Promoting Energy and Resource Efficiency through the Ecodesign Directive[1]

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1 Introduction

Looking at the developments in environmental policy and law and during the last decades, one of the noticeable trends is that *products* – and the environmental impacts throughout products' life cycles - have received greater attention in environmental policy.[2] In the 1970s and 1980s the main focus of product-related policies was dangerous chemicals in products and the health risks they posed to humans and the environment. Later policies promoted the recycling of products in order to reduce the increasing amounts of waste in society and reduce the extraction of natural resources. The introduction of laws that mandated the recycling of products and promoted "extended producer responsibility" (EPR)[3] – where producers are assigned financial responsibility for the take-back and recycling of products – have provided better recycling practices and higher amounts of recycled materials, and in some cases helped to reduce the amount of waste being generated.[4]

But more holistic approaches to deal with products were considered necessary. As a reaction to the rising quantities, varieties and complexities of products, the European Commission introduced the concept of Integrated Product Policy (IPP) in a Green Paper in 2001.[5] With IPP the focus of the policies was placed on the products and how the entire life cycle of the products could be considered when regulating their environmental impact. By considering the entire life cycle, cumulative environmental impacts can be assessed and addressed. A specific aim is to avoid burden shifting, where an environmental improvement in one life cycle phase may lead to increasing environmental impacts in another life cycle phase.

In its 2003 communication on Integrated Product Policy (IPP) the European Commission elaborated on the concept of "life cycle thinking", and stated that "*...life cycle thinking needs to become second-nature to all those who come*

2 For a review of the historical developments *see* e.g. Onida, M. (2004). *Environmental protection by product policy: Focus on dangerous substances*. ELNI Review No 2/2004*;* Rubik, F. 2006. *Integrated product policy: practices in Europe*. In Scheer, D. and Rubik, F. Governance of Integrated Product Policy. In search of sustainable consumption and production. Greenleaf Publishing; Dalhammar, C. (2007). *Product and life cycle issues in European environmental law: A review of recent developments*. Yearbook of Eur Enl Law Vol. 7. Oxford Univ. Press, s. 91-92; Malcolm, R. (2011). *Ecodesign law and the environmental impacts of our consumption of products*. Journal of Environmental law 23:3, p. 487-503.

3 For an account of principles behind EPR and the historical developments of EPR-related laws, *see* e.g. Lindhqvist, T. (2000). *Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental. Improvements of Product Systems*. Doctoral Dissertation. Lund University.

4 One example is packaging: in EPR systems where producers pay fees for the amount and type of packaging used, they have explicit incentives to minimize packaging, as opposed to a system where taxpayers finance waste treatment; *see* Tojo, N., Lindhqvist, T. and Dalhammar, C. (2006). *Extended producer responsibility as a driver for product chain improvements*. In Scheer, D. and F. Rubik. Governance of Integrated Product Policy: In Search of Sustainable Production and Consumption. Greenleaf Publishing.

5 COM(2001) 68 final.

into contact with products"[6]. The quote implies that there is a general obligation for all actors – including private and professional consumers, and producers - to assess the life cycle impacts of products, and act upon this information.

Life cycle thinking is now considered a bearing principle also in other areas of EU environmental law, for instance in waste policy.[7] While there is no formal definition of "life cycle thinking", there is some agreement that the main aim is to reduce environmental impacts throughout the entire life cycle of products, in all relevant life cycle phases, including resource extraction and refinement, component and product manufacturing, transport, use of the final product, and the waste (end-of-life) phase. The design of products is of great importance, as the *design will greatly influence the environmental impacts of production, use, and waste treatment*. For instance, if certain chemicals are eliminated from the product, they will not cause problems once the product becomes waste; otherwise some chemicals can make material recycling practices impossible. Banning certain chemicals in products may also mean that such chemicals will not be used in the production processes (as production chemicals may contaminate the product), with associated health benefits. Thus, well designed rules on product design may have positive implications in several life cycle phases.

From the lawmakers' perspective, life cycle thinking may provide a good guidance for actions, and promote a more holistic perspective in environmental lawmaking. In fact, we have often neglected regulating the most important life cycle phases of products when designing environmental laws.[8] It may however be problematic to apply life cycle thinking in all situations, for instance when the lawmaker has limited information about all the relevant life cycle environmental impacts. Even more problematic is that regulation triggering improvements in one part of the life cycle may lead to problems in another part of the life cycle.[9] For instance, banning a specific chemical in order to protect human health and improve recycling practices may mean that more energy will be required in production processes due to the substitution of process chemicals. Some of these conflicts may be possible to solve technically once

6 COM(2003) 302 final, 10 [italics by the author].

7 *Cf*. COM(2005) 666 final.

8 *Cf*. Dalhammar, C. (2013). *Livscykeltänkande i miljölagstiftningen: teori och praktik*. In: Gipperth, L. and Zetterberg, C. (Eds.). Miljörättsliga perspektiv och tankevändor. Vänbok till Jan Darpö och Gabriel Michanek. Iustus Förlag, 174-175. For example, the setting of energy efficiency standards for energy-using products is a rather recent phenomenon, though energy use is typically associated with much more environmental impact than other life cycle phases (such as the production phase, and waste disposal). This is because electricity production is often associated with substantial environmental impacts, i.e. air pollution and the release of greenhouse gases.

9 Ibid., p. 178-179.

industry has to deal with the problems, and therefore they should not automatically lead to a decision not to implement new regulations.[10]

In order to regulate the various life cycle phases of a product we need a mix of laws and other instruments, as will be outlined in the next section. The main EU law for promoting life cycle thinking is the Ecodesign Directive,[11] which was adopted in 2005 after a long and quite controversial legal process. It is a framework Directive which forms the legal base for standard-setting for different product groups. The Directive is unique in several ways. It explicitly refers to "life cycle thinking" as an explicit aim,[12] and many features of the Directive is inspired by the policy ideas expressed in the Commission's strategies on Integrated Product Policy (IPP), in several ways. For, instance the Directive provides the opportunity for using voluntary agreements as an alternative to binding rules[13]. The Directive aims to encourage ecodesign – i.e. the conscious choice to design products that have a small environmental life cycle impacts as possible - among industries.[14]

Recent evaluations indicate that the Directive is one of very few policy instruments that have successfully addressed energy efficiency and promoted cuts in CO_2 emissions in the EU. As the main life cycle impacts from most energy related products are related to energy needed during usage[15], setting mandatory energy efficiency standards for product groups such as electric motors, boilers, white goods, and TVs and so on can lead to significant energy savings. The Directive could potentially be both the most effective, and not least the most cost-effective[16], EU policy instrument for inducing energy efficiency and reducing CO_2 emissions.[17] Indeed, it is estimated by some that regulating the energy efficiency of products have the same potential to reduce carbon dioxide emissions in the EU as the entire trading system for carbon

10 Typically, industry often applies such arguments to lobby against new regulations, even when the arguments are questionable. It is therefore crucial that policymakers are well informed about recent technical developments.

11 Dir. 2009/125/EC establishing a framework for the setting of ecodesign requirements for energy-related products.

12 Ibid., recitals 7 and 13.

13 *See* ibid., Art. 15.3, Art. 17, Annex III, and recital 19.

14 Ibid., recitals 5, 8, 9 and 15.

15 This is because electricity production is often associated with substantial environmental impacts. Such as air pollution and the release of greenhouse gases.

16 In a recent evaluation, the cost-efficiency of the measures were considered very high, *see* CSES/Oxford Research. (2012). Evaluation of the Ecodesign Directive (2009/125/EC). Final Report to the European Commission. March 2012.

17 Regarding effectiveness: While CO2 emission trading systems and CO2 taxes have high potential for emission reductions they have not yet delivered to their potential, in the jurisdictions where they have been implemented, for several reasons. While a price on carbon may be considered the main "engine" for climate policy, a major problem concerns the legal and political obstacles to do so, both within nations and at the EU level.

dioxide[18] (the EU-ETS).[19] Also in the US the effectiveness of product regulation to stimulate energy efficiency has been established, and Sachs states that: "*Although information disclosure, financial incentives, and other softer alternatives to regulation play a vital role in reducing energy demand, these should be viewed as complements to efficiency regulation, rather than replacements.*"[20]

Thus, we know that the Directive have a large potential to contribute to set EU objectives on energy efficiency and CO_2 reduction, though recent reports propose that this potential would be larger if relevant changes were introduced in the Directive and the associated processes of standard-setting.[21] From the viewpoint of life cycle thinking however, there has been critique that most standards set under the Directive regulates only product energy efficiency. Other environmental aspects such as chemical content and recyclability of materials have not been regulated except in very few cases.[22] As the issues of "resource efficiency" and "resource security" have become highly prioritized in the EU,[23] there is much discussion on how the Ecodesign Directive can be used to enhance resource efficiency. The European Commission has recently launched a research project to analyse how resource efficiency may be promoted better through product policy.[24] But while there is much hope that the Ecodesign Directive will contribute to EU objectives of resource efficiency, there are several issues to consider related to how legal standards can be set in practice.

In this contribution we will analyze how the Ecodesign Directive may help to achieve set EU objectives related to a) energy efficiency and b) resource efficiency. The next section will briefly outline the most important EU product oriented laws, and some of the key legal issues related to their implementation. The following sections will describe the key features of the Ecodesign

18 Regulated through Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, and associated legal acts.

19 ECOFYS. (2012). Economic benefits of the EU Ecodesign Directive. Report, p.5.

20 Sachs, N. (2012). *Can We Regulate Our Way to Energy Efficiency? Product Standards as Climate Policy*, 65 Vanderbilt Law Review 1631-1678, p. 1633.

21 *See* section 4.

22 Global View Sustainability Services et al. (2011). Review of EuP preparatory study evidence: Does it support development of non energy related implementing measures? Report to DEFRA; van Rossem, C., Dalhammar, C. and Toulouse, F. (2009). *Designing Greener Electronic Products: Building Synergies between EU Product Policy Instruments or Simply Passing the Buck?* Report: European Environmental Bureau (EEB), Brussels.

23 *See* section 5.

24 More information about the project can be found at: "lct.jrc.ec.europa.eu/assessment/ projects" [2013-09-12]. Potential standards for three product groups are outlined in Ardente, F. and Mathieux, F. (2012). *Application of the project's methods to three product groups.* European Commission. Joint Research Centre. Institute for Environment and Sustainability. Report n. 2 of the project "Integration of resource efficiency and waste management criteria in European product policies – Second phase". November 2012.

Directive and how it may contribute to energy and resource efficiency. Then, we will shortly discuss how the Ecodesign Directive can best interact with other types of policy instruments such as eco-labels. The piece ends with conclusions and discussion.

2 A Short Review of EU Product Regulation

In order to better understand the Ecodesign Directive and its function, it is useful to have a basic overview of other product-oriented environmental laws in the EU. This section will provide a brief account of the main legislation.

Chemicals in products

Regarding chemicals in products, there are specific regulations in place for a number of product groups, such as pharmaceuticals, medical equipment, pesticides, toys, biocides, batteries, and building products.[25] The RoHS Directive[26] regulates substances in electrical and electronic equipment, while the ELV Directive[27] regulates substances in vehicles, and the Directive on Packaging and packaging waste[28] has rules for chemicals in packaging.

Most of the rules regulate specific product groups, or groups of products with similar characteristics, but there is also horizontal legislation in place. Most notably, REACH[29] will have an indirect impact on chemicals in products as it sets standards for chemicals in several ways. If a chemical is phased out entirely, or its use is highly restricted, this will influence also if and how the chemical is present in products. Exposure scenarios can also be important as they can account for exposure of chemicals from products. Further, REACH has some specific rules relating to chemicals in products.[30]

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25 For and overview *see* Jans, J. and Vedder, H. (2012). *European environmental law after Lisbon*. 4th Ed. Europa Law Publishing, chapter 15, and Kemikalieinspektionen [Swedish Chemicals Agency]. (2012). B*ättre EU-regler för en giftfri miljö – rapport från ett regeringsuppdrag*. Rapport Nr 1/12. Kemikalieinspektionen: Stockholm.

26 Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment [previously Directive 2002/95/EC].

27 Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles.

28 European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste [with amendments and updates].

29 Regulation (EC) No 1907/2006 of the European parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

30 *See* for instance articles 7 and 33.

The Product Safety Directive[31] is applicable to products that may pose a risk to health. Safety standards are only outlined in general terms, and the content is provided through other laws and standards. The Directive provides a base for withdrawing unsafe products from the market by EU member states.

Waste oriented product law

When it comes to products in the waste phase, there are several Directives in place that aim to secure safe waste handling, stop illegal exports, and promote recycling. Also here, there are several Directives that regulate specific product groups. The ELV Directive[32] - discussed above - does not only set rules for substances, but also sets clear quantified targets for reuse, recycling and recovery of vehicles and their components. Likewise, the Directives on Batteries[33] and Packaging and Packaging Waste[34] contain rules concerning both on chemicals in the products and collection and recycling targets, with stipulated targets for different categories of packaging.[35] In the case of electrical and electronic product, rules are instead set through two separate directives.

The WEEE Directive[36] regulates the collection and recycling targets for waste electrical and electronic equipment (WEEE). It thus works in combination with the RoHS directive, and the two directives were implemented at the same time.[37]

The Directives discussed above differ somewhat in their approach when it comes to enforcing "producer responsibility". In some directives it is clearly stated that producers must be responsible for establishing take-back schemes and fulfill recycling obligations, whereas this obligation is less clearly stated in others. In practice, Member States have a lot of leeway when it comes to how

31 Directive 2001/95/EC of the European Parliament and of the Council of 3 December 2001 on general product safety (Text with EEA relevance).

32 Above n. 27.

33 Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC.

34 Above n. 28.

35 Regarding legal harmonization, the Directives are aimed at setting harmonizing rules for chemical content, whereas Member States are usually allowed to set stricter rules for collection and recycling. Different legal techniques are used for this purpose (e.g. the use of a dual legal basis, or the use of specific clauses in the directives).

36 Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE) [it will be repealed by the new WEEE Directive in Feb 2015: Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (WEEE)].

37 The two Directives have different legal bases in the TFEU (art. 192 in the case of the new WEEE Directive; art. 114 in the case of the new RoHS Directive).

to implement producer responsibility in practice, and therefore sets up quite different systems.[38]

Many of the Directives take a rather holistic perspective: in addition to regulating chemicals and set mandatory targets for collection and recycling they mandate the provision of information from producers to recyclers in order to improve recycling practices, such as information on the composition of products. For instance, the WEEE Directive states that producers should provide information about the location of dangerous substances and preparations in the products.[39] This can led to more cost-effective recycling practices, as certain components are easier to locate, and also help recyclers to identify toxic parts that may pose a health threat during recycling. Further, several of the Directives mandate that producers secure money for waste treatment as soon as the product is put on the market, to make sure the products are not "orphans" once they become waste (if the producer has ceased to exist, there is no one who can pay for waste collection and treatment of the product).[40] The WEEE Directive was implemented in conjunction with the RoHS Directive, and they complement each other, as the RoHS Directive phases out substances that makes recycling more difficult and dangerous.

In several of the Directives, the stated intent of the rules is to provide economic incentives for producers to change the product design in order to reduce waste treatment costs. This however works best for packaging, where producers pay for the quantity and material type they put on the market. For most other product groups it is more difficult to provide such direct incentives, as a) the costs for treatment and recycling are a small part of the total product cost, and b) the way the systems are set up, with collective systems used by several producers, makes it difficult to assign individual costs.[41]

The Waste Framework Directive[42] is important in many ways. It provides guidance for interpreting rules in other directives. It also encourages member states to introduce measures to promote extended producer responsibility in order to stimulate ecodesign and life cycle improvements[43], and to promote re-use and recycling.[44]

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38 The Member States have different approaches towards producer responsibility, and promote different schemes for collection and recycling. *See* for instance the analysis in van Rossem, C., Tojo, N. and Lindhqvist, T. (2006). *Lost in Transposition? A study of the implementation of Individual Producer Responsibility in the WEEE Directive*. Report commissioned by Greenpeace International, Friends of the Earth and the European Environmental Bureau (EEB).

39 Above n. 36, Art. 11.

40 *See* for instance Art. 8 in the WEEE Directive.

41 *See* Okopol/IIIEE/RPA. (2007). The producer responsibility of the WEEE Directive. Final report to the European Commission.

42 Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives.

43 Art 8-9, rec. 27.

44 Art. 11.

Energy labeling

The Energy Label Directive (2010/30/EU) provides the framework for the setting of energy label requirements for household appliances, such as dishwashers, refrigerating appliances, and light bulbs.[45] The requirements for specific product groups are set up in regulations, and labeling of products is mandatory for producers. The letters A-G are used to provide consumers with information about the energy efficiency of products. Apart from providing consumers with valuable information, producers use the labeling as benchmarks for their products.

There is also a number of voluntary energy labeling schemes, such as the Energy Star scheme.[46]

Eco-labeling

The EU also has an eco-labeling scheme, the Flower.[47] Under the scheme, eco-label criteria are set for a number of product groups and services. There are several successful regional and national eco-label schemes as well. A manufacturer whose product complies with the eco-label criteria may apply for labeling, and pays a yearly fee in the scheme. There are also several successful regional and national eco-labeling schemes.[48]

The Ecodesign Directive in relation to other EU product legislation

Most of the legal instruments described above cover several product groups, though eco-labeling and energy labeling sets criteria for specific categories of products. The Ecodesign Directive (described in the next section) can complement these rules through the setting of rules for specific product groups. The directive also has a wider mandate than the other rules; in principle, it may be used to set all kinds of environmental impacts during the product life cycle.

The mandatory rules that apply to all products put on the market are often complemented by voluntary schemes and approaches (e.g. eco-labels and green public procurement), as will be discussed later in this contribution.

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45 Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products.

46 *See* Council Decision 2006/1005/EC of 18 December 2006 concerning the conclusion of the Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficiency labelling programmes for office equipment ; Agreement between the Government of the United States of America and the European Community on the coordination of energy-efficiency labelling programmes for office equipment [Official Journal L 381 of 28.12.2006].

47 Regulated by Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel.

48 These include the Nordic Swan and the German Blue Angel schemes.

Product oriented law and legal harmonization

Most product oriented laws aim at harmonization of national laws.[49] As discussed above, the type of environmental problem matters here: rules on chemical content in products aims for total harmonization in most cases, whereas member States are usually allowed to set higher targets for collection and recycling of specific product streams as long as this does not hinder free movement to any substantial degree. As the EU sets rules for an increasing number of product groups, covering more and more environmental aspects, there is very little room for Member States to set their own rules for products. This is of course positive from an internal market perspective, and there are ongoing efforts to also harmonize rules at the global level. However, if there is virtually no room for Member States' measures, this will reduce the dynamics of lawmaking.[50] In practice, Member States have often triggered new EU laws through proposals of new national rules, as the Commission often initiatives EU-wide rules in order to reduce legal fragmentation that would pose threats to the free movement of goods within the EU.[51] This provides a reason for Member States to propose national measures even if there seem to be little legal scope for such measures. Denmark's recent announcement on national rules on phthalates, in potential breach of EU rules, is an example of a measure that – though unpopular among many stakeholders – may bring changes to EU chemical policy.[52]

Processing and production methods (PPMs)

EU product oriented laws tend to regulate the physical composition of products, and the downstream processes (waste handling etc.) and avoid regulating upstream processes such as raw materials extraction, emissions during manufacturing, and transport. These life cycle phases are often referred to as processing and production methods (PPMs). The main reasons for this state of affairs is that it would be challenging to monitor compliance in other parts of the world, and that setting standards for PPMs may violate WTO-administered laws, most notably the General Agreement on tariffs and trade (GATT). The GATT makes several references to the "like products" concept. For instance, in Art. III.4, it is stated that:

> "The products of the territory of any contracting party imported into the territory of any other contracting party shall be accorded treatment no less

49 Legal harmonization is a complex and often misunderstood topic. For more discussions *see* e.g. Wiers, J. 2003. *Trade and Environment in the EC and the WTO*. Europa law Publishing, Groningen; Jans and Vedder, above n. 25, chapters 3 and 6.

50 Dalhammar, above n. 2, p. 121-123.

51 *Cf*. Onida, above n. 2., p.9-10.

52 ENDS Europe. (2012). Denmark defies Brussels over phthalate ban. ENDS Europe Thursday 23 August 2012.

> favourable than that accorded to like products of national origin in respect of all laws, regulations and requirements affecting their internal sale, offering for sale, purchase, transportation, distribution or use. The provisions of this paragraph shall not prevent the application of differential internal transportation charges which are based exclusively on the economic operation of the means of transport and not on the nationality of the product."

The main controversy surrounds whether "*likeness*" only refer to physical characteristics, or if it is possible to set different legal standards – and differentiate between products, e.g. banning the imports of certain products - depending on how a product is produced. The issue has been subject to hundreds of academic articles but since there is limited case law, the issue is not yet settled. The shrimp/turtle case[53] seems to open the door for PPM-like standards under certain circumstances. However, Bhagwati and Mavroidis[54] argue that while PPM-related standards may possibly be allowed under GATT, they may still be politically and economically controversial, and therefore such standards should be avoided.

In reality, many policymakers believe (wrongly) that PPMs are explicitly forbidden by WTO rules,[55] and tend to be careful with setting such standards. There are indications that EU laws – most notably the Ecodesign Directive – have been designed to avoid regulating PPMs unless these are affected through product design.[56]

3 The Ecodesign Directive

Background

The Ecodesign Directive[57] provides a framework for setting ecodesign requirements for energy-related products. Its initial scope included "energy-using" products, but this scope was extended to include all "energy-related" products in 2009. This means that not only energy-using products (TVs, dishwashers, boilers etc.) are within the scope of the Directive but also products such as windows, insulation material and water-using appliances. Vehicles are however expressively excluded from the scope of the Directive.[58]

53 United States — Import Prohibition of Certain Shrimp and Shrimp Products. WTO case Nos. 58 (and 61). Ruling adopted on 6 November 1998.

54 Bhagwati, J. and Mavroidis, P.C.. (2007). *Is action against US exports for failure to sign the Kyoto Protocol WTO legal?* World Trade Review 6: 299 – 310, p. 308-310.

55 *Cf*. Egelund Olsen, B., Steinicke, M. and Engsig Sörensen, K. (eds). 2006. *WTO Law – From a European perspective*. Copenhagen: Thomsen, 269.

56 Dalhammar, C. (2007). *An emerging product approach in environmental law: Incorporating the life cycle perspective*. Doctoral Dissertation, Lund University, Chapter 8.

57 Above n. 11.

58 Art. 1(3).

While the Directive can in principle be used to regulate a vast number of life cycle aspects, energy efficiency is the key focus. A main reason for the enactment of the Directive was that various market drivers and support tools (e.g. energy labels, eco-labels and consumer information) were not enough to encourage cost-efficient design solutions among producers. This actually applied also for design improvements that provide reduced energy usage with very low associated costs for manufacturers.[59] A further reason for the Directive was that the WEEE and RoHS Directives dealt with waste and chemical issues for electrical and electronic products, and that a directive focusing on energy efficiency would complement existing legislation.

The main objective of the Directive is to ensure free movement on the Internal Market (i.e. within the EU) of products in compliance with minimum performance requirements, and simultaneously contribute to energy security and climate mitigation.[60]

Key elements of the Directive

The Directive is a so-called framework directive. It does not create binding requirements for products by itself but provides a framework, which allows for setting compulsory ecodesign requirements - so-called implementing measures (IMs) - for various product groups. All manufacturers and importers that import or sell their products in the EU must comply with the rules. Most of these requirements relate to binding standards for product energy use and these are often referred to as minimum environmental performance standards (MEPS). Voluntary undertakings (self-regulation) by industry are considered to be a valid alternative to mandatory requirements under certain conditions.[61]

The Directive contains qualification criteria for the product groups for which requirements are to be set (see Art 15 (2)). In order to qualify for regulatory measures they should represent a significant volume of sales and trade (>200,000 units per year in the EU), have significant environmental impact, and there should also be a significant improvement potential. Further, existing policies should be analyzed in order to identify a real need for new legislation. While these criteria would appear to pose significant hurdles for regulations, they have not been a major obstacle in practice, with over 30 product groups already regulated, or planned to be regulated. The Commission adopts Working plans to prioritize the products for which requirements will be set (see Art. 16).

There are two types of mandatory product requirements, often refereed to as "implementing measures" (IMs) (see Annexes I-II in the Directive):

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59 For evidence, *see* Boardman, B. 2004. *Achieving energy efficiency through product policy: the UK experience*. Environmental Science and Policy 7(3), 165-76.

60 The Directive is adopted under Art. 95 of the Treaty establishing the European Community [now Art. 114 in the TFEU]. Art. 6 of the Directive contains a free movement clause.

61 Annex VIII.

> *1) Specific requirements* set limit values for products, such as maximum energy consumption during use, or maximum water consumption during use. These are rather straightforward, although the process of measuring e.g. energy and water use may in practice be quite complicated;
>
> *2) Generic requirements* do not set specific limit values. Examples of such requirements are obligations that the mercury content of a product shall be specified on the packaging, or information to consumers about how to use a product in an energy efficient manner.

There are criteria for the development of implementing measures under the Directive (see Art. 15(5)). Set requirements should have no significant negative impacts on the functionality of the product; no adverse effect on health, safety and environment; no negative impact on user regarding the affordability of the product and its cost during its life cycle; no negative impact on competitiveness; no imposition of proprietary technology and no excessive administrative burden. While these criteria appear to be restricting the choice of legal requirements, it has been possible to set standards - at least for energy efficiency, as will be discussed below. However, the criteria will restrict the potential to use the Directive to induce "technology forcing": the standards set will be possible to reach for manufacturers in the near future without high costs involved, and thus require limited innovation activities from manufacturers.

Often requirements are set *in two tiers*: this means that a certain improvement of product performance must be in place by a certain date (e.g. for products placed on the market 2014 and onwards) whereas a more stringent standard comes into force at a later date (e.g. for products placed on the market 2017 and onwards). This means that manufacturers have to improve product design in the short run, but have reasonable time to adjust to more stringent criteria. This is because manufacturers will need some time to adjust production; it is often very costly to make production changes if it has to be done abruptly, whereas medium and long term changes can be aligned with product design cycles and investment decisions.

Legislative process

There are three main phases of the legislative process for setting eco-design requirements for any given product group. First, each product group is analysed in a *preparatory study*[62], to assess whether mandatory standards should be set, and which requirements that are appropriate. The Commission use consultants to perform these studies. They use the so-called MEErP methodology (discussed below) when performing the studies. Stakeholder input is provided through meetings, questionnaires and comments on draft reports. The consultants then prepare a final report with options for regulatory measures. The options for regulatory measures outlined by the consultants are however not binding for the Commission.

62 *See* Art. 15(4) in the Directive.

The second stage of the legislative process is initiated by the Commission when it produces a working document with proposals for implementing measures. Explanatory notes are provided to explain the choices made or to outline various legislative options. The working document is then discussed in the *Consultation Forum,*[63] which include representatives from various stakeholder groups, for review and comments.

In the third stage of the legislative process the Commission undertakes an internal review process (inter service consultation) and then sends a (final) proposal for an implementing measure to the members of the *Regulatory Committee*[64] (with representatives of EU Member States). The Committee discusses the proposal and has the opportunity to amend it, before voting is undertaken. If adopted, with a qualified majority, the text is then sent to the Council and the European Parliament for scrutiny. If they do not object, the implementing measure is adopted by the Commission and published in the Official Journal.

The first and second stages of the legislative process are public. Documents are public and meetings are open to various stakeholders. Due primarily to the extensive stakeholder consultation, the time between the start of the preparatory study and the coming into force of the first tier requirements is quite long.[65] For the first 12 implementing measures published so far, the time span varied between 3.5 and 6.7 years, with an average of almost 5 years.[66] The time span from the start to the second tier requirements (see above) coming into force varies between 5.25 years and 9.25 years with an average of almost 7 years. The main problem with the long time involved in setting standards is that standards can be obsolete when they enter into force due to technological developments.

The MEErP and life cycle costs

When conducting the preparatory studies, consultants make use of the Methodology for Ecodesign of Energy-using Products (MEErP), a common methodology developed for performing life cycle assessments in the context of the Ecodesign Directive.[67] The consultants undertake a technical,

63 Ibid. Art. 18.

64 *See* Art. 19, which also refers to relevant parts of the Comitology Decision [Decision 1999/468/EC], which deals with the function and set-up of different committees.

65 Siderius, H.-P. (2012) *The ecodesign and energy labeling process – challenges and solutions*. Paper, EuP Network.

66 Siderius, P.J.S. and Nakagami, H. (2013). *A MEPS is a MEPS is a MEPS: comparing Eco-design and Top Runner schemes for setting product efficiency standards*. Energy Efficiency 6:1-19.

67 Kemna, R. et al. (2011). *MEErP 2011 Methodology Report*. Methodology for Ecodesign of Energy-related Products: Final report prepared for the European Commission. The Directive also has rules on the methodology in Art. 15 and the annexes. The MEErP contains an EcoReport, a simplified MS Excel life cycle assessment (LCA) tool. It calculates impacts caused by a product during different phases of its life-cycle, i.e.

environmental and economic analysis.[68] This includes: The selection a number of representative variants of the product; analyzing the technical options for improving the environmental performance of the product (conditions: economic viability, no significant loss of performance or usefulness for consumers); identify, for the environmental aspects under consideration (i.e. energy efficiency), the best-performing products and technology available on the market. The consultants should also take into consideration the performance of products available on international markets and benchmarks set in other countries' legislation. An impact assessment is also undertaken with relevant calculations on issues such as energy saving potential and costs for industry for complying with proposed standards.

Concerning energy consumption in use, the level of energy efficiency is *the life-cycle cost minimum to end-users*, or "least life cycle costs" (LLCC) for representative variants, taking into account the impact on other environmental aspects. The importance of life cycle costs is stated in Art. 15 and the Annexes of the Directive. In Annex II it reads: "*Concerning energy consumption in use, the level of energy efficiency or consumption must be set aiming at the life cycle cost minimum to end-users for representative product models, taking into account the consequences on other environmental aspects.*" While life cycle costs may include disposal costs and other costs, in reality it is the 1) product purchase price and 2) the running costs that are the main elements in the calculation, while other parameters may be neglected.[69] Typically, in most cases, the most energy efficient products are more expensive to purchase than the less energy efficiency (average) products, but as they use less energy they have smaller operating expenses during their lifetime. There are a couple of problems with the use of least life cycle approach as the standard to aim for. Firstly, the price difference between the average product and the top performers tend to be treated as "static", whereas in reality the price for top performers tend to decrease every year due to learning effects. This typically means that we should be able to set stricter standards than we do because the least life cycle costs for top performers will be lower every year. Indeed, in the Japanese Top Runner scheme, which uses a different method for setting standards, it is possible to set stricter requirements earlier.[70]

A second problem is that producers can often charge a premium for top performing products, and make a premium profit on the top segment of the market. This means that that the purchase cost for consumers is not necessarily a good benchmark for setting standards in all cases. There are additional technical problems to address when setting standards. Therefore, Siderius argue that applying "learning curves" – showing how quickly the costs for top

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production, use, and end-of-life. The required inputs for the EcoReport are a Bill of Material (BOM), energy consumption data, and economic data. The EcoReport delivers environmental impact indicators and Life-Cycle Cost (LCC) as outputs.

68 For more details about the process *see* Siderius and Nakagami, above n. 66.

69 This is discussed in Siderius, H-P. (2013). *The role of experience curves for setting MEPS for appliances*. Energy Policy 59, 762-772. *See* also Kemna et al., above n. 67.

70 Siderius, above n. 69, p. 770.

performing products decrease over time – should be used in the setting of standards. He also argues that in some cases product price calculations may have to be complemented by other methods, for instance enter into agreements with producers on when it is reasonable to ask for a specific legal standard.[71]

4 The Ecodesign Directive and Energy Efficiency

Never before have we in the industrialised world had as many products and appliances in our homes as we have today. Both the quantity and the variety of products are increasing, and the use of new products is growing in the developing world. Globally, the use of electricity for information and communications technology (ICT) and consumer electronics (CE) has been growing more than 7% annually since 1990, constituting close to 15% of the total household electricity consumption. Boilers, ventilation, and other equipment also account for a large share of household energy use, whereas electric motors account for 30-40 percent of the energy use in industry. Even taking into account foreseen significant energy efficiency improvements, electricity consumption by appliances is projected to increase by 250% by 2030.[72] Therefore, regulating various appliances has become an important strategy for improved energy efficiency and reduction of GHG emissions in several jurisdictions. In this section we will review the successes of the Ecodesign Directive in this respect and discuss how it may be improved.

Achievements to date

Energy efficiency standards for a number of product groups have been set under the Ecodesign Directive, and more will come in the next couple of years. The expected savings from the first 12 regulations set under the Directive (11 product groups and one horizontal standard for standby and off-mode losses from various equipment) are outlined in Table 1.

71 Ibid.

72 OECD/IEA. (2007). *Energy Use in the New Millennium. Trends in IEA Countries. In support of the G8 Plan of Action*. Paris: OECD/IEA; OECD/IEA. (2009). Gadgets and Gigawatts. Policies for Energy Efficient Electronics. Paris: OECD/IEA.

Adopted implementing measures	**Estimated savings (yearly by 2020)**
Standby and off mode losses of electrical and electronic equipment (household and office)	35 TWh
Simple set top boxes	9 TWh
Domestic lighting	39 TWh
Tertiary sector lighting (office and street)	38 TWh
External power supplies	9 TWh
Televisions	43 TWh
Electric motors	135 TWh
Circulators	23 TWh
Domestic refrigeration	8 TWh
Domestic dishwashers	2 TWh
Domestic washing machines	1.5 TWh
Fans	34 TWh
	= 376 TWh = 14% of the electricity consumption of the EU in 2009

Table 1: Expected savings under the first 12 implementing measures adopted under the Ecodesign Directive. (Source: European Commission).

Electric motors – which account for 30-40 % of EU electricity use – standout as the product group with the most impressive expected reductions. While the expected achievements of the set standards are impressive, even more standards for product groups with huge potential for energy efficiency will come in the next couple of years. They include boilers and pumps and circulators. In a longer timescale, we can probably expect regulation of other important product groups such as windows and construction materials.

The Directive could potentially be both the most effective, and not least the most cost-effective[73], EU policy instrument for inducing energy efficiency and reducing GHG emissions, but this has not been properly researched.[74] Also in the US context the effectiveness of product regulation to stimulate energy efficiency has been established.[75]

73 In a recent evaluation, the cost-efficiency of the measures were considered very high, *see* above n. 17. Earlier studies also claim that promoting energy efficiency through products standards can be very cost-efficient, *see* e.g. Boardman, above n. 58.

74 Regarding effectiveness: While CO2 emission trading systems and CO2 taxes have high potential for emission reductions they have not yet delivered to their potential, in the jurisdictions where they have been implemented, for several reasons. While several studies point to a price on carbon as the main "engine" for climate policy, a main problem concerns the legal and political obstacles to do so, both within nations and at the EU level.

75 Sachs, above n. 20, p.1633.

Main shortcomings of the Directive and possible improvements

The savings projected in the table above are substantial but still they constitute only the "low-hanging fruits", as standards set for energy efficiency under the Directive are generally not very stringent – though there are variations in stringency between product groups. The lack of stringency can be attributed to several factors. One is the lengthy legal procedures with extensive stakeholder publications, which make the process for standard-setting – and updating of set standards - cumbersome. Further, the Commission is understaffed, which also delays the processes. The fact that it takes a long time to set standards means that it is harder to account for upcoming technology. The preparatory study on TVs suffered from this problem:[76] it was not possible to take into account new emergent technologies such as TV's based on LED technology. This also means that the standards are sometimes "outdated" already when they enter into force, since manufacturers can easily comply with them due to technological developments.

Another problem, which also compromises the stringency of the requirements, is the fact that standards are to be based on the "least life cycle cost" standard (see previous section). As previously discussed, using the Top Runner (the best product on the market) as a standard – as is done in Japan – would allow for stricter standards at an earlier date. The use of learning curves that take into account the fact that the production cost – and price - of top performing products will quickly go down as their market share increases, would also allow for the setting of stricter standards.[77]

Thus, current standards are not stringent enough to act as drivers of innovation and eco-design among the most progressive firms. The Directive is not explicitly intended to trigger eco-innovation, but rather to remove the worst product from the market. But even so, the standards could often be set tighter without the risk of significantly higher prices, or the risk that some manufacturers would be forced out of the market. Sachs argues that product standards should not be used for "technology forcing", which implies an intent to stimulate more radical product innovations, as this would entail many risks.[78] Legal standards set so far have not been a main barrier for innovation, but radical standards may actually pose a barrier to desirable innovation as manufacturers may choose not to pursue the development certain "risky" technologies which may entail long run benefits. One method that could potentially remediate this problem, proposed by some stakeholders, would be to set requirements in more than two tiers, with checkpoints along the way.[79]

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76 Huulgaard, R.D. and Remmen, A. (2012). Eco-design Requirements for Televisions. How Ambitious is the Implementation of the Energy-using Product Directive? Report, Danish Ministry of the Environment.

77 *See* Siderius, above n. 69.

78 *See* Sachs, above n. 20, p.1661-1664.

79 This solution has been proposed by interviewees in a recent study, *see* Dalhammar, C. et al. (forthcoming). Addressing resource efficiency through the Ecodesign Directive: A review of opportunities and barriers. Report. Copenhagen: Nordic Council of Ministers.

This means that long term standards (e.g. a standard for product put on the market in 2023) could be set, and that these could checked along the way (e.g. 2015 and 2018); if they are likely to be too demanding they can be made less stringent, and if technological developments have meant that the standards are too easy to fulfil for manufacturers they can be strengthened. This would allow for more radical standard-setting that could provide impetus for companies to engage in innovation, but if it turns out those standards are too demanding they can be made less stringent. Another policy approach is to rely on other policies to stimulate radical innovation instead; these include government funding of R&D projects and government procurement projects that purchases new advanced technologies to quickly increase the market share.[80] Then legal standards should primarily aim to take the worst performing products off the market.

Thus, there is need for research on how the legislative process could speed up, how emerging technologies can be taken into account, and whether standards should be more progressive to stimulate eco-innovation. There is also a need to discuss what kind of environmental aspects are best regulated through minimum legal standards, and where other instruments are better suited to provide stimulus for change. Some actors stress the need to change the "least life cycle cost" methodology in order to allow the setting of stricter standards, and to allow for updating standards during the legislative process so they do not risk being obsolete once adopted.[81] Siderius proposes several changes in the legislative process that could speed up the setting of standards, such as the use of stricter deadlines.[82] He also points out that the consultants contracted by the Commission to do the preparatory study must have right qualifications, otherwise the study is insufficient and this will delay the later steps in the legislative process.

Comparisons with other jurisdictions

Several jurisdictions around the world set MEPS for products, including the US, Australia and Japan. Several recent reports have compared the schemes. A recent report by Waide makes comparisons between the stringency of the standards, and notes that there are significant differences in different jurisdictions, and that the EU should more consistently monitor the requirements applied in other markets.[83] Siderius and Nakagami recommend

80 *See* e.g. Dalhammar, C och Leire, C. (2012). *Miljöanpassad upphandling och innovationsupphandling som styrmedel*. Rapport till Upphandlingsutredningen. IIIEE reports 2012:1. Lund University.

81 Jepsen, D. et al. (2011). *Product-related top runner approach at EU level*. Federal Environment Agency. Umweltbundesamt, Dessau-Rosslau.

82 Siderius, H.P. (2012) *The ecodesign and energy labeling process – challenges and solutions*. Paper, EuP Network.

83 Waide, P. (2013). *International comparisons of product policy*. Report. Coolproducts: Brussels.

that the EU applies one important element of the Japanese Top Runner scheme: that the actual best-performing product on the market serve as benchmark for standard-setting, rather than the application of least life cycle cost.[84] As discussed previously, the use of learning curves can also be beneficial.

Another noted weakness in the EU scheme is that – due to the complicated legislative process, lack of staff in the Commission, and limited funding provided to make preparatory studies – it takes a very long time to implement the standards compared to other jurisdictions.[85] Further, the EU invest comparatively small resources in the preparatory studies compared to countries like the US and Japan. All these things need to be addressed. Another crucial weakness in the EU scheme is that the monitoring is an issue for the Member States[86], and the practices vary a lot throughout the EU. Some member States have very poor market surveillance and therefore there are a high number of non-compliant products on the Internal Market. Therefore, there is a need to invest resources, and improve cooperation between Member states. It has also been suggested that the Commission should coordinate these efforts to a larger extent than today.[87]

However, while the EU can learn from other jurisdictions, there are also areas where the EU is very progressive. For instance, the EU is the first jurisdiction that has implemented a horizontal regulation to limit stand-by power consumption for a number of product groups.[88] Another progressive aspect, that separates the Ecodesign Directive from the laws of other jurisdictions, is *the life cycle perspective*: other jurisdictions tend to regulate product energy consumption in the use phase, whereas the Ecodesign Directive allows for the regulation of other environmental aspects as well. But so far this has not been done to any significant degree, as will be discussed in the next section.

5 The Ecodesign Directive and Resource Efficiency

While various directives and regulations address products directly or indirectly, the Ecodesign Directive is unique in that it specifically aims for a life cycle perspective. Most legal standards set so far have however been MEPS related to energy use. There are a few exceptions. For instance the Regulation for dishwashers regulates water consumption for dishwashers[89], whereas the Regulation for household lamps states that information about mercury content

84 *Cf*. Siderius and Nakagami, above n. 66, p. 15-16.

85 Waide, above n. 83. p.5.

86 *See* Art. 3 and 7 of the Ecodesign Directive. Art. 12 obliges Member States to cooperate, but this cooperation does not seem to be very advanced as yet.

87 Waide, above n. 83, p. 8.

88 Waide, p.7.

89 Commission Regulation (EU) No 1015/2010 of 10 November 2010 - Ecodesign requirements for household washing machines, Annex I.

must be provided on the packaging.[90] However, the number of requirements that do not relate to energy in the use phase are few. There are however a lot of interest in applying the Directive to promote resource efficiency. In this section we will discuss why the legal standards set so far has not addressed resource issues, why there is a lot of interest at the EU level for using the Directive as an instrument to promote resource efficiency, the potential standards that could be set, and some of the legal issues involved. We will also discuss why user behavior is crucial when deciding what kind of standards that are reasonable to set.

Why the limited life cycle perspective in the application of the Ecodesign Directive?

Several recent studies have investigated why the standards set under the Directive tend to focus on energy efficiency in the use phase while other environmental aspects have seldom been regulated. A study by van Rossem et al.[91] finds that the MEErP methodology used by consultants in the preparatory studies has a tendency to "steer" the studies towards energy issues, and that some of the assumptions made in the studies are problematic. There was also a tendency to neglect hazardous substances in some studies. One problematic issue concerns the life span of products: if a study assumes that a laptop will be used five years when in reality it is used less than three years, the importance of energy in the use phase is also overestimated in comparison with other environmental aspects.[92] Further, a "passing the buck" strategy was noted: consultants engaging in preparatory studies do not propose legal standards for certain environmental aspects, *instead referring to the use of other EU directives to deal with these issues* (typically the WEEE and RoHS Directives and the REACH Regulation). However, it could be argued that the consultants should investigate how well other instruments perform for the product group at hand, to see if standards set for specific product groups under the Ecodesign Directive could complement horizontal legislation.

A study commissioned by DEFRA[93] found that the *policy focus* so far has been on product groups with high "energy in use" impacts; this provides part of the explanation as to why regulatory standards have focused on these aspects.

90 Commission Regulation (EC) No 244/2009 of 18 March 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for non-directional household lamps, Annex II, 3.1.

91 van Rossem, C., Dalhammar, C. and Toulouse, F. (2009). *Designing Greener Electronic Products: Building Synergies between EU Product Policy Instruments or Simply Passing the Buck?* Report: European Environmental Bureau (EEB), Brussels.

92 This is because the total amount of energy used during the laptop life time will be lower than expected, whereas the environmental impacts associated with production and waste are the same.

93 Global View Sustainability Services et al. (2011). *Review of EuP preparatory study evidence: Does it support development of non energy related implementing measures?* Report for DEFRA.

It was also found that consultants assumed that actors are in compliance with the WEEE and RoHS Directives, the REACH Regulation, and regulations connected to air/ozone emissions, without further investigations on whether this is actually the case; if there is poor compliance there may be a stronger case for addressing certain aspects through the Ecodesign Directive.[94] It was also found that there is also some political resistance to further substance restrictions. The report discusses how a key *enforcement* feature of all of these instruments is the requirement for *robust compliance testing standards and procedures* both for the producers to *check internal compliance* as well as for *market surveillance* authorities. In several of the improvement options identified in the report testing standards are not yet available, which poses a barrier for setting standards related to resources and recycling in many cases. The study also noted that there are *enforcement concerns*. A credible method has not yet been recognized that can support enforcement of a lifecycle ecodesign approach and in particular benchmark improvement targets e.g. for materials.

Making use of the Ecodesign Directive to address resource issues

Resource use considerations have come to the forefront of the sustainability agenda in the last couple of years. Both the European Union (EU) and various nations are currently developing strategies to promote resource efficiency and address resource security, in addition to existing, related strategies such as waste and recycling policies.[95] Several concepts with overlapping aims and strategies have been applied, including “sustainable material use”, “sustainable use of natural resources”, “resource efficiency”, “circular economy”, “closing the loop”, “cradle-to-cradle”, “peak resources”, the identification of "critical raw materials for the EU" and “resource security”.

An effective response to the resource related concerns would involve a number of strategies at the international, European and national levels. Relevant policies include both measures to increase resource supply – such as starting new mining operations – and measures that would promote resource efficiency and recycling. These would include policies such as material taxes and charges, and caps on resource extraction. However, most of the proposed policies – such as an increased use of resource taxes – are difficult to implement due to political and legal reasons. It is generally difficult to raise

94 The downside is that this could lead to regulatory overlaps.

95 At the EU level there are several policies related to resources, *see* e.g. COM (2011) 21. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. A resource-efficient Europe - Flagship initiative under the Europe 2020 Strategy; COM (2011) 571 final. Roadmap to a Resource Efficient Europe; COM (2008). 699 final. Communication from the Commission to the European Parliament and the Council. The raw materials initiative - meeting our critical needs for growth and jobs in Europe; European Commission (2011). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions tackling the challenges in commodity markets and on raw materials.

taxes in the face of strong opposition, and any domestic taxes risk putting domestic manufacturers at a competitive disadvantage compared to foreign competitors. The policy options are therefore clearly limited. The Ecodesign Directive is interesting in this context for several reasons. Firstly, it offers a feasible way forward. The Directive is already in place, and currently institutional learning is taking place on how to regulate the ecodesign characteristics of products, due to developments both under the Ecodesign Directive and other EU regulations (mainly the RoHS Directive and the REACH Regulation). Secondly, products are a potential source of materials and resources; in the future we expect that much more materials will be recycled, and that many substances and materials that cannot recycled today will be possible to recycle in a cost effective manner. By improved recycling we will reduce the need for opening new mining operations, which are often associated with severe impacts on human health and the environment. *Product design is crucial for the recycling potential* because products should be designed in order to be easy to recycle, and often hazardous substances in products make recycling difficult or even impossible.

What kind of standards are relevant to use?

The next question concerns what kind of standards that are relevant to set under the Ecodesign Directive to address resources. The European Commission asked the Joint Research Centre to analyses the potential for setting resource related standards through ecodesign legislation. Based on expert judgment, a typology of 20 possible criteria was proposed in the project, consisting of declarations, threshold criteria, and provision of information, and implementation of design alternatives for ecodesign (see table).[96]

96 Ardente and Mathieux, above n. 24.

Typology of Ecodesign requirement		**Parameter potentially influenced by the requirement**				
Typology	*Sub-typology*	*RRR*	*Use of priority resources*	*Recycled content*	*Use of haz. Subst.*	*Dura-bility*
Declaration of indices (RRR rates, RRR benefits rates, Recycled content, Recycled content benefit)	General indices	X	X	X		
	Indices restricted to some specific material (e.g. RRR rates or Recycled content restricted to plastics, CRM,[97] etc.)	X	X	X		
Threshold of indices (RRR[98] rates, RRR benefits rates, Recycled content, Recycled content benefit)	General indices	X	X	X		
	Indices restricted to some specific material (e.g. RRR rates or Recycled content restricted to plastics, CRM, etc.)	X	X	X		
Design for recycling	Use of compatible materials (or forbid the jointly use of materials that are not compatible for recycling)	X				
	Use of materials more recyclable	X	X			
	Reduce number of contaminants (labels, glue, solders, etc.)	X				X
Design for disassemblability / dismantlability	Time based index (e.g. dismantling of acomponent)	X	X	X	X	
	Mass / Time based index	X	X	X	X	
	Non destructive disassembly (for repair/substitution)	X				X
	Reduction / simplification of fastening (e.g. reduction of number and typologies)	X	X		X	X
Availability of spare parts						X
Warranty						X
Indices for durability	According to standardized measurement of performances (when available)					X

97 Critical Raw Materials.

98 RRR is the acronym for Rusability/Recyclability/Recoverability.

Dematerialization	Reduction of the weight of materials	X	X			X
	Design of components for optimal use of materials	X	X			X
Declaration of substances	BOM of product or parts (at different level of detail)	X	X		X	
	Relevant substances (e.g. CRM to be recycled)	X	X		X	
	Pollutants (e.g. flame retardants), which interfere with EoL treatments	X	X		X	
Threshold of substances	Relevant substances (e.g. CRM to be recycled)	X	X		X	
	Pollutants (e.g. flame retardants), which interfere with EoL treatments	X	X		X	
Marking / labelling /tracing	Easy identification of recyclable materials / parts	X	X	X	X	
	Identification of pollutants	X	X	X	X	
	Use of innovative technologies for the automatic sorting systems (tracing substances, magnetic powders, etc.)	X	X		X	
Provision of information		X	X	X	X	

Table 2: Typology of ecodesign requirements (Source: Ardente and Mathieux 2012).

As can be seen in the table, several types of standards can be used. These include standards related to:

1. Durability and availability of spare parts: such standards can prolong product life and thus save resources. There may however be a trade-off as prolonged product life means that it takes longer before a product is replaced with a more energy efficient product (as will be discussed below).
2. Dematerialization: standards promoting e.g. light weighting can induce dematerialization
3. Recycled content: requirements on percentages of recycled content will help to start up a market for recycled material. As a demand for recycled material is secured (products can only be put on the market if

they contain a minimum percentage of recycled materials) there will be economic incentives for more recycling operations.

4. Substance regulations: through substance bans, or labeling of toxic components, the technical and economic feasibility of recycling is strengthened.
5. Labeling: labeling of parts and substances can also aid recycling practices, and help consumers to sort the waste properly.
6. Design for disassembly: requirements related to design can increase the economic and technical viability of recycling.
7. Information: information to consumers and professional users – e.g. on how to use the product to extend its lifetime, how to properly clean it without the excessive use of detergents, and information about sorting and recycling – can be very important to stimulate resource efficiency.

A special concern is of course how we can set standards that are possible to comply with, and monitor. In the JRC report[99], the authors provide examples of how standards can be set and monitored for some of the issues above. For some types of standards, new methods and indicators for checking compliance may however need to be developed.

Special consideration when setting resource related standards

The JRC report shows that the setting of legal requirements related to resources is possible, and that many such requirements can be properly measured and monitored, even if the development of new testing methods may be required in some cases. There are however numerous complex issues involved. We will discuss a few key issues here.

One concern relates to recycled content. It is possible to promote recycling through mandating percentages of recycled content (e.g. that 20 % percent of the plastic and metal in a product put on the market must be recycled). However, in many cases the amount of recycled content cannot be established by examining the product itself: for many materials – e.g. metals – it is not possible to establish whether the content is virgin material or recycled material. This means that manufacturers would have to make use of supplier declarations – i.e. certificates establishing that materials are recycled, or that components contain a certain part of recycled material – in order to prove compliance. As most supply chains today are complex and involve numerous actors in many countries, this is a complex task. The risk for the issuing of false certificates is obvious, and in principle the compliance of actors outside the EU cannot be established. This may mean that EU manufacturers will complain as they are likely to be subject to inspections, whereas non-EU manufacturers can in some

99 Ibid.

cases choose not to comply. Another problem concerns that fact that some raw material suppliers may mix virgin and recycled material, and do not know exactly how much of their sales that are recycled material. In order to comply with recycled content standards, monitoring of virgin and recycled material must be performed. While these issues are problematic, it should be noted that similar concerns have been raised over existing legislation (e.g. the WEEE, RoHS and Toy safety Directives, and the REACH Regulation). Quite often we have a "chicken-and-egg" problem[100] when issuing new environmental legislation: complying with rules are costly, so industry will not set up monitoring systems until rules are in place. It typically takes a number of years before an established system is in place. However, the RoHS Directive and the REACH Regulation, and upcoming rules on conflict minerals, means that information systems are being established, and many of these practices can most likely be used also for communication and monitoring of recycled content requirements.

Another main issue concerns *the importance of user patterns*. For instance, we may think that improving product durability is in general a good strategy in order to preserve resources, as it prolongs product life time and thereby lessens the need for new products. However, for many product groups such as laptops and cell phones, the users change product more and more often. This is seldom due to product quality, but rather the users' desire for novelty (new features and new software in new products). This implies that designing such products for improved durability may actually be *a waste of resources*: if we use more energy intense processes and better materials, but producers still only used a very limited time, this means that resources are wasted. For some product groups, it may be better to promote the re-use of components and recycling of materials rather than try to prolong product life time. If we instead look at a product group like vacuum cleaners, the user pattern is very different. Most people use the cleaners until they break down. Standards that provide incentives for prolonged product lifetime can therefore make sense, as can standards to that force manufacturers to supply spare parts for a number of years after the sales.

Another complexity concerns the *incentives for proper use*. One idea that has been discussed is a legal requirement that manufacturers must – if the consumer demands it – issue a longer guarantee than is usually the case (e.g. 5 years instead of 1 year). The premise is that this would provide incentives for producers to design longer lasting products. The potential downside is however that consumers may be rather careless with the product, knowing that a new one will be supplied if it breaks down within the guarantee period.

Legal implications

The issues above exemplify some of the complexities involved in the setting of product standards. Further, the Ecodesign Directive itself contains elements

100 *See* Dalhammar and Leire, above n. 80, p. 63.

that may provide barriers to the setting of resource related requirements. First of all, the PPMs issue discussed previously have influenced the legal text.[101] Most notably, in Annex I, Part 1, 1.1, it is stated that "*In so far as they relate to product design, significant environmental aspects must be identified…*". This means that upstream processes like raw material extraction and various production phases and associated impacts, cannot easily be regulated under the Ecodesign Directive, except indirectly if they are influenced through rules on product design. In principle, it should not be possible to require PPM-related information either. In other words, requirements should be put on the product content and function, including potential for disassembly and recycling and other functions related to the downstream processes.

Another issue is that Art. 15 of the Directive is very likely to be important in relation to standards for resource efficiency. In Art. 15(2) of the Directive it is stated that in order to qualify for IMs under the Directive a product group would have to meet some criteria:

> (a) the product shall represent a significant volume of sales and trade, indicatively more than 200 000 units a year within the Community according to the most recently available figures;
>
> (b) the product shall, considering the quantities placed on the market and/or put into service, have a significant environmental impact within the Community, as specified in the Community strategic priorities as set out in Decision No 1600/2002/EC; and
>
> (c) the product shall present significant potential for improvement in terms of its environmental impact without entailing excessive costs, taking into account in particular: (i) the absence of other relevant Community legislation or failure of market forces to address the issue properly; and (ii) a wide disparity in the environmental performance of products available on the market with equivalent functionality.

There are some question marks concerning the interpretation of these rules. Leaving the discussion on "volume"[102] aside, the issue of "*significant environmental impact within the Community*" is the first point for discussion. First of all, a reasonable interpretation is that the environmental potential should be realized within the EU, and that potential benefits outside the EU should not count. We may criticize this state of affairs but the rule seems clear in this respect. Thus, one potential "hurdle" is that only environmental improvements within the EU should be counted. Even if EU rules will provide benefits also outside the EU, these should not be included in the calculation. The main problem is however that some resource use requirements may have a

101 Dalhammar, above n. 56, chapter 8.

102 There are some complaints from industry about the way that "units" are defined, in order to allow the regulation of a wider number of product groups, but we will not get further into that discussion here.

problem to pass the legal hurdle of "significant environmental impact". For instance, rare earth elements and some other valuable materials are used in very small amounts. This could mean that the environmental impact is considered small and should therefore not be regulated, even if there is a significant improvement potential and the costs of requirements are low. For some materials that are used in higher amounts it will probably be easier to determine the significance of rules that aids recycling.

However, the rules above are generally difficult to interpret in relation to resources; they are easier to apply to energy efficiency calculations. It is for instance difficult to establish how "significant" the ban of a substance in a product is, when looking at the health and environmental effects (which are often hard to establish and put a price on, and may in some cases occur outside of the EU), and how it may aid recycling practices. When a substance poses a barrier to recycling practices it may however in some cases be possible to estimate the benefits of removing it, even in terms of energy savings (as recycling saves energy compared to the production of virgin materials for many resources), and/or increased recycling levels and associated benefits etc. In other cases – e.g. rules on prolonged product life, which can be related to rules on longer guarantee periods – it may be possible to estimate energy savings, but the calculations may have to be based on uncertain assumptions (e.g. regarding the potential energy/material improvements in future products put on the market).

Secondly, the environmental benefits and the cost/benefit ratio of certain requirements related to improved recycling will be difficult to evaluate due to *dynamic effects*. For example, numbers from Japan shows that recycled paper initially was more expensive than conventional paper, but became cheaper than conventional paper over time.[103] This is rather typical in waste policy, where dynamic effects may lead to rapid reduction of costs for new systems, and a static use of LCA methodology and cost-benefit analysis (CBA) may therefore not provide a good basis for policy.

The issues above seem to imply that Art. 15 is written with energy related requirements in mind.

The costs and benefits of generic requirements, e.g. requirements on consumer information, are generally difficult to estimate and relate to the requirements in Art. 15.

In any case, some types of requirements that have a huge environmental potential would probably be allowed even if the legal text is interpreted in a "narrow" way. Several potential requirements that would boost recycling could probably be warranted, especially if the volumes are high. *One genuine problem however concerns standards set now that could boost recycling in the future*. It is likely that e.g. rare earth elements (REE) and other materials can be cost-efficiently recycled in the future as there are ongoing pilot projects to test new recycling methods, and prices of REEs are expected to rise. But the costs of future recycling practices will be influenced by the product design now,

103 Ministry of the environment. (2009). *Green public procurement in Japan*. Available: "www.globalecolabelling.net/docs/japan2009/09kobejapan_the_green_purchasing_law__and_promoting_green.pdf" [2013-06-04]

when products are put on the market, as the design influences the future potential to identify and separate materials. However, *even if producers can be mandated to make design alterations at a very low cost today to allow more cost-efficient recycling in the future, it is not clear if this is allowed under Art. 15*. If such requirements would not be allowed, the potential for strategic, long term ecodesign policies are clearly very restricted. The potential options are to a) make an "extensive" interpretation of Art. 15 in the Directive, or b) alter the wording of the Directive, which is unlikely in the short term.

It is however possible that we overestimate the importance of the legal text: it is probable that the initial stakeholder meetings and preparatory studies influence the overall direction of the process of legal standard-setting for a given product group, without too much attention being paid to the exact wording of the Directive. However, if standards start to address toxic substances and resources to a much larger extent than today, the situation might change and legal issues may be brought up more often.

6 The Interplay between the Ecodesign Directive and the Policy Instruments

A final issue that we will bring up here concerns the interplay between standards set under the Ecodesign Directive and other policy instruments. As the improvement of life cycle environmental performance is a complex task, several instruments must be applied in a policy mix. Some key interactions are outlined below.

The main role of the mandatory standards set under the Ecodesign Directive is to make sure the worst-performing products are removed from the market. They provide limited incentives for the manufacturers with the best-performing products. This means that other instruments are required to stimulate eco-innovation among the front-runners. Typically these instruments are eco-labels, energy labels, and the use of environmental requirements in public procurement. An "optimal" way to strengthen policy is to coordinate the stringency of requirements among policy instruments, and to regularly update both mandatory criteria and the criteria applied in labeling and procurement, to push both "leaders" and "laggards" among manufacturers to constantly improve product environmental performance.

For instance, the above implies that energy efficiency requirements in the Ecodesign Directive should be matched with the development of updates in energy labeling; the ecodesign requirements removes the worst products from the market, whereas labeling provide consumers with information about how well the products on the market perform, and encourages manufacturers to design products with a good energy performance.

Another way to look at the interaction is to look at policies that are directed towards single product groups as a complement to horizontal rules. REACH[104] is the main EU instrument to address chemicals. It will influence chemicals in

104 Above n. 29.

products both indirectly, as it regulates chemicals throughout supply chains and through the specific information requirements related to products in other articles (see Articles 7 and 33 in REACH). However, REACH's rules on chemicals in products are deficient, and the rules on provision of information on request (Art. 33) (which are also rather weak) do not properly include some actors such as recyclers. Rules for specific product groups could be used to address (to some extent at least) such shortcomings. As changes to REACH are very cumbersome process, product-specific rules set through specific directives or the Ecodesign Directive can also be more flexible to implement.

Some environmental and social aspects are difficult to address through legal requirements. These may typically include PPMs in product chains (child labour, labour rights, emissions during manufacturing, cutting of rainforests etc.). Then other instruments may constitute a better way forward. For instance, eco-labeling criteria often include PPMs. Public procurement is often viewed as an instrument that may be used to address issues that are difficult to address through mandatory standards.[105]

7 Conclusions and Discussion

It is obvious that ecodesign standards related to the energy efficiency of products can contribute significantly to energy efficiency and climate targets. However, as discussed in this contribution, there are several ways in which the Directive, and how it is applied, can be changed in order to set even stricter standards, and accommodate for even greater environmental improvements. One reason for why mandatory standards are required to improve product energy efficiency in many cases is that economic instruments (e.g. energy taxes) are not likely to influence consumers when they purchase certain types of products; few people choose a TV or a laptop based on the energy efficiency.

Regarding resource efficiency and resource security, the analysis shows that the Directive can play an important role for achieving EU objectives in the resource area, but that significant legal hurdles, as well as other complexities, exist. Further, the way a product is used will influence the suitability of regulations, indicating that different standards should be applied for different product groups. As the Directive offers one of the feasible policy options to contribute to EU targets on resources, it is very likely that future legal requirements will - to a larger extent than today - address recyclability and toxic substances. From a strategic perspective, it is crucial that we address product design now, because the design greatly influences the ability to safely and cost-efficiently recycle materials in the future.

The Ecodesign Directive and the related processes have a number of characteristics that are quite unique, but also quite interesting in the larger context of future environmental laws in the EU; especially complex rules that relies on input from expertise applying tools in the fields of engineering and

105 *Cf.* Dalhammar and Leire, above n. 80.

economics. First of all, the Directive provides only a framework for the actual standards set; these are set based on recommendations in reports prepared by consultants, which rely on the MEErP methodology. However, as exemplified by the case on learning curves, there is a possibility to make very different assumptions in the preparatory studies, which will greatly influence the final requirements. Thus, *much of the legal standards will be based on experts making judgments on potential legal requirements, based on calculations that rely on certain methods, and with the use of certain assumptions*. As proposed legal standards tend to lean towards more "caution", standards will in most cases be less stringent than the "optimal" standard. In other words, it is likely that most manufacturers can be able to comply with stricter standards without any significant cost increases. This implies that the Commission should constantly review the methodologies and how they are applied in order to ensure more optimal standard-setting.

Secondly, in order to better promote innovation and the diffusion of best products on the market, we need to *constantly update standards in order to account for technological developments*. Another option in order to promote innovation is to use several tiers of future requirements, which can be updated and reviewed from time to time. Then manufacturers would have long term targets that would influence and guide innovation activities, but if standards turn out to be too demanding – or outdated because of innovations on the market - they can be altered.

Thirdly, we know that *the type of product and how it is used will have great implications for what standards that are suitable to apply*. For instance, whether it makes sense to improve the durability of products depends on the user characteristics; there is little use in enforcing design for prolonged life for products where users are increasingly looking for novelty, such as laptops and cell phones. Doing so would instead lead to wasted resources.

Fourthly, a main concern is whether we can apply a truly preventative approach. As discussed, it is unclear *to what extent the existing Ecodesign Directive allows us to set standards today that may provide benefits in the future* – when we can most likely recycle more materials than is (technically and economically) possible today. If we do not address the design of the products already now, we will forever play "catch-up" and try to recycle products that are poorly designed from the beginning.

Further, when addressing the life cycle environmental impacts of various products, we need to rely on a mix of instruments, both mandatory rules and voluntary instruments. Despite its wide scope, the Ecodesign Directive can only address certain problems, whereas we must rely on other instruments to address other ones. This also means that policymakers should consider the interactions between instruments whenever new policies are proposed.

As outlined in this contribution there are an increasing amount of rules in EU law addressing the life cycle impacts of products. Product oriented law is relatively new field within environmental law, and as we go along we will learn more about how we can design better rules. A main concern for the future is how all the various EU product rules should best interact, but also how they can interact with other laws. For instance, the optimal use of appliances in buildings requires that buildings and appliances function well together. This in

turn implies that we need to analyses the interplay of various directives relating to appliances, energy performance of buildings, and construction materials.

A special consideration is whether the Ecodesign Directive could – as is done within some eco-labelling programs[106] – set "sufficiency" standards, i.e. an absolute cap on energy use form a product group; this would mean that larger appliances (many appliances such as TVs constantly grow in size) are only allowed if they use no more energy and/or resources than existing ones, which in effect means that technological innovation is required in order for manufacturers to put larger appliances on the market. The main motivation for such a measure is that it will not be enough to promote eco-efficiency in a world with a growing human population with ever-increasing demands for new goods and services, and where efficiency gains are offset through increased consumption levels: more stringent standards must be set which imply more absolute "caps" on resource use.

106 *See* Calwell C. 2010. *Is efficient sufficient? The case for shifting our emphasis in energy specifications to progressive efficiency and sufficiency*. Report: European Council for an Energy Efficient Economy.