stakeholders have access to information on chemicals in products to assist them in making decisions and taking appropriate action on chemicals exposure, risk and management.



A product's life cycle, exemplified by a cellphone, including design, production, sales, use, waste management and recycling in a system where information on the chemicals involved is transferred between the various actors during the life cycle of the cellphone.

The CiP Programme document sets out the information exchange objectives and describes the roles and proposed responsibilities of stakeholders throughout the product life cycle. The guidance describes the type of CiP information stakeholders may wish to exchange and how they can determine which information is relevant, e.g. which chemicals they include. Furthermore, it gives examples on the approach taken by different business sectors within their respective supply. Information on chemicals in products is a key to sustainable recycling.

### **Legal requirements for information on chemicals in products**

In addition to voluntary measures connected to information exchange, legal requirements can be imposed on companies placing products containing hazardous chemicals on the market.

Countries can choose to make GHS mandatory by developing national rules on classification and labelling of chemicals. In the European Union, GHS has been implemented through the Regulation on Classification, Labelling and Packaging of Substances and Mixtures (CLP Regulation) and also under REACH (Safety Data Sheet requirements).

EU rules related to information on certain chemicals in products can also be found in the REACH Regulation and the Biocidal Products Regulation.



## Enforcement of legislation

The enforcement of existing regulation is crucial for an effective reduction of hazardous chemicals in products. Enforcement can e.g. be done through on-site inspection of companies which manufacture, import or sell products, to monitor their chemicals management system. Labelling and documentation can be followed-up and also be complemented by analyses of the products, if necessary.

Networks of inspectors and various reporting systems can be created in order to make enforcement more efficient.

## Other ways of working with industry

Voluntary dialogue with industry, which is complementary to legislation, can help to achieve results. This dialogue can include awareness-raising activities such as training courses, seminars and other information activities.

To give an example, since 2011 the Swedish Chemicals Agency has been working together with companies in the toys, textiles, cosmetics and hygiene products sectors in order to ensure that children are given greater protection. Companies and sectors wishing to be in the forefront of efforts to phase out hazardous substances have been participating on a voluntary basis, and during the course of this cooperation targets have been identified concerning:

- Voluntary restrictions and phasing out of substances such as allergens and sensitizers from products for use by children.
- The exchange of knowledge between companies, government authorities and the research world.
- Information activities aimed at companies or consumers.



## Examples from EU

### Basic chemicals legislation

#### *REACH*

REACH is a European Union regulation, adopted to increase the protection of human health and the environment from the potential risks posed by chemicals while enhancing the competitiveness of the EU chemicals industry. It also promotes alternative methods for the hazard assessment of substances in order to reduce the number of tests on animals.

REACH stands for Registration, Evaluation, Authorisation and Restriction of Chemicals.

In principle, REACH applies to all chemical substances, those used not only in industrial processes but also in our day-to-day lives, in articles such as cleaning products and paints as well as in others such as clothes, furniture and electrical appliances. This regulation therefore affects most companies across the EU.

REACH places the burden of proof on companies. To comply with the Regulation, companies must identify and manage the risks linked to the substances they manufacture and market in the EU. They have to demonstrate to the European Chemicals Agency (ECHA) how the substance can be safely used, and they must inform users of the risk management measures to be taken.

If the risks cannot be managed, the authorities can restrict the use of these substances in different ways. In the long run, the most hazardous substances should be substituted with those that are less hazardous.

## Product specific legislation

### *Toys*

The Toys Safety Directive stipulates that the content of chemical substances in toys must not pose any risk to human health.

In the case of certain substances, there is a set limit for leaching (migration) from the toy. Substances classified as CMR substances, i.e. those which are carcinogenic, harmful to genetic material (mutagenic) or able to interfere with reproductive capacity (toxic for reproduction), must not be used in accessible parts of toys. The inaccessible parts are also subject to the CMR ban if the substance is inhalable.

The Directive also contains a list of allergenic fragrances which are banned from use in toys above certain concentration limits as well as limit values for nitrosamines and nitrosable substances for toys intended for children under the age of 36 months or toys intended for placing in the mouth.

### *Electrical and electronic products*

The EU RoHS Directive contains restrictions of the use of certain hazardous substances in electrical and electronic equipment.

The aim of the Directive is to reduce the risks to human health and the environment through the substitution of mercury, cadmium, lead, hexavalent chromium and the flame-retardants PBB and PBDE in electrical and electronic equipment with less hazardous alternatives or alternative techniques. The RoHS Directive defines concentration limits for these substances. Another aim of the Directive is to enable a more resource-efficient and sustainable recycling of electrical and electronic equipment.

### *Ecodesign Directive*

The ultimate aim of the Ecodesign Directive is that manufacturers of energy-using products will be required at the design stage to reduce their energy consumption and any other negative environmental impact of their products. While the Directive's primary aim is to reduce energy use, it is also to enforce other environmental considerations including: materials use, water use, polluting emissions, waste issues and recyclability.

## Legislation related to information on chemicals in products

### *Biocidal Products Regulation*

The Biocidal Products Regulation contains rules relating to articles treated with biocides. Treated products/articles are defined as all substances, mixtures or articles which are treated with or which intentionally incorporate one or more biocidal products. A treated article can be an outdoor paint containing an algaecide, a carpet treated against moths or a cutting board treated with antibacterial substances. Even clothing treated to prevent odour are regarded as treated articles according to the definition of the Biocidal Products Regulation.

If the article comes with a biocidal claim such as ‘antibacterial’, ‘treated to prevent odour’, ‘protects against mosquitoes’, ‘hygienic’ or ‘inhibits bacterial growth’, the article has to be labelled with the following information:

- Statement that the article incorporates a biocidal product
- Purpose of the treatment
- Name of all active substances contained in the biocidal product
- Name of all nanomaterials contained in the biocidal product
- Instructions for use, including necessary precautions

Treated articles may only be placed on the EU market if they have been treated with biocidal products containing active substances approved in the EU for the relevant product type and use.

The Biocidal Products Regulation contains requirements stipulating that the efficacy of active substances when used in treated articles can be demonstrated. Furthermore, when a biocidal claim is attached to a treated article which is placed on the market, the manufacturer of the article must be able to substantiate such a claim.

The Nordic countries have developed and published a guidance document on how to test and demonstrate the efficacy of treated articles (“Efficacy Assessment of Treated Articles – a Guide”). The guide states that the benefit of a treated article must be proven. Without such benefit, this would pose an unnecessary risk to human health and the environment.

## REACH

The REACH Regulation contains legal obligations regarding the identification of a substance as a Substance of Very High Concern (SVHC) and its inclusion in the Candidate List. Suppliers of articles which contain such a substance in a concentration above 0.1% (weight by weight) must provide the recipients of such articles with enough information to allow their safe use. The recipients in this case are industrial or professional users and distributors, not consumers. They should, as a minimum, be informed of the name of the substance in question.

Consumers can request similar information, and the supplier of the article must provide this information free of charge within 45 days.

Producers and importers of articles can obtain information on the substances present in their articles and their concentration levels from actors further up their supply chain, such as article suppliers outside the EU and suppliers of substances and mixtures.

A number of authorities responsible for implementing REACH within the EU have jointly developed a guidance document for suppliers of articles for the EU market. This guidance is intended to make suppliers of articles – i.e. producers, importers, wholesalers and retailers – aware of how to obtain and provide information in order to fulfil their obligations regarding articles.

- Firstly, the guidance document provides a description of REACH, the obligations regarding the process of providing information for the Candidate List of substances, and a description of a number of other aspects of REACH.
- Secondly, it provides practical advice which focuses on how suppliers should fulfil the duty to inform customers, including how they should apply the trigger limit (regarding when to provide information), how they should first access information from further up the supply chain, and how they should know which information to provide.
- Thirdly, it provides advice on the routines and tools to apply to the work of accessing, storing and providing information. Finally, it provides a brief summary of important areas of advice regarding these obligations and the reasons why suppliers may benefit from carrying out these obligations in line with this guidance document.

## Enforcement networks and systems

### *Regional Enforcement Network for Chemicals and Waste (REN)*

The Regional Enforcement Network for Chemicals and Waste (REN) is a project financed by the Government of Sweden through the Swedish International Development Cooperation Agency (Sida) and implemented by UNEP in 25 countries in Northeast Asia, South Asia and Southeast Asia. The project aims to reduce the illegal transboundary movement of harmful chemicals and hazardous waste, such as electric and electronic products. Improved capacity of frontline enforcement officials and enhanced cooperation at both national and regional level will promote more effective enforcement of chemical and waste-related multilateral environmental agreements (MEAs).

REN has set up an informal network to serve as a platform for information exchange and experience-sharing for the participating countries as well as the partners. Project activities include technical assistance for problem-solving, information and intelligence-sharing, enforcement operations and the Asia Environmental Enforcement Award, networking, awareness and partnerships for sustainability.

### *EU Enforcement Networks for Chemicals*

There are several enforcement networks for chemicals in the EU, which are invaluable for the enforcement authorities. These include:

- Forum
- CLEEN
- RoHS-Adco
- Toys-Adco
- Prosafe

Mutual projects, the interpretation of legislation, the exchange of inspectors and other questions are discussed in these networks.

## *RAPEX*

The Rapid Alert System for dangerous non-food products – RAPEX – is a system used by the EU countries to exchange information about hazardous consumer products available on the market. A list of the notifications made to RAPEX is published every Friday regarding hazardous products reported by authorities in the EU member states. The list contains information about each product, its potential danger and the measures taken by the reporting country.

## **Definitions from EU regulations**

*Substance* – A chemical element and its compounds in the natural state or obtained by any manufacturing process, including any additive necessary to preserve its stability and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition.

*Mixture* – A mixture or solution composed of two or more substances.

*Chemical* – A substance or mixture.

*Hazardous substance/chemical* – Any substance which has an inherent capacity to cause an adverse effect, immediately or in the more distant future, on humans, animals or the environment.

*Chemical product* – A product consisting of one or more substances.

*Product* – An object which during production is given a special shape, surface, or design that determines its function to a greater degree than its chemical composition.

*Article* – An object which during production is given a special shape, surface, or design that determines its function to a greater degree than its chemical composition. REACH uses the term “article” for what is internationally known as “product”. According to REACH, articles can be clothing, flooring, furniture, jewellery, newspapers and plastic packaging.



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