

LEGISLATIVE DEVELOPMENTS AND ECODSIGN TOOLS FOR REDUCTION OF CHEMICAL RISKS

LIKUMDOŠANA UN EKODIZAINA PAŅĒMIENI AR ĶĪMIKĀLIJĀM SAISTĪTO RISKU MAZINĀŠANAI

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Introduction

The contamination of environment with hazardous chemicals has reached alarming values, especially with persistent, bio-accumulative and toxic (PBT) substances. Most of the hazardous substances are emitted to the environment during production, application and disposal of various products, containing them. The exposure of humans can occur from direct use of the products, as well as via environment and food causing adverse impact to human health: such as asthma, allergies or cancer. PBT substances receive particular attention, since once released to the environment, they are present there for a long time and bio-accumulate along the food chain. In the last decades concern about chemicals risks has been growing significantly: various political frameworks have formulated a common target – by 2020 negative effects on health and environment from chemicals' use have to be minimized, see overview in table 1.

Table 1.

Political documents setting target to reduce use of substances of particular concern

Document	Aim with regard to hazardous substances
Kalmar Communiqué of the Council of the Baltic Sea States 1996, HELCOM rec. 19/HELCOM rec. 19/5	Aim: to ensure that discharges, emissions and losses of hazardous substances will be continuously reduced, towards the target of their cessation within one generation (25 years), with the ultimate aim of achieving concentrations in the environment near background values for naturally occurring substances and close to zero concentrations for man-made synthetic substances
Implementation Plan of the World Summit on Sustainable Development (2002)	... aiming to achieve, by 2020, that chemicals are used and produced in ways that lead to the minimization of significant adverse effects on human health and the environment
Sixth Community Environment Action Programme (Decision No 1600/2002/EC)	Aim: to achieve within one generation (2020) that chemicals are only produced and used in ways that do not lead to a significant negative impact on health and the environment, recognising that the present gaps of knowledge on the properties, use, disposal and exposure of chemicals need to be overcome. Chemicals that are dangerous should be substituted by safer chemicals or safer alternative technologies not entailing the use of chemicals, with the aim of reducing risks to man and the environment
Water Framework Directive 2000/60/EC	The ultimate aim: to achieve the elimination of priority hazardous substances and contribute to achieving concentrations in the marine environment near background values for naturally

Document	Aim with regard to hazardous substances occurring substances
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The task of the recent study was to screen the existing EU requirements regulating the chemicals content of the products (articles) and to analyze existing eco-design tools, whether they support reduction of chemical risks and implementation of legislation and above formulated reduction targets.

Legislation on hazardous substances in products (articles)

In order to achieve the aim to reduce negative chemicals impact on human health and environment several legal acts are adopted to regulate use of very hazardous chemicals. Most of the legal acts focus on chemicals use in industry regarding occupational health, safety and environment, only few legal acts limit chemicals use in the articles e.g. in products.

REACH (EC regulation No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH):

- Requires registering chemicals to be placed on the market and assess risks of intended chemicals use, e.g., also possible residues in articles (exemption: polymers shall not be registered, if the monomers are registered); thus, REACH aims to solve one of the biggest challenges in chemicals management – huge knowledge gap on properties of chemicals.
- Requires registering and assessing risks of chemicals in articles, if the release of chemicals during the use of articles is foreseen.
- Use of very hazardous substances is allowed only with an authorisation.
- Regulates use of certain very hazardous substances in chemical products and articles.
- Requires to pass on down the supply chain information on chemicals hazards in a form of a Standard document (safety data sheet); polymers are exempted from this requirement (similar commonly used standards for other raw materials/articles does not exist).

Thus, REACH regulation focuses on chemicals, but also covers articles and raw materials, which are produced in EU. The regulation does not cover:

- articles and raw materials, other, than chemicals, which are imported to EU (only marketing and use restrictions apply, as well as, if chemicals release during use is foreseen)
- polymers, which are imported to EU, if the monomers are already registered

The RoHS regulation (Directive 2002/95/EC)

- The directive applies to the new electrical and electronic equipment (EEE). Such equipment may not contain any of the 6 banned substances: Pb, Hg, Cd, Cr(VI) PBB, PBDE in quantities above defined limit. Inclusion of more substances is foreseen [1].

Directive 2005/32/EC on the eco-design of Energy-using Products (EuP)

- This directive applies to the energy using products (e.g. mainly electric and electronic products, and others). Regarding environmental targets to be achieved, the directive refers to the 6th Community Environment Action Programme. This general directive only sets frame for development of more detailed product standards, which shall follow.

Directive 2001/95/EC on general product safety and its daughter directives 2005/32/EC

- The objective is to ensure that products placed on the market are safe, however, with regard to the chemicals it is difficult to achieve due to unclear criteria for chemicals safety. Under this directive couple of daughter directives exist for specific products; other are in the development process, only few PBT substances are addressed there.

Eco-design tools

Eco-design focuses on the integration of environmental considerations in the product development (Karlsson and Luttrupp, 2006 [2]). It starts at the conceptual development phase of the products when problematic materials can be avoided or design for closed loop systems of those materials can be made.

Aim of eco-design is to reduce environmental impact (thus – also the impact caused by chemicals) of the product throughout the whole life cycle. On the philosophic level, the eco-design is about reduction of toxicity.

What about practical implementation? In the table 2 one can see most commonly used, freely accessible eco-design tools, which are analyzed from a perspective of chemicals risk reduction:

- Whether the tool is explicitly addressing chemicals or toxicity in order to draw attention to the significance of the issue?
- Are there hazard criteria or list of substances of concern? There are thousands of chemical substances on the EU market, nearly all products on the market contain chemicals: are there criteria, to know, which hazardous properties and from which amounts are relevant?

There are different types of eco-design tools ranging from guidelines and checklists (*Eco-design health check*), to one-score screening indicators (MET-matrix) and full life cycle assessment, or a comprehensive on-line tool (Eco-design pilot). Most of the tools address chemicals issue (hazardous materials), but provide no hazard criteria. Some tools provide lists of substances, most often these are just lists of legally restricted substances. Despite of user-friendliness of such lists, we should note, that:

- 1) bans/ restrictions in legislation is a must for every company on the market, and it does not offer any advanced level for eco-design;
- 2) such lists are quickly outdated, and one may not rely on the source, which is not frequently updated. None of the reviewed tools provides on-line access to an up-to date substance list.
- 3) with regard to the new alternatives, such lists provide no assistance.

Life Cycle Assessment is one of the basic tools to estimate impacts of a product and to verify environmental achievements by improved design. With regard to chemical or toxic risks, LCA is difficult to apply due to lack of normalisation and weighing factors for chemicals. A very popular approach are eco-indicators providing a dataset with impact factors for many materials and some chemical substances. Regarding to human health, only few impacts are included, and the eco-indicators cover only small part of the chemicals used [3].

A designer guide to Eco-conscious design can be seen as the most advanced with regard to chemicals, providing possibility for qualitative analysis.

Table 2.

Eco-design tools

Name	Source	Description	Chemicals addressed	Hazard criteria	Checklist of substances
Eco-design pilot	www.ecodesign.at/pilot	Checklist type system with a scoring	Yes	No	No
Quality Function Depletion system	Grossman, Hanusch, Birkhofer, 2007[4]	A matrix with a scoring system	No	No	No
A Designer's Guide to Eco-Conscious Design of E& EE	www.ecodesignguide.dk	Detailed guide including checklists and calculators	Yes	Yes	Yes
MET matrix	Brezet, van der Hemel, 1997[5]	A matrix with a scoring system	Yes	No	No
Smart EcoDesign	www.cfsd.org.uk	Designer guideline including checklists	Yes	No	Yes
Sustainable design of EE products	www.envirowise.gov.uk	Guideline with checklists	Yes	No	Yes
Eco-design Health Check	www.inem.org	Matrix / checklist	Yes	No	No
LIDS wheel	Brezet, van der Hemel, 1997[5]	A matrix with a scoring system	No	No	No
10 golden rules	Luttrupp, Lagerstedt, 2006[6]	A designer guide	Yes	No	Yes
ECMA - 341	www.ecma-international.org	Designer guidelines incl. checklists	Yes	No	Yes
Factor X	Wuppertal Institute, Taeko A, 2007[7]	Calculation model, environmental v. product value	No	No	No
LCA	Various; ISO Standards (14040-42-44-47-48)	Quantification of environmental impacts via whole life cycle	Yes	Partly	No
Eco-indicators	www.pre.nl	Quantified environmental impacts (factors)	Yes	Yes	No

Conclusions

The eco-design as approach has a good potential of minimization of chemical risks, but practical implementation is lagging behind due to lack of suitable tools as well as deficiency of information on properties of chemicals and composition of raw materials.

One the high political level (World Summit 2002, 6th Community Environment Action Programme) there is formulated aim to achieve that within one generation negative effects on health and environment from chemicals' use have to be minimized. However, the current legal development focuses on regulation of use of chemicals within EU, which is sufficiently covered, when fully implemented (REACH). With regard to the imports of other raw materials, polymers and articles, chemicals hazards are not sufficiently covered (legal rules address only some product areas and a few substances).

With regard to chemicals, most of eco-design tools, although include reduction of toxicity as an aim, does not provide the criteria of hazardousness, with some exemptions, which also hampers reduction of chemical risks. One of the problems is also missing requirement or widely accepted standards on passing on information down the supply chain on content of hazardous substances in non-chemical products, as well as polymers.

Most of the eco-design tools in the field of chemicals focus only on legal compliance, which cannot be regarded as an advanced level. The list of banned/ restricted substances preferably shall be provided in on-line access (currently – none of the screened tools provides that) to ensure proper updating. Information on potential changes in the future (e.g. candidate substances) would be helpful in order to make far-sighted and good decisions regarding material choice.

Advanced level with regard to chemicals risk would be, if besides implementation of legislation, companies would reduce substances which are very hazardous to human health and the environment such as persistent, bio-accumulative and toxic, and very persistent and very bio-accumulative (PBT/ vPvB), and others (carcinogen, mutagen, reprotoxic, endocrine disrupters). Since development of own lists of substances of concern is quite resource- and expertise intensive task, assistance to industry establishing lists would be helpful. Also new legislation – REACH – will provide such lists.

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Simanovska J., Valters K., Bažbauers G. Likumdošana un ekodizaina paņēmieni ar ķīmikālijām saistīto risku mazināšanai

Vides piesārņojums ar ķīmiskajām vielām ir sasniedzis tādus apmērus, kas pieprasa tūlītēju rīcību. Pasaules sammits 2002.gadā formulēja ambiciozu mērķi - līdz 2020.gadam samazināt ķīmikāliju izraisīto negatīvo ietekmi uz cilvēka veselību un vidi. Rakstā apskatīti svarīgākie normatīvie akti, kas paredz produktu (izstrādājumu) radīto ķīmisko risku samazināšanu: REACH (Regula par ķīmisko vielu reģistrēšanu, licencēm un ierobežojumiem), RoHS (Bīstamo vielu ierobežojumu direktīva) un citi. Raksts kā vienu no visefektīvākajām ķīmisko vielu riska samazināšanas metodēm piedāvā ekodizainu, ko izmanto produkta izstrādes fāzē, kad ir iespējams izvairīties no problemātisku materiālu lietošanas vai ieviest ražošanā slēgtas sistēmas. Publikācija analizē esošo ekodizaina instrumentu potenciālu samazināt produktu (izstrādājumu) radīto ķīmisko vielu risku un panākt atbilstību normatīvo aktu prasībām. Apzinātas normatīvās bāzes vājās vietas, kas nerodina pārtraukt nevēlamu vielu izmantošanu. Uzskaitītas galvenās grūtības, kas kavē ekodizaina instrumentu izmantošanu ķīmisko risku samazināšanai.

Simanovska J., Valters K., Bažbauers G. Legislative developments and ecodesign tools for reduction of chemical risks

The contamination of the environment with chemical substances calls for immediate action. The World Summit in 2002 formulated an ambitious target to minimise the negative effects on the health and environment caused by chemicals by the year 2020. The main legal driving forces for the reduction of chemicals risks arising from products, e.g. RoHS, REACH, and others, are analysed. Ecodesign is seen as a very effective approach for the minimisation of environmental impacts arising from the consumption of products since it starts at the conceptual development phase of the products when the potential freedom for changes is the greatest. The most common ecodesign methods are reviewed and the suitability and ability to reduce chemicals' risks caused by products (articles) and reaching legal compliance is evaluated. The shortcomings in legislation related to inhibition of use of undesired chemicals in products are identified. The main difficulties in the application of the existing ecodesign tools in the chemical risk reduction are identified.

Симановска Я., Вальтерс К., Бажабуерс Г. Законодательство и инструменты экологического дизайна (экодизайна) для уменьшения риска, вызванного использованием вредных химических веществ

Загрязнение окружающей среды вредными химическими веществами достигло масштаба требующего немедленного действия. Мировой саммит в 2002 году выдвинул амбициозную цель: до 2020 года уменьшить вредное влияние опасных веществ на окружающую среду и на человеческое здоровье. В статье рассматриваются главные правовые акты Евросоюза, которые нацелены на снижение химического риска от присутствия химических веществ в составе продуктов (изделий), в том числе REACH (Европейская система регистрации химической продукции (химических веществ)) и Директива по ограничению химических веществ, и другие. Авторы предлагают эко-дизайн как один из самых эффективных способов для снижения химического риска. Эко-дизайн применяется в фазе разработки изделия, когда имеются самые лучшие возможности отказаться от использования проблематичных материалов, а также разработать закрытую систему производства. В статье рассматриваются существующие инструменты экодизайна в отношении их потенциала снижения химического риска и достижения соответствия требованиям законов. Определены узкие места в законодательстве, а также главные трудности, связанные с использованием существующих инструментов экодизайна для уменьшения химических рисков.