Exploratory analysis of

Resource efficiency requirements in Ecodesign: Review of practical and legal implications

[FINAL REPORT]

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**Glossary**

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<th>Abbreviation</th>
<th>Definition</th>
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<tr>
<td>ADP</td>
<td>Abiotic Depletion Potential</td>
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<tr>
<td>billion</td>
<td>1000 million</td>
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<tr>
<td>BIOIS</td>
<td>BIO Intelligence Services (contractor for MEErP update 2013-'14)</td>
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<tr>
<td>CCFL</td>
<td>Cold Cathode Fluorescent Lamps (typically used as display backlights)</td>
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<td>CDW</td>
<td>Construction and Demolition Waste (Directive)</td>
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<tr>
<td>CECED</td>
<td>Domestic appliances manufacturer's association</td>
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<tr>
<td>CFC, HCFC, HFC, HC</td>
<td>chemical group names of greenhouse gases (typically used in refrigerants)</td>
</tr>
<tr>
<td>CML</td>
<td>Centrum voor Milieukunde, Leiden University</td>
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<tr>
<td>COP, EER</td>
<td>Coefficient of Performance, Energy Efficiency Ratio (efficiency metrics for air conditioners)</td>
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<td>CPR</td>
<td>Construction Products Regulations</td>
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<td>CRM</td>
<td>Critical Raw Materials</td>
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<tr>
<td>CRT</td>
<td>Cathode Ray Tube (display)</td>
</tr>
<tr>
<td>DE</td>
<td>Domestically Extracted or Deutschland (Germany) or Digital Europe</td>
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<tr>
<td>DG</td>
<td>Directorate-General: DG ENER, DG ENTR, DG ENV for respectively Energy, Enterprise and Industry, Environment</td>
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<tr>
<td>DMC</td>
<td>Domestic material consumption. DMC = DE + PBT, in Gt/a RME</td>
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<tr>
<td>DMI</td>
<td>Domestic materials input (DMI), in Gt/a materials with economic value used as input in an economy, default excludes materials input upstream in imports</td>
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<tr>
<td>DMI in RME</td>
<td>As DMI, but including upstream inputs in imports (experimental parameter Germany, not yet Eurostat)</td>
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<tr>
<td>EC</td>
<td>European Commission, European Community</td>
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<tr>
<td>EEE</td>
<td>Electric and Electronic Equipment</td>
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<td>EHI</td>
<td>European Heating Industry association</td>
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<td>EN</td>
<td>European standard (norm) identifier</td>
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<tr>
<td>ELV</td>
<td>End-of-Life Vehicles (Directive)</td>
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<td>ELoL</td>
<td>End-of-Life</td>
</tr>
<tr>
<td>EPA</td>
<td>United States Environmental Protection Agency</td>
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<td>ErP</td>
<td>Energy-related Products</td>
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<tr>
<td>GATT</td>
<td>General Agreement on Tariffs and Trade</td>
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<tr>
<td>GDP/DMC</td>
<td>Resources productivity indicator (for ‘decoupling’)</td>
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<tr>
<td>GPP</td>
<td>Green Public Procurement</td>
</tr>
<tr>
<td>GWP</td>
<td>Global Warming Potential (time-horizon 100 years)</td>
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<tr>
<td>GWP100</td>
<td>Global and European standardisation bodies</td>
</tr>
<tr>
<td>IPP</td>
<td>Integrated Product Policy</td>
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<tr>
<td>JRC, JRC-IES</td>
<td>EC DG Joint Research Centre; here JRC-Institute for Environment and Sustainability</td>
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<tr>
<td>kWh</td>
<td>kilo-tonnes (1000 metric tonnes, 106 kg)</td>
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<tr>
<td>LCA</td>
<td>Life Cycle Assessment</td>
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<tr>
<td>LCD</td>
<td>Liquid Crystal Display</td>
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<tr>
<td>LED</td>
<td>Light Emitting Diode</td>
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<tr>
<td>MEErP</td>
<td>Methodology for the Ecodesign of Energy-related Products</td>
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<tr>
<td>MinIenE</td>
<td>Netherlands Ministry of Infrastructure and Environment</td>
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<tr>
<td>Mt</td>
<td>Mega tonnes (106 metric tonnes, 109 kg)</td>
</tr>
<tr>
<td>OEF</td>
<td>Organisational Environmental Footprinting</td>
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<tr>
<td>PERF</td>
<td>Product Environmental Footprinting</td>
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<tr>
<td>PPM</td>
<td>Process and Production Methods (distinguish PR=product related and NPR=non-product related)</td>
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<tr>
<td>ppm</td>
<td>parts per million</td>
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<tr>
<td>PTB</td>
<td>Physical Trade Balance</td>
</tr>
<tr>
<td>RE</td>
<td>Resources Efficiency</td>
</tr>
<tr>
<td>REACH</td>
<td>Registration, Evaluation, Authorisation and Restriction of Chemicals (Directive, defines SVHC)</td>
</tr>
<tr>
<td>RME</td>
<td>Raw Material Extracted (mass)</td>
</tr>
<tr>
<td>RoHS</td>
<td>Restriction of Hazardous Substances</td>
</tr>
<tr>
<td>RRR</td>
<td>Re-usability/Recyclability/Recoverability</td>
</tr>
<tr>
<td>SVHC</td>
<td>Substance of Very High Concern</td>
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<tr>
<td>TEWI</td>
<td>Total Equivalent Warming Impact</td>
</tr>
<tr>
<td>VHK</td>
<td>Van Holsteijn en Kemna (author)</td>
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<tr>
<td>WEEE</td>
<td>(Directive on) Waste of EEE</td>
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<td>WEEELABEX</td>
<td>European standards project WEEE</td>
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<td>WFD</td>
<td>Waste Framework Directive</td>
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<td>WTO</td>
<td>World Trade Organisation</td>
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Executive summary

This study for the Dutch Ministry of Infrastructure and Environment explores the potential role of material resource efficiency, except energy efficiency during use, in the Ecodesign of Energy-related Products (ErP) Directive.

Assignment

The context of the study is an initiative of the Netherlands and several other Member States, requesting the Commission to make proposals on how to (better) incorporate enforceable resource efficiency measures in Ecodesign, following the EU flagship initiative for a ‘resource-efficient Europe’. More specifically the study looks at the result of recent DG JRC research on resource efficiency parameters, where the Ministry would like to know whether the DG JRC list of resource efficiency parameters is complete and if and how these parameters would be enforceable.

Resource efficiency in Ecodesign

The following summarizes in one sentence the main conclusion on the role of resources

In principle, the Ecodesign directive can regulate almost any resource efficiency parameter of energy-related products, provided that

- a) the parameter can be measured and
- b) there is a significant impact and improvement potential.

Resource efficiency parameters

The recent DG JRC study has developed new calculation methods to take into account resource-efficiency parameters like Reusability/Recyclability/Recoverability (RRR rates), Recycled Content, Use of Priority Resources (RRR Benefit Rates), Use of Hazardous Substances (as a barrier to end-of-life treatment) and Durability. These calculation methods are theoretically largely applicable in Ecodesign\(^1\) and —through the efforts of BIOIS and Fraunhofer under a Commission DG ENTR contract—have recently been added to the generic methodology for preparatory studies (MEErP).

However, DG JRC gives little guidance on practical implementation and is frequently referring to ‘expert judgement’ and ‘LCA’ (Life Cycle Assessment) for crucial parts of the calculation.

Furthermore, most DG JRC parameters concentrate on end-of-life. Waste prevention, i.e. the first priority in the EU waste hierarchy, is missing as is the reduction of Critical Raw Materials in the production phase.

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\(^1\) Except for the fact that they do include abiotic depletion potential and that some characterisation factors are not in line with limit values in EU legislation.
Waste prevention includes important issues such as the minimisation of non-energy resources consumption during the use phase, light-weighting, etc. The topic of Critical Raw Materials is a part of EU policy, where Ecodesign can make an important contribution both from an economical and environmental point of view.

**Recommendations**

To strengthen the role of material resource efficiency in Ecodesign, beyond energy efficiency, the following actions are recommended on short, medium and long term:

**Short term**

In the current Ecodesign measures, there are several examples where non-energy resource efficiency parameters are addressed, e.g. water consumption of household washing machines and dishwashers, paper consumption of imaging equipment, durability aspects (technical life, spare part availability, etc.) of light sources, vacuum cleaners, etc.

On the short run, it seems logical to build and expand on what already appears to be enforceable within Ecodesign:

- Regulation of the consumption of direct and indirect resources during product use (beyond energy efficiency) and
- Durability (technical life, spare part availability) \(^2\)

**Medium term**

As mentioned, resource efficiency parameters that can be measured on the product are easier to implement than those that require a ‘paper trail’ of declarations or certain obligations. Thus it would seem logical to start investigating parameters that can be derived from

- Product weight and/or weight fractions that are an indication for resources use in production and distribution (light-weighting, miniaturisation, critical raw materials)
- Physical/chemical characteristics like purity, surface quality or key mechanical properties for which there are test standards and that are indicative –even only approximate—of recycled content.

**Long term**

After considerably more research and capacity building than what is available today, it may be appropriate to use Ecodesign through those parameters that cannot be directly measured on the

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\(^2\) In this context it must be mentioned, as pointed out by the recent JRC-study, that durability requirements can go both ways: A minimum requirement may save on material resources in production and waste at end-of-life, but a maximum requirement may –especially for energy-related products—more appropriate where the longevity of products gets in the way of replacement by much more efficient products.
product but where there is an expectation for the future that certain related parameters might be beneficial. This would include such forward-looking items as

- Reusability
- Recyclability
- Recoverability

The recent DG JRC study is a good theoretical basis, but the expectation that ‘expert judgement’ or one of the many LCA methods that exist will be enough for Ecodesign measures that will actually ban products from the market is, in our view, not realistic.

This does not mean that in the meanwhile, until such time that the medium-term and long-term mandatory regulation through such a ‘hard’ legal instrument as Ecodesign can be implemented, nothing can be done. The report mentions e.g. the possibility, to be implemented through Member States, to make a more direct coupling between the manufacturer’s financial costs of the waste directives (e.g. WEEE) and the ‘recyclability’, ‘reusability’ and/or ‘recoverability’ of the products.

Furthermore, even when the research hasn’t delivered a complete picture yet, the possibility of horizontal Ecodesign measures could be explored on those items where there is a consensus. For instance, setting maximum disassembly times for electronic (or hazardous) components of products might give an added value.

There may also be ‘horizontal measures’ delimiting and simplifying the complexity of Ecodesign measures. For instance, regarding the restrictions on the use of hazardous substances and substances of very high concern the RoHS and REACH directives are doing a good job, and it could be decided that Ecodesign measures will not address these issues.

The following paragraphs provide more background information to the above recommendations.

**Resources use by ErP**

The European Union is responsible for the use of 9.5 billion tonnes raw material equivalent per year, including a 2.5 billion tonne Rucksack from the trade balance (EU 2010). Minerals for the construction make up the largest part but the –more valuable– energy-related products in the scope of the Ecodesign directive make up approximately 28% or 2.6 billion tonnes of this total. Three-quarters of the 2.6 billion tonnes consists of energy-resources (fossil fuels and bio-mass for energy) and one-quarter of other material resources (metal ores, minerals, etc.). Energy sources can be split in a part that is consumed directly in the use-phase of the products and a share that is related to production, distribution, end-of-life and energy-related inputs. Overall, energy resources during the use phase are responsible for 1.7 billion tonnes, whereas other materials and energy resources for production, distribution and end-of-life make up 0.9 billion tonnes.
There is not enough data to estimate the share of energy-related products in the total 2.6 billion tonnes of EU waste. Depending on definitions and system boundaries that share can be set between 2% and 23%.

As regards the EU abstraction of 237 billion tonnes of water for cooling, irrigation, process- and drinking water, the ErP play an important role, but it is not clear what part of the water use can actually be reduced by those products and what part is functionally indispensable.

The proportion between direct energy use (during use-phase), the indirect ‘energy-related’ energy use (e.g. of products that influence space heating energy, food waste, etc.) and the indirect production energy varies widely and is shown in the illustrative figure below.
Figure 2. Energy/carbon footprint of Energy-related Products (source: VHK, based on MEErP/EcoReport for individual products. Note that the last 4 products were added for comparison, based on EcoInvent data)

The study concluded that the resource efficiency of almost any energy-related product can in principle be addressed through Ecodesign measures, provided the relevant parameter can be measured and a significant impact and improvement potential exists. The various elements of this conclusion require further explanation.

**In principle**

"In principle" means that there are exceptions. For instance, the "need to act" is less for parameters that are already sufficiently regulated through other instruments or where market forces already realize the improvement potential. Chapter 3 gives an overview of the parallel legislation that already exists and which may tackle similar issues as those in the scope of the Ecodesign directive. In practice and in most cases, the Ecodesign measures will have an added value beyond what is already in existing legislation or what market forces can achieve. A possible exception is the restriction on the use of hazardous substances or substances of very high concern (SVHC), where the RoHS and REACH directives are doing a job which will be difficult to improve upon through Ecodesign.

Ecodesign requirements should be acceptable within the (rules for the) framework of international trade agreements (WTO, GATT). This is described in Chapter 4. The international trade rules make a distinction between requirements where compliance can be assessed on the
Resource Efficiency and the Ecodesign Directive

product itself (product-properties/performance or product-related process and production methods PPMs) or not (non-product PPMs, e.g. based on declarations or obligations to set up collection, recycling, etc. schemes). The former are usually accepted under WTO/ GATT, whereas for the latter the legislators will need to forge a strong case to demonstrate the necessity of such a potentially trade-restricting measure. Chapter 4 also addresses the possibility to include certain resource efficiency parameters in the generic requirements according to Annex I of the Ecodesign Directive.

Following Article 15, sub 5 of the Ecodesign directive there shall be no significant negative impact in terms of the functionality of the product, health, safety and the environment, affordability and life cycle costs, industry’s competitiveness, imposing proprietary technology, excessive administrative burden. In practice, these items are taken into account in the preparatory studies and are relatively seldom problematic at political level.

Almost any

‘Almost any’ means that there are a few resource efficiency parameters that are known in scientific literature, but where there is no political consensus (yet) on if and how they should be tackled. Examples are abiotic depletion potential (ADP) and land use, where it will be difficult for the Ecodesign directive to develop measures on the short term. Other than that, the Ecodesign directive covers the whole product-life cycle, from production, distribution and use to end-of-life, and allows addressing all types of resource efficiency aspects.

Can be measured

It seems obvious that one cannot set a legal requirement for a parameter that cannot be measured, but this is much more complicated than it seems. A ‘measurement’ means that there must be a test and calculation method that is accurate, produces reproducible results, is technically feasible, does not lead to excessive costs for industry and surveillance authorities and is as close as possible to real-life situation. The development of test standards requires capacity building by experts and extensive testing programmes, often including a ‘round-robin’ test amongst several European test labs, and a comprehensive stakeholder consultation within the European standardisation organisations (ESOs). This is time-consuming and may typically take up to eight or ten years if there is no history of national or prior international standards. It also requires appropriate financial incentives, typically accompanying European Commission mandates.

For several resource parameters related to end-of-life, like reusability, recyclability and recoverability, there is the additional problem of a 5 to 25 year time gap between the production and the moment these parameters can prove their effectiveness.

The Commission is trying to speed-up the process by communicating ‘transitional methods’, which fill the gap between the publication of a regulation and the completion of a harmonised standard, but that situation is far from ideal especially where there is no history of testing at all.

Last but not least, a test and calculation method alone is not enough. It should also be applied not only by industry but also by the market surveillance authorities. Following the principle of
subsidiarity, market surveillance is the task of the Member States but there is broad consensus and complaint, especially from industry facing the problem of ‘free riders’, that the current (funding for) market surveillance is completely inadequate. This problem exists for testing on energy efficiency and will certainly also exist for any other resource efficiency parameter.

**Significant**

In accordance with Article 15, sub 2, of the Ecodesign directive a product is eligible for measures when it is economically and environmentally ‘significant’ and the improvement potential is ‘significant’. The ‘significance’ is a flexible concept, very much depending on how wide the scope of a product group is defined, but in practice there are some unwritten rules. For instance, if a key parameter, usually energy consumption or carbon emissions but it could be any other parameter, is less than 0.1% of the EU-total the chances of a product group being elected for specific Ecodesign measures are slim. Improvement-levels of 20% (e.g. on energy losses) within 5-6 years after the implementation of an Ecodesign measure are not uncommon.

Whether a specific resource efficiency parameter inside a product group is eligible for measures depends, apart from the relative share in EU-totals, very much on the type of product as is indicated in figure 1. For large energy users the effect of energy efficiency measures on most other environmental categories (greenhouse gases, acidification, toxicity, etc.) tends to dwarf the relative impact of all other parameters. On the other hand, for several low-energy electronic devices and low-usage small appliances, the impact of the production and end-of-life stages may be significant. Also there are several products that –during their use phase-- consume auxiliary resources (water, detergents, ink, paper, etc.) or that (may) influence resources consumption indirectly e.g. the waste of food through sub-optimal refrigeration, textile wear through cleaning, etc.

**Main conclusions regarding the analytical, preparatory stage:**

- The recently developed RE parameters are mainly oriented to end-of-life of products and are not complete.

- Waste prevention, i.e. the first priority in the EU waste hierarchy and currently an important contributor to diminishing the waste stream, is the most important RE parameter missing.

- Waste prevention includes
  - minimal materials use through miniaturisation and light-weighting of the product, affecting all life-cycle-phases, and
  - minimal (non-energy) resources consumption during the use-phase, e.g. direct use of water, paper and refrigerants, but possibly also indirect (‘related’) resources impacts e.g. linked to food preservation (in fridges), textile wear (in laundry equipment), etc.

- The JRC scenario-method to establish Durability Benefit of energy-related products seems to take into account the appropriate parameters and considerations, but requires stakeholder consensus on the inputs i.e. regarding the future energy efficiency of the specific product.
• The JRC method on hazardous substances entails a multi-stage analysis, first identifying components that—according to RoHS and REACH legislation—are hazardous or of very high concern and then identifying if the processing of these components at end-of-life will be hazardous. This type of analysis can be performed if enough effort (budget) is invested in gathering the necessary input data given the probably large variances between treatment locations and methods.

• JRC methods to establish RRR\(^3\) rates and RRR Benefit rates have been integrated as much as possible in the existing methodology for Ecodesign preparatory studies (a.k.a. MEErP). This methodology is new and no preparatory studies have been completed where it has been used.

• Mass-based RRR rates should be used with caution, as stated in JRC’s own analysis, and RRR Benefit rates are more appropriate for the holistic life-cycle thinking in Ecodesign.

• The data retrieval and development of stakeholder consensus on appropriate input data for the RRR Benefit rates will require a major (specialist) effort and budget in the Ecodesign preparatory studies. Should it be decided to follow this route, the Commission will have to not only raise budgets but also make an exception to the proportionality-principle that it currently applies, i.e. that the research effort is proportional to the environmental gain that can be expected. Test cases conducted so far for energy-related products (washing machines, televisions) show that relatively very limited environmental gain is to be expected, i.e. (far) less than 10% for most environmental impact categories.

• The JRC-assessment of Recycled content Benefit has been included in the most recent versions of MEErP and, through the Extra Materials facility, its EcoReport-tool. The effort to assess this rate in preparatory studies is more limited than for the RRR Benefit rates. In the same scope also materials with a certified origin (e.g. FSC) could be included and is currently missing.

• The Ecodesign Directive allows addressing all RE parameters discussed, but requires proof of their significance and (for specific measures) proof of their technical and economic feasibility. Much of the information required for delivering that ‘proof’ has been shown to be difficult to retrieve in the public domain. The evidence base is most likely easiest to collect for measures related to recycled content, durability of specific components, presence/use of hazardous substances, use of materials of certified origin.

Main conclusions regarding practical implementation and enforceability:

• Ecodesign measures regarding savings on non-energy resources consumption in the use-phase have proven to be enforceable, at least for directly consumed resources, legally and in practice. Methodology and measures regarding weight-saving measures in Ecodesign would need to be developed.

• Measures on product durability (life time extension) have proven to be enforceable when formulated in terms of minimum technical life of the product or components according to

\(^3\) Reusability, Recyclability and Recoverability
harmonised test and calculation procedures. Also minimum warranty times and the time period during which spare parts are available can be enforced.

- Current Ecodesign practice, e.g. in the case of mercury in certain light sources, is to leave banning of hazardous substances to the RoHS and REACH directives and –as appropriate-- make certain allowances (e.g. on ignition time requirements) when the hazardous substances are used in a form that is less hazardous at end-of-life (e.g. amalgam instead of liquid/gaseous mercury).

- Should Ecodesign preparatory studies, using the JRC-method and/or other parameters within MEeRP, be able to provide robust evidence that justifies introduction of specific RRR measures in legislation, (a set of) specific and tailor-made requirements should be introduced in Ecodesign legislation that could meet legal and practical criteria of enforceability.

- Amongst others this means that the requirements should be technically and economically feasible and preferably relate to parameters that can be assessed with an accurate, reliable and reproducible test and calculation methods at product-level. If they would depend on input from upstream actors (suppliers) or downstream (end-of-life) processes, the administrative burden would be considerable and still the accuracy and reproducibility of measurements would require robust test standards to be in place to guarantee a level playing field.

- As an alternative to treating re-use, recycling and (heat) recovery in Ecodesign, policy makers could consider to strengthen the coupling with the minimum-requirements from EU Waste Directives, i.e. make the cost contribution of manufacturers to the effort to achieve these requirements (more) depending on design-measures they take to facilitate proper end-of-life treatment.

- The application of recycled content in actual measures suffers from similar problems as mentioned for the RRR Benefit rates, but with some differences. First, there is already some standardisation of the (documentation and assessment) process where the recycled content of plastics could be established through declaration through suppliers. Second, although approximate, it could be considered to measure directly or indirectly (e.g. through derived characteristics such as reflectance, surface quality, etc.) the material contamination and thus the approximate recycled content on the product.

- International trade agreements emphasize the relation between the proposed measure and its means of verification. Measures that can be verified on the product itself are considered to constitute less of a (potential) barrier to trade than measures that can only be verified indirectly as they relate to non-product related production and process methods. Several RE parameters incorporate such non-product related PPMs (for example through a link to End-of-life treatment envisaged). There are however measures that may relate solely to the product, such as parameters dealing with durability, light-weighting, presence of substances (hazardous or critical raw materials, etc.).
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1. Assignment

1.1 Background

In this study ‘resource efficiency’ means using the Earth’s limited resources in a sustainable manner while minimising impacts on the environment. Resource efficiency or a ‘resource-efficient Europe’ is a flagship initiative that is part of the Europe 2020 Strategy, the EU’s growth strategy for a smart, inclusive and sustainable economy.

The Roadmap to a resource efficient Europe is one of the main building blocks of this resource efficiency flagship initiative. The Roadmap sets out a framework for the design and implementation of future actions. It also outlines the structural and technological changes needed by 2050, including milestones to be reached by 2020. The milestone set for sustainable consumption and production requires the Commission to (a.o.):

- address the environmental footprint of products, including through setting requirements under the Ecodesign directive, to boost the material resource efficiency of products, and through expanding the scope of the Ecodesign directive to non-energy related products;
- establish a common methodological approach to enable Member States and the private sector to assess, display and benchmark the environmental performance of products, services and companies based on a comprehensive assessment of environmental impacts over the life-cycle.

More details are given in Annex A, which also discusses related publications on the Union Environment Action Programme and the Circular Economy.

1.1 Actions since 2011

Since the publication of the Roadmap The Netherlands, together with several other Member States, has asked the Commission Services to come forward with proposals on how to incorporate “resource efficiency” within the context of Ecodesign, and possibly Energy Labelling as well.

This topic was therefore subject of the evaluation of the Ecodesign Directive in 2011 (CSES, 2011), but on the basis of this study the Commission Services decided it was premature to introduce resource efficiency related requirements within the Ecodesign context. In its report to the Parliament of the review of Directive 2009/125/EC December 2012 the European Commission stated that “many non-energy related products have a significant environmental impact that mainly occurs in the earliest phase of the life cycle and therefore product testing would no longer be adequate for conformity assessment; there is a significant difficulty in establishing enforceable ecodesign requirements.”

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It is expected that by the end of 2014 a further statement or decision regarding materials efficiency in Ecodesign shall be made, possibly taking into account the results of the study for the review of the Energy Labelling Directive 2010/30/EC, also addressing the appropriateness of resource efficiency aspects under Ecodesign Directive 2009/125/EC.

In the meantime a study by DG JRC described potential parameters for the introduction of requirements related to material efficiency, addressing these through parameters such as Reusability / Recyclability / Recoverability, Recycled content, Use of Priority Resources, Use of Hazardous substances and Durability. The study by JRC concluded that technical possibilities for such requirements exist but uncertainty remains as regards the exact formulation of such requirements and how these could be enforced. In November 2012 the Commission launched a related study with the aim to amend the current Ecodesign methodology MEeRP with resource efficiency aspects (BIOis 2013), but the actual changes or enhancements to the previous method version are limited. Also relevant may be the on-going study regarding Product and Organisational Environmental Footprinting methods (PEF+OEF).

Summarising the above, it is clear that although the Ecodesign Directive in principle offers possibilities to regulate resource efficiency of products this option is rarely used. The Dutch Ministry of Infrastructure and the Environment therefore asked VHK to assess the options for (and the problems associated with) introducing resource efficiency requirements in Ecodesign implementing measures given that these requirements should be realistic, feasible and enforceable.

1.2 Objective

The current study aims to support the Dutch efforts by addressing, in the next chapters, a number of key questions on the implementation of the above legal demands.

The main research question as formulated by DGMI is:

7 by Ecofys, 2013-2014, see: www.energylabellingevaluation.eu

8 Integration of resource efficiency and waste management criteria in European product policies – Second phase, Deliverable 3 – Development of guidance documents, JRC, December 2012

9 Technical assistance for a material-efficiency Ecodesign Report and Module to the Methodology for the Ecodesign of Energy-related Products (MEeRP). Project website: http://meerp-material.eu/. The project is expected to be concluded by September 2013.

10 In Dutch: De kernvraag richt zich op de vormgeving van aspecten van materiaal efficiency in een wettelijke juridische context, zodanig dat deze realiseerbaar en handhaafbaar zijn, dat wil zeggen ‘kan het?’, en zo ja op welke wijze kunnen/ moeten de diverse parameters worden ingevuld.

Onderliggende vragen:

Zijn de volgende parameters afdoende voor het vormgeven van materiaal efficiency in de context van Ecodesign?: Reusability/Recyclability/Recoverability, Recycled content, Use of Priority Resources, Use of Hazardous substances and Durability. Welke parameters ontbreken eventueel?

Is elke parameter geschikt om als wettelijke eis te worden opgenomen? Op welke wijze kan dat worden vormgegeven en welke complicaties zijn daarbij aan de orde? Welke good practises bestaan al?

Is een producent in staat om elke parameter van materiaal efficiency te realiseren? En zo ja, wat is daarvoor nodig en welke condities zijn relevant voor deze realisatie?
Can aspects of resource efficiency of products be addressed in the regulatory/judicial framework of the Ecodesign Directive in such a way these aspects can be met by manufacturers and enforced by market authorities, and if so, what would be needed for the practical implementation of such measures?

The above primary question is formulated by the client as the following secondary questions:

- Are the parameters Reusability/Recyclability/Recoverability, Recycled content, Use of Priority Resources, Use of Hazardous substances and Durability sufficient to describe aspects of resource efficiency. Is there a need for additional parameters?
- Is each parameter suitable as legal requirement? How can such parameters be implemented in a Regulation and what possible consequences can be expected? Are there examples of good practice(s)?
- Can a producer meet (each of) these requirements? How would a producer show compliance and what conditions are needed to allow this?
- Is a market authority able to verify the conformity of the product with (each of) these requirements? What conditions are needed to allow this?

The questions are addressed by a review regarding the practical and the legal aspects of introducing such requirements. The questions have been rephrased into "work items" as shown in the table below.

### Table 1. Work items, contractor activities announced, reporting.

<table>
<thead>
<tr>
<th>Project brief</th>
<th>Activity announced</th>
<th>Report section</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Work item 1: Is the list of resource efficiency parameters complete?</strong></td>
<td>review of RE parameters from DG JRC study and other (EU) reports</td>
<td>Chapter 3.9</td>
</tr>
<tr>
<td></td>
<td>discuss context of resource efficiency (problem, main issues)</td>
<td>Chapter 2</td>
</tr>
<tr>
<td><strong>Work item 2: Are the resource efficiency parameters suitable as legal requirement?</strong></td>
<td>review of RE in exist ED prep.studies, cross-check with the parameters above</td>
<td>Chapter 4</td>
</tr>
<tr>
<td></td>
<td>legality of requirements for such parameters</td>
<td>Chapter 4</td>
</tr>
<tr>
<td></td>
<td>overview of stakeholder views</td>
<td>Chapter 5</td>
</tr>
<tr>
<td><strong>Work item 3: How would a producer show compliance of a product placed on the market?</strong></td>
<td>desk-research into available studies and tools</td>
<td>Chapter 3-4-5</td>
</tr>
<tr>
<td></td>
<td>availability of test standards</td>
<td></td>
</tr>
</tbody>
</table>

Is een toezichthouder in staat om elke parameter op juistheid te controleren? En zo ja, wat is daarvoor nodig en welke condities zijn relevant voor toezicht en handhaving?
Work item 4: How would a market authority verify the conformity a product placed on the market?  
see above – focusing on market surveillance.

Scope of study

The scope of products to be assessed in this study is limited to the current scope of the Ecodesign Directive which are energy-related products.

The enlargement of the scope to include non-energy related products has been discussed in the evaluation (2014) of the Energy Labelling and Ecodesign Directives\textsuperscript{11}. In this study the authors conclude that on the basis of the preconditions set out (necessity, feasibility and added value) it seems premature to expand the scope of the Directives particularly if limited resources are available.

Resources efficiency is considered here to exclude energy efficiency of the products during the use phase. The latter is certainly part of the resources efficiency flagship initiative of the Commission, but it is not the part for which the Commission requires input from the Member States in the context of the Ecodesign directive.

Furthermore, the discussion hereafter concentrates on the design scope of the Ecodesign directive, i.e. product design-oriented ('front-end') and not waste-oriented ('end-of-pipe') parameters and measures, unless the two are linked. Also the report is focused on energy-related products (ErP) that are or could potentially within the scope of the directive.

2. Resource use by ErP

2.1 Introduction

This introductory chapter sketches the quantitative context, exploring the size of materials resources use by the energy related products that are in the scope of the Ecodesign directive and the opportunities that a strategy of materials resource efficiency may bring.

2.2 Material resources

According to preliminary accounting by VHK\textsuperscript{12} the Domestic Material Consumption (DMC) of the EU-27 amounted to 8.3 billion tonnes per annum (Gt/a, see figure 1). Taking also into account the 'Rucksack' of materials incorporated in imported goods, the figure rises to an estimated 9.5 billion tonnes.

\textbf{Figure 1. Domestic Materials Consumption EU 2007 (source: VHK, MEErP - Part 2, 2011; original data Eurostat 2011)}

\textsuperscript{12} based on Eurostat data and Ecodesign-related studies and the MEErP, Part 2.
Energy-related products (ErP), i.e. the total of products that are or could be regulated under the Directive 2009/125/EC\textsuperscript{14}, were responsible for an estimated 28% of this total, i.e. 21% in energy-related materials (20% fossil fuels, \~1.5% biomass) and 7% in non-energy related materials (metal ores 4%, biomass \~0.5%, minerals 1%, fossil feedstock 1%). In other words, the proportion between non energy-related and energy related material resources is approximately 1 on 3.

\textsuperscript{13} Note that the conversion factor for Rucksack imports are still experimental; especially the conversion for Cu and Ni at 200-250 kg/kg is high.

\textsuperscript{14} This includes also ErP that are not (yet) regulated such as building insulation, windows, etc.
A part of the energy-related resources consumption will not be due to the use phase of end-products, but to their production, distribution and end-of-life phase. The partitioning is not easy\textsuperscript{15}, but all in all VHK estimates that overall some 15-20% of the energy used by products in the scope of the Ecodesign directive is due to production, distribution and end-of-life. This would mean that use-phase energy resources of ErP constitute 17-18% of DMC and 10-11% of DMC goes to energy and non-energy material resources for the other stages of the product life.

A closer look at specific energy related products indicates that this proportion is very different per product. For space heating and lighting related products the use phase constitutes more than 90% of the total, when using direct and indirect energy accounting. For larger domestic appliances and computers the share is 70-80%. For TVs the proportion between use phase and production is 50/50 and for small electric appliances and other products with a very low frequency of use, the use phase is 20% or less.

\textbf{Figure 4. Energy/carbon footprint of Energy-related Products (source: VHK, based on MEErP/EcoReport for individual products. Note that the last 4 products were added for comparison, based on Ecoinvent data)}

\textsuperscript{15} And often subjective, i.e. some analysts partition all resources only to consumer end-products and -services (e.g. EIPRO 2006 study), whereas in the Ecodesign accounting also industrial products, like industrial pumps, fans and motors are considered as end-products. The estimate above is based on the latter.
2.3 Waste

At the end-of-life, only a fraction of the DMC materials input can be classified as ‘waste’. One obvious reason is the fact that more and more of the discarded products (the ‘arisings’) are being recovered (recycled, composted, incinerated with heat recovery, etc.). Another important, but often forgotten reason is that many materials are incorporated in products, buildings and infrastructures that are in use for a very long time of e.g. 50 years for buildings and that over that long time the economy (and population) has grown continuously. Eurostat calculates the total amount of EU-waste in 2007 at 2.6 billion tonnes, i.e. approximately 25-30% of the input (See Figure 5. Waste accounting EU 2007, total 2.6 billion tonnes (source: Eurostat) Figure 5). There is no estimate of the total waste from ErP, but Eurostat does make a separate accounting of the waste of electrical and electronic equipment (WEEE). The table 2 shows that of the 8.5 million tonnes (Mt) of annual WEEE arisings (products discarded) some 2.8 Mt end up as waste. For an estimation of the total waste from ErP there is currently not enough data, but depending on the definition and the system boundaries of ‘waste’ the ErP can be said to make up between 2% and 23% of the waste stream.\textsuperscript{16}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{waste_accounting_eu_2007.png}
\caption{Waste accounting inside EU: 2.6 Gt}
\end{figure}

\textsuperscript{16} Based on VHK, MEErP 2011 (Tables 3 and 7), post-consumer waste from ErP is \textasciitilde 45 Mt (30 steel, 1 aluminium, 1 other metal, 2 plastics, 0.5 glass, 10 paper/cardboard/wood). This is less than 2% of the 2615 Mt Total EU Waste. Counting also the waste in the production phase, excluding the major minerals, adds 19 Mt (12 metal, 2 plastics and 5 paper/cardboard production) to arrive at 64 Mt waste, which is 7% of the 920 Mt waste excluding the major minerals (a recent Eurostat indicator). If we include the mineral waste from metal ore mining for ErP (410 Mt, including Rucksack) and the solid waste from steel manufacture (24 Mt), the total becomes 498 Mt or 19% of total EU Waste. Finally, when we add the combustion waste from coal-fired space heating (6.3 Mt) and from coal-fired power plants (91 Mt) the total is 595 Mt or 23% of the 2615 Mt total EU Waste. Note that these are very rough estimates.
Table 2. Materials flow End-of-Life electric and electronic equipment in million metric tonnes (source: Eurostat env_waste, relates to EU 2008)

<table>
<thead>
<tr>
<th>EEE materials flow End-of-Life</th>
<th>Mt</th>
<th>Mt</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEE products placed on market</td>
<td>10.1</td>
<td></td>
</tr>
<tr>
<td>stock-effect (product-life dependent)</td>
<td>1.6</td>
<td></td>
</tr>
<tr>
<td>WEEE arising</td>
<td>8.5</td>
<td></td>
</tr>
<tr>
<td>of which</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collected as EEE</td>
<td>3.2</td>
<td></td>
</tr>
<tr>
<td>of which</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recovered from EEE</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Waste from recovery</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Mixed fraction (not collected as EEE)</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>Recycled (90% of metals)</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>Heat recovery (70% plastics)</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Disposal (output Waste sector)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incinerated</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Landfill</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TOTAL WASTE</td>
<td>2.8</td>
<td></td>
</tr>
</tbody>
</table>

Eurostat statistics are still incomplete and the above table gives only an indication.

The accuracy of Eurostat totals is also debatable. Eurostat data seems to indicate that the total mass of EEE products put on the market is stable or slightly diminishing. The mass of collected, recovered, recycled EEE seems to be (slowly) growing.

As an illustration of what can be expected for the WEEE mass in the future some US data for the period 1999-2009 are given in figures 6 (numbers of products) and 7 (weight in short tonnes). The US figures show a number of interesting phenomena: There is a contrast between the huge number of cell phones versus their minimal contribution to the discarded mass. There is the ‘stock effect’, which makes that the waste mass per product is always running behind the sold mass. Finally the graphs show the effect of weight reduction in especially the new flat-screen TVs versus the old CRT television.
Figure 6: Sales of electronic products by model year, short tons of products sold. *Results for 2010 are projected based on estimates from previous years. (source US EPA 2011)

Figure 7: Sales of electronic products by model year, in number of units sold. *Results for 2010 are projected based on estimates from previous years. (source: US EPA 2011)

Figure 8: Quantity of electronic products ready for end-of-life management in the United States. *Results for 2010 are projected based on estimates from previous years. (source: US EPA 2011)

Figure 9: Quantity of electronic products collected for recycling or disposed, by year. *Results for 2010 are projected based on estimates from previous years. (source: US EPA).
2.4 Water

Water resources are part of the EU’s strategy for resources efficiency. The total amount of EU water abstracted in 2007 was 237 billion m³ (see figure 6)\textsuperscript{18}. Of this total, over half is used for cooling (temporarily set apart from e.g. river flows), one-quarter for irrigation (pumped from ditches, wells, etc.) and one-fifth is drinking water from the public grid. Figure 5 shows an estimate of the share of energy-related products, concluding that almost half of the total water use can be attributed directly or indirectly to these products. Of this, almost 90% is in the form of cooling of electric power plants and thus energy-related. Of the domestic drinking water, it is estimated that half of the domestic drinking water flows through --and could potentially be influenced by-- energy-related products such as water heaters, washing machines and dishwashers. Moving towards the boundaries of what could be considered an energy-related product, e.g. by incorporating also toilets, shower heads and taps (currently being researched by DG ENV), the share of ErP transporting drinking water would of course increase to complete coverage. However, it has to be considered that only a part of the water is due to the product and an often larger part is due to functional requirements of the user (hygiene, comfort, etc.). Furthermore, most opportunities for water saving can be expected in the use phase of the product and not necessarily in the other phases of the life-cycle.

\textbf{Figure 10. Water accounting flow diagram EU 2007 (source: Eurostat)}

\textsuperscript{18} This relates to water use by human intervention. Note that there are also publications on the ‘water footprint’ of 950 to 1000 billion m³, which include also rainwater and so called ‘grey water’, i.e. the ‘virtual’ amount of water that would be needed to bring the pollution level of surface water in area below certain limit values.
2.5 Conclusions

The conclusions of this introductory chapter are that

• the consumption of non-energy material resources linked to the production, distribution and end-of-life phase of energy-related products (ErP) is significant, constituting 7% of the mass of the EU domestic materials consumption (DMC) but a significantly higher share of its economic value and environmental impact.

• Taking into account also the consumption of energy resources related to production, distribution and end-of-life, ErP constitute around 10-11% of the DMC-mass versus 17-18% of the DMC-mass for energy resources employed during the use phase.

• There are large differences between products regarding the share of non-energy material resources versus energy-resources.

• The ErP-share in the amount of EU-waste is estimated at 3% of total. As regards water consumption, most of their impact is energy–related (cooling of electric power plants) but ErP can play a significant role in water saving during the use phase of the products.

Given the above it is certainly worthwhile for Member States and the European Commission to investigate the possibilities of a realistic implementation of measures. The large differences between individual products suggest that a tailor-made approach may be warranted. There are several signs that the Commission is willing to move
3. Resource efficiency parameters in EU policy

3.1 Policy context

The first task of the assignment is to identify, beyond those incorporated in the JRC-report, the relevant resource efficiency (RE) parameters. Up to a degree this task is also linked to subsequent tasks, i.e. whether the legislator is legally, technically and economically able to enforce the regulation of these parameters.

Therefore this chapter looks at the RE parameters that have been and are being regulated in EU legislation, but also if and how they were put into practice, i.e. in which format they were deemed enforceable.

Relevant EU-legislation is discussed in historical order. The efficiency of non-energy materials resources has been on the Commission agenda for a few decades, running from the Ecolabels and EU Energy Label in 1992 up to the latest amendments to the Ecodesign methodology (MEErP and EcoReport tool) in June 2014.

3.2 Ecolabel

The EU Ecolabel\textsuperscript{19} was launched in 1992 when the European Community decided, no doubt inspired by successful regional labels such as Blauer Engel and Nordic Swan, to develop a Europe-wide voluntary environmental scheme that consumers could trust. Since then, the number of products and services awarded the EU Ecolabel has increased every year. Today there are over 17000 licensed products, of which over 50% are issued in Italy, 22% in France, 9% in the UK and 4% in the Netherlands.

Statistics of January 2012 shows that ErP represent a small part of the 17000 licensed products that are allowed to carry the Ecolabel logo, i.e. mainly televisions and heat pumps. Recent statistics of December 2013\textsuperscript{20} in the EU Ecolabel Work Plan revealed a total of 37215 licenses, of which 1852 for televisions (5%), 494 licenses for heat pumps (1.3%), 2 licenses for sanitary tapware and no licenses for light bulbs, personal and notebook computers. In the past, the Commission set-up Ecolabel schemes for refrigerators and freezers, washing machines and dishwashers but they did not manage to attract a significant number of applicants and were discontinued. For ErP with both an Energy Label (see next paragraph) and an Ecolabel, the Ecolabel logo is integrated into the Energy Label.

\textsuperscript{19}http://ec.europa.eu/environment/ecolabel/

The RE parameters and Ecolabel criteria for (various) ErP include:

- Plastic parts shall be of one polymer or be of compatible polymers for recycling and have the relevant ISO 11469 marking if greater than 25 g in mass.
- Ban on the use of brominated flame retardants and other hazardous substances with reference to (especially) the exemptions under RoHS\textsuperscript{21} and derogations under REACH\textsuperscript{22} (sometimes more stringent, sometimes with specific derogations for the EU Ecolabel Regulation 66/2010 general criteria). Plasticizers are explicitly addressed and plastic parts should not have more than 50% chlorine content;
- Minimum warranty time (to increase lifetime; e.g. minimum 5 years for imaging equipment and water heaters, 2 years for televisions\textsuperscript{23})
- Genuine or equivalent spare parts are available for at least 10 years from the date of purchase (verification through declaration).
- Instruction-manual on environmentally responsible handling of the product during use and at disposal;
- Easy design for dismantling (obligation to file a report with dismantling actions, exploded view labelling the main components, identification of components with hazardous substances. No quantitative requirements)
- Minimum recycled content for packaging (e.g. 80% for cardboard, 75% or biodegradable/compostable for plastics)
- For heat pumps\textsuperscript{24}: limit on Global Warming Potential of refrigerants (GWP100 ≤2000; if GWP100<150 then COP and EER requirements are 15% reduced)

\textsuperscript{23} Already the minimum under EU consumer law.
\textsuperscript{24}
- GWP of refrigerants in water heaters: Regulated in combination with efficiency through TEWI (Total Equivalent Warming Impact) limits (max. 200 g CO2-equivalent/kWh heating output for all except heat pump water heaters; max. 150 g CO2-equivalent/kWh heating output for heat pump water heaters);
- For imaging equipment: Specific requirements on N-printing, duplexing, ability to handle recycled paper (paper resource efficiency); take-back requirement (possibly through 3rd party) of ink cartridges; acceptance of remanufactured toners/ink (cartridges).
- Recycled content computers: The external plastic case of the system unit, monitor and keyboard shall have a post-consumer recycled content of not less than 10 % by mass. Assessment and verification: The applicant shall provide the competent body with a declaration stating the percentage post-consumer recycled content.
- Additional specific disassembly requirements for computers and televisions (obligation to file a report, see above):
  - circuit boards, and/or other precious metal-containing components, shall be easily removable using manual separation methods both from the product as a whole and from specific components (such as drives) that contain such boards to enhance recovery of high value material (not for TV);
  - all plastic materials in covers/housing shall have no surface coatings incompatible with recycling or reuse;
  - metal inlays that cannot be separated shall not be used;
  - fixtures within the personal computer shall allow for its disassembly, e.g. screws, snap-fixes, especially for parts containing hazardous substances;
- Lifetime extension for personal computers: shall have exchangeable and upgradeable memory and graphic cards as well as expansion capability (presence of at least four USB interfaces).
- Lifetime for light sources: minimum lifetime (15000 and 20000 h for single/double ended non-LED lamps) and lumen maintenance (80% at 9000h/15000h). The applicant shall provide a test report stating that lifetime and lumen maintenance have been determined using the test procedures referred to in EN 50285.

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24 Commission Decision of 9 November 2007 establishing the ecological criteria for the award of the Community ecolabel to electrically driven, gas driven or gas absorption heat pumps (2007/742/EC); prolonged through an amendment in 2014.
25 Commission Decision of 28 May 2014 establishing the criteria for the award of the EU Ecolabel for water-based heaters (2014/314/EU)
28 Commission Decision of 12 March 2009 establishing the revised ecological criteria for the award of the Community Eco-label to televisions (2009/300/EC)
29 Commission Decision of 6 June 2011 on establishing the ecological criteria for the award of the EU Ecolabel for light sources (2011/331/EU), OJ L 148, 07.06.2011, p. 13–19
• Water saving for toilets\textsuperscript{30}: Maximum values (Toilets 6 l/full flush, urinals 1 l/full flush; water saving device mandatory if full flush volume exceeds 4 l/flush)
• Wood in parts of toilets or urinals: Virgin wood shall be covered by valid sustainable forest management and chain of custody certificates issued by an independent third party certification scheme such as FSC, PEFC or equivalent.
• Water saving for taps and shower heads\textsuperscript{31}: Taps maximum flow 6 l/min without limiting device; 8 l/min with limiting device. Shower heads max. 8 l/min.

The legal format of product-specific criteria for the EU Ecolabel is a Commission Decision. Criteria are prepared by (a consultant for) one of the Ecolabel Competent Bodies (usually national ecolabelling organizations such as Blauer Engel, Nordic Swan, Milieukeur, etc.). Stakeholder consultation (e.g. NGOs, industry) is part of the decision making process for the criteria, which are revised every 4 years.

The Ecolabel aims at the environmentally best performing products in the market, explicitly taking into account the whole life cycle from raw materials to end of life. Given this ambition level and the expertise behind the scheme, the measures listed above can be considered the best practice in setting up practical measures for materials resource efficiency for a voluntary labelling scheme and within the framework of the current EU legislation. The Ecolabel site communicates that ‘From the raw materials to manufacturing, packaging, distribution and disposal, EU Ecolabel products are evaluated by independent experts to ensure they meet criteria that reduce their environmental impact.’ The Ecolabel aims at the best products in the market and is revised

3.3 EU Energy Label

The EU Energy Label is a mandatory labelling scheme. It started out in 1992 (framework directive 92/75/EC) and resulted in labels for cold and wet domestic appliances, lamps, televisions and room air conditioners. Under the new framework directive 2010/30/EU the existing labels were updated and the range was expanded (until now) to water heaters, central heating boilers and vacuum cleaners.

Apart from the obvious energy efficiency parameters, RE parameters that are addressed in the labelling scheme include:
• Water consumption of washing machines\textsuperscript{32} and dishwashers\textsuperscript{33} (on the label, see figure ),
• GWP of refrigerants in room air conditioners (product information).\textsuperscript{34}

\textsuperscript{31} Commission Decision of 21 May 2013 establishing the ecological criteria for the award of the EU Ecolabel for sanitary tap ware (2013/250/EU)
\textsuperscript{33} Commission Delegated Regulation (EU) No 1059/2010 of 28 September 2010 ... with regard to energy labelling of household dishwashers, OJ L314, p.1, 30.11.2010
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The incorporation of water consumption in the EU energy label for washing machines and dishwashers, first under framework directive 92/75/EC in 1995 and now under framework directive 2010/30/EU, has a 20 year history. Over this time period a 50% reduction in water use was achieved and the measure has thus been very successful.  

Regarding the inclusion of the GWP of the refrigerant there are no reports on its effectiveness.

Figure 12. Washing machine energy label with water consumption mentioned in the lower left corner.

3.4 Integrated Product Policy (IPP)


IPP distinguished 5 groups (building blocks) of measures targeted at

- reducing and managing wastes generated by the consumption of products (chemicals and waste policies)
- innovation of more environmentally-sound products (Research & Development support)
- creating markets for more environmentally-sound products (stimulate adoption)
- transmitting information up and down the product chain (labels and price signals)
- allocation of responsibility for managing the potential and actual environmental burdens of product systems (legal and financial liability)


36 which should not be confounded with the Life Cycle Assessment tools that already existed at that time.
IPP does not generate specific measures, but the role envisaged for the Commission was to

- define a common understanding and articulate a common vision
- encourage the diffusion of best policy practice
- support effective implementation and
- develop specific integrated product policy measures (taking into account internal market and subsidiarity).

The principles set out in the IPP documents have found their way in many of the below mentioned policy instruments, but the main IPP-influenced instrument is likely to be the Ecodesign Directive, first introduced in 2005.

### 3.5 Waste directives

Since the 1970s the Commission has issued various directives on waste. The current body of legislation includes a generic 2008 Waste Framework Directive (WFD\(^37\)), specific waste stream directives on batteries, electrical and electronic equipment (WEEE), End-of-life vehicles (ELV), packaging, Construction and Demolition Waste (CDW) and many more. In principle these directives cover a large range of products, but—for instance—for fossil fuel fired equipment and some professional electrical equipment no specific targets could be identified. Of course, given that these ‘missing’ products consist mainly of metals there is already a strong incentive to recycle. Still, Ecodesign could play a role in reducing final waste of such products by improving product design.

The directives are mainly waste-oriented, i.e. they set the responsibility with the manufacturer to achieve—amongst others—minimum recycling and recovery quotes. In practice, this means that the manufacturers find a third party to take care of this. The third party will then be paid through a levy or simply by a mark-up on the product price (or demolition costs).

Due to this typical end-of-pipe solution there is limited feedback mechanism between the waste management and the product design of the individual products. On the other hand, the Commission signals for instance that for Packaging Waste the Member States have set up (EPR) schemes for packaging waste with fees usually based on weight, but increasingly also on recyclability of the packaging\(^38\). This should at least give some (economic) incentive.

Still, in the 2008 Waste Framework Directive the design-oriented measures are not forgotten. In fact, to reduce the waste stream at its source is given the first priority in the ‘5R’ waste hierarchy (Art. 4 of the directive):

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\(^{38}\) Gunther Wolff, Waste Prevention Policies in the EU, European Commission – DG Environment, Barcelona, 14 November 2013 (presentation)
1. Reduce (Design for Dematerialisation\textsuperscript{39})
2. Re-use (Design for Re-use)
3. Recycle (Design for Recycling)
4. Recover (Design for energy recovery)
5. Remove (Design for best disposal)

Figure 13. The ‘5R’ waste hierarchy (source: EC, DG ENV\textsuperscript{40})

‘Prevention’ means measures taken before a substance, material or product has become waste, that reduce (a) the quantity of waste, including through the re-use of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of harmful substances in materials and products;

The directive includes two new recycling and recovery targets to be achieved by 2020: 50\% preparing for re-use and recycling of certain waste materials from households and other origins similar to households, and 70\% preparing for re-use, recycling and other recovery of construction and demolition waste. The Directive requires that Member States adopt waste management plans and waste prevention programmes.

An "interim report on the evolution of waste generation and the scope of waste prevention, including the formulation of a product eco-design policy addressing both the generation of waste and the presence of hazardous substances in waste, with a view to promoting technologies focusing on durable, re-usable and recyclable products” is required under Art. 12, b of the directive.

The resulting report\textsuperscript{41} advocates Life Cycle Thinking and mentions typical ecodesign examples (see box).

\textsuperscript{39} The denominations between brackets stem from the author. The waste hierarchy is defined in Art. 4 of the 2008 Waste Framework Directive.
\textsuperscript{40} http://ec.europa.eu/environment/waste/framework/
\textsuperscript{41} ARCADIS et al., Final report - Analysis of the evolution of waste reduction and the scope of waste prevention, for European Commission DG Environment, 2010.
3.6 RoHS and REACH

The Directives on RoHS (Restriction of Hazardous Substances) and REACH (Registration, Evaluation, Authorisation and restriction of CHEmicals) are design-oriented directives in the sense that they restrict/ban the use of harmful substances in the broadest sense. RoHS restricts the use of 6 hazardous substances (Hg, Cd, Pb, Cr-VI, PBB, PBDE). The European Commission is preparing legislative proposals regarding DEHP, DBP and BBP. DecaBDE has been discussed for several years whether to cover it under RoHS restrictions, but it now may be a candidate for Authorisation under REACH.

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44 ENDS Europe, 22 May 2014
Under REACH there are 31 substances on the authorisation list\(^{45}\) per September 2014. The REACH candidate list\(^{46}\) of Substances of Very High Concern (SHVC) for authorisation currently contains 155 substances (16 June 2014). The REACH database of registered substances, i.e. to be investigated for eligibility as SHVC, contains 12636 unique substances and contains information from 48801 Dossiers (status 14 August 2014).

In principle, these directives should cover all substances of concern in the context of resource efficiency, i.e. their harmful nature requires special treatment at end-of-life\(^{47}\) and thus would hamper the recycling and recovery effort. The main reason why ‘hazardous substances’ are still an issue in product-specific measures such as the EU Ecolabel criteria, the DG JRC study (see par. ) and MEERP (see pa. ) is that

- there are still several (temporary) exemptions on RoHS for specific applications (mercury in lamps, lead in solder, etc.\(^{48}\)) and
- for REACH, the procedure to phase out SHVC takes time and there is the possibility to ask for derogations for specific applications.

In other words, in product-specific measures there is still a potential environmental benefit, if consensus can be reached, to address the RoHS-exemptions, REACH-derogations and pre-empt the restriction of REACH-registered substances not yet elected as SHVC.

### 3.7 Ecodesign

### General

The Ecodesign framework directive\(^{49}\) allows to set minimum Ecodesign requirements for energy-related products on specific aspects, in accordance with Annex II of the directive, or generically, following Annex I. The latter looks at all phases of the product-cycle, from raw materials to end-of-life, and specifies the following RE parameters in Part 1:

- predicted consumption of materials, of energy and other resources such as fresh water, in particular
  - weight and volume of the product,
  - use of materials from recycling activities,
  - consumption of energy, water and other resources.
  - use of hazardous substances ...,

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\(^{45}\) Meaning that they cannot be placed on the market, unless a special derogation is approved for a specific application. See http://echa.europa.eu/web/guest/addressing-chemicals-of-concern/authorisation/recommendation-for-inclusion-in-the-authorisation-list/authorisation-list

\(^{46}\) Meaning that they have been identified as SHVC but have not yet reached their ‘sunset date’ (phase-out).

\(^{47}\) E.g. treatment as hazardous waste, protection of workers and special equipment in treatment plants

\(^{48}\) For instance, apart from the exemptions in the Directive, Commission has published 14 Commission Directives with derogations for specific applications.

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e. quantity and nature of consumable for proper use and maintenance,
f. ease for reuse and recycling as expressed through: number of materials and components used, use of standard components, time necessary for disassembly, complexity of tools necessary for disassembly, use of component and material coding standards for the identification of components and materials suitable for reuse and recycling (including marking of plastic parts in accordance with ISO standards), use of easily recyclable materials, easy access to valuable and other recyclable components and materials; easy access to components and materials containing hazardous substances;
g. incorporation of used components;
h. avoidance of technical solutions detrimental to reuse and recycling of components and whole appliances;
i. extension of lifetime as expressed through: minimum guaranteed lifetime, minimum time for availability of spare parts, modularity, upgradeability, repairability;
j. amounts of waste generated and amounts of hazardous waste generated;

Part 2 gives requirements relating to the supply of information, amongst others to consumers and (recycling/disposal) treatment facilities.

Part 3 formulates requirements for the manufacturer ‘addressing the environmental aspects identified in the implementing measure as capable of being influenced in a substantial manner through product design, manufacturers of products must perform an assessment of the product model throughout its lifecycle, based upon realistic assumptions about normal conditions and purposes of use. Other environmental aspects may be examined on a voluntary basis. On the basis of this assessment, manufacturers must establish the product’s ecological profile. It must be based on environmentally relevant product characteristics and inputs/outputs throughout the product life cycle expressed in physical quantities that can be measured.’ This assessment must then be used to evaluate design alternatives, also against benchmark values.

Current RE measures

There are a number of occasions where specific ecodesign requirements (following Annex II) dealing with non-energy related resources efficiency have been introduced, i.e. on:

- water consumption in the regulation on household washing machines\(^{50}\)
- water consumption in the Ecodesign regulation on household dishwashers\(^{51}\).
- durability (technical life) in all three Ecodesign regulations of light sources (CFLs), i.e. regarding lamp survival factor (at 6000 hours), lumen maintenance, number of switches before failure, premature failure rate.\(^{52}^{53}^{54}\)

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\(^{51}\) Commission Regulation (EC) No 1016/2010 of 10 November 2010 ...with regard to ecodesign requirements for household dishwashers, OJ L 293, 11.11.2010, p.31.
• durability (technical life) in the Ecodesign regulation of non-CFL and non-LED directional and non-directional compact fluorescent light sources, i.e. regarding lamp survival factor (at 6000 hours), lumen maintenance, number of switches before failure, premature failure rate.

• durability in the Ecodesign regulation of vacuum cleaners, i.e. for hoses (minimum 40 000 oscillations under strain) and motors (minimum 500 h technical life).

• paper resources use in the Ecodesign-endorse self-regulatory initiative on imaging equipment, through minimum targets for duplexing and N-printing.

• refrigerants GWP in room air conditioners.

At the moment there are a few preparatory studies underway by DG ENV that explicitly intend to look whether (further) water savings and other non-energy resources savings can be achieved with taps and shower heads as well as washing machines, dishwashers and toilets.

In the meanwhile, the Commission has been trying to introduce end-of-life RE criteria in Ecodesign legislation, but is struggling.

The Commission DG ENTR proposed in a draft working document on the regulation of ventilation units to set information requirements on disassembly, but on specific limit values (e.g. disassembly time) no census could be reached, especially on the practical implementation, and thus the specific requirement was dropped.

In the Ecodesign Consultation Forum of 8 October 2012, the Commission launched a proposal for the end-of-life stage in Ecodesign implementing measures for televisions. The proposal entailed


56 Also known as ‘voluntary agreement’, meaning that by engaging in such an agreement, with enough market coverage and ambition level, an industry sector can avoid mandatory Ecodesign measures. The agreement on imaging equipment has been officially endorsed as such by the European Commission and continuation of this endorsement takes place annually.

57 Similar to the way the EU Ecolabel is handling the subject for heat pumps.

58 “Detailed instructions including the required tools for the manual (pre-)disassembly from the ventilation unit of electronics parts (printed wiring boards/printed circuit boards and displays >10 g or > 10 cm²), batteries and larger plastic parts (≥100 g) for the purpose of efficient materials recycling shall be available on the free access website of the manufacturer.” Draft Working Document Ventilation Units, October 2012.

59 European Commission, Proposal to Consultation Forum for revision of Ecodesign Implementing Measure for Televisions “Integration of resource efficiency and waste management: criteria in European product policies – Second phase” (From DG ENV/DG JRC project on resource efficiency ...), Brussel, 8 October 2012.
• Improved dismantlability of certain key components (PCBs, PMMA board, LCD, CCFLs and their combinations)
• Declaration of Indium content
• Improved recyclability of plastics.

In the, currently still ongoing, discussion on measures for televisions (currently combined with computer monitors as ‘electronic displays), Digital Europe contested the added value and the enforceability of the recyclability criterion. From disassembly tests of approximately 100 TVs they concluded a very high variance in measured disassembly times (up to ±50%).

Furthermore, according to Digital Europe, future display panels will move towards even thinner, lighter-weight designs\(^60\) (using fewer valuable resources), and we can already see the development of flexible and transparent technologies that may be more inherently difficult to dismantle than present designs. Under a mandatory dismantling time requirement, an overall more resource efficient design might be discouraged from the European market for the sake of meeting mandatory dismantling time to qualify for access to EU markets. Digital Europe believes that setting targets on the recycling results is much more effective than setting requirements on dismantling. Recycling standards are guaranteed to deliver improvements in the recycling process where dismantling requirements are unlikely to have such an effect.

**MEErP**

The 2011 Methodology for the Ecodesign of Energy-related Products (MEErP)\(^61\) as well as the ‘EcoReport’ LCA-tool provides the analytical framework for the preparatory Ecodesign and Energy Labelling studies. The previous methodology (MEEuP) already incorporated most RE parameters listed in Annex I of Directive 2009/125/EC (except those which require a qualitative assessment). As regards RE parameters the updated (2014) version also allows

• Quantification of re-usability/recyclability/recoverability, through
  -\(-10\%/+10\%\) malus/bonus for recyclability (follows from disassembly time of LCD, batteries, PCBs, large parts versus average),
  - product service life in EcoReport includes re-use time
  - heat recovery bonus incorporated in EcoReport material environmental profile
• Index for Critical Raw Materials (CRM, metric: grams Sb equivalent).
• An ‘Extra materials’ facility allowing more flexibility, amongst others as regards the recycled content of all material types (see also MEerP update by BIOIS in the next paragraphs).
• A new parameter ‘recycmax’ to take into account the ‘stock effect’ due to the mass of materials in use.
• An update on hazardous substances and substances of (very) high concern, based on the most recent inputs from RoHS and REACH.

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\(^60\) Probably hinting at Chips-on-Glass technology (instead or in addition to chips of on circuit boards). VHK.

\(^61\) VHK, Methodology for the Ecodesign of Energy-related Products (MEErP), 2011.
The current Ecodesign regulations are almost all based on preparatory studies according to the 2005 MEEuP. Full preparatory studies that should use the MEerP are only now being launched, so there is no experience whether these updates and additions actually lead to new RE requirements.

The MEerP explicitly refrained from listing a number of impact indicators where there is no (consensus in) EU policy and there is no robust data available, these include abiotic depletion potential (ADP), Land use and Biodiversity. Product Life and Number of Users (collective use) are import parameters in the impact assessment and may be subject to measures for certain products, but they are not considered appropriate generic parameters, i.e. parameters where ‘longer’ or ‘more’ is always better.62

Preparatory studies

Ecodesign measures are based on preparatory studies that follow the MEEuP (thus far) or MEerP (future) methodology. However, the budget for the preparatory studies is limited and—in consultation with the Commission’s policy officer—priorities are set relatively early in each task on the basis of the relative importance of the impacts. This is formalised, on explicit instigation of the Commission, in the ‘Task 0’ or the so-called ‘quick-scan’ of the MEerP.

In this context, how can contractors (and policy officers) be expected to cope with the often disproportional high costs and efforts of deeply investigating complex end-of-life subjects that, if all goes well, may save a small fraction (say 10%) of an aspect (material resources impact) that in itself has a small impact with respect to the energy resources use of most energy-related products? In fact, apart from a few exceptions (see above), they don’t. In almost all preparatory studies the contractors have used the given (but editable) default end-of-life scenario given in the MEEuP’s EcoReport, because even if the values of those values would be two or three times higher or lower they still would not be significant compared to use-phase parameters.

As the most important energy-using products have now been investigated in the Ecodesign preparatory studies it is possible that this situation changes and there are products and studies where it will be proportional to spend e.g. € 100 000 to € 200 000, or half of the total budget, on the improvement of the environmental impact end-of-life phase of a product group. But thus far this has not been the case.

62 For instance where lifetime extension slows the introduction of more efficient products or where collective ownership and use significantly diminishes individual responsibility (e.g. collective heating & energy billing versus individual heating)
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3.8 Green Public Procurement (GPP)

In the context of Green Public Procurement (GPP) there are criteria for 22 products and services\(^{63}\), of which half (11) are ErP:

- Office equipment
- Gardening products and services
- Thermal insulation
- Combine heat and power (chp)
- Road construction and traffic signs
- Street lighting and traffic signals
- Indoor lighting
- Toilets and urinals
- Sanitary tap ware
- Imaging equipment
- Electrical and electronic equipment used in the health care sector

The GPP-criteria are to a large degree similar\(^{64}\) to the EU Ecolabel and—as the EU Ecolabel—refer to Ecodesign and Energy Labelling (delegated) regulations for energy efficiency.

3.9 DG JRC study 2011-2012

The assignment brief includes the RE parameters developed by DG JRC-IES in the context of the project ‘Integration of resource efficiency and waste management criteria in European product policies.

The JRC methodology treats hazardous substances, durability and recycled content, but has a focus on re-usability, recyclability, (heat) recovery (RRR) as well as recycled content\(^{65}\).

The study was performed in 2011-2012 time-period and over that time the methodology has clearly evolved under the influence of feedback from Commission services (including contractors working on Ecodesign), experience from test cases and the comments from a final stakeholder meeting.

**RRR rates**

In a first instance the RRR rates were developed as mass-based indices, derived from the sum of the evaluation of the three Rs per component.

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\(^{63}\) http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm

\(^{64}\) The GPP allows a graded approach where minimum and elaborate criteria are established, so that even under very tight budgetary constraints GPP criteria can be applied in procurement procedures.

Re-usability rate is to be assessed (yes/no) on the basis of whether, according to expert analysis, the component was easy to dismount and whether the manufacturer had created, himself or through a third party, a market for such re-usable components. The mass of re-usable components is summed and divided by the total product mass to obtain the re-usability index.

Recyclability rate is to be assessed based on partitioning, following expert analysis, each component to one of four waste streams and then apply the typical recycling percentage of that waste stream. The four streams are:

1. Parts for selective treatments. These could include:
   a. parts that have to be treated in line with legislative prescriptions (e.g. for the extraction of potentially hazardous substances)
   b. Parts containing other relevant materials (e.g. critical raw materials according to the EU classification)

2. Parts for selective recycling. These include parts with single recyclable materials and parts made by various recyclable materials, which are worth to be recycled separately.
   Conditions to be fulfilled are:
   a. The mass of the part and nature of embodied materials is such that there is an economical interest for dismantling.
   b. There is a specific EoL channel after dismantling for these materials with higher recycling rates compared to the results obtained after material separation.

3. Parts difficult to process.

4. Other parts for material separation. These include parts not in the previous bullet points, which are made of materials that can be separated by mechanical treatments (e.g. shredders) and recycled.

The analyst should define the corresponding recycling rate for parts belonging to the previous points. The product of the accumulated mass in each waste stream with the respective recycling rates, divided by the total product mass, gives the recyclability rate. The IEC provides a preliminary list of recycling and recovery rates for some materials and parts for the European context. However, this is not exhaustive. For missing data, analysts should refer to other data sets or available information from the literature and/or from recyclers. The improved (final) version by JRC no longer proposes default tables for materials-compatibility, time of disassembly, etc.

Recoverability of the incineration heat of the component is to be calculated based on the expert-assessment of whether the component itself contains hazardous substances or SVHC (substances of very high concern) (under RoHS and REACH) or the combustion of the component would lead to emission of toxic pollutants or whether they would be contaminated after shredding. Originally, in the first case the default was a recoverability of zero; in the second case

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recoverability ratio would be half. These default values were later abandoned and the method requires specific analysis to establish appropriate values per product.

Recycled content is the ratio between the post-consumer recycled mass\(^{67}\) and the total mass of a product.

**Use of Priority Resources**

In a second instance, JRC recognized that the use of mass-based indices is limited and to avoid sub-optimization and errors the whole life-cycle impact and all impact indicators needs to be taken into account. This approach is named ‘Use of priority resources’ and instead of the RRR-rates the RRR Benefit rates are defined for each environmental impact category.

Most of the environmental impact indicators were the same as those used in Ecodesign and other EU legislation, e.g. for greenhouse gases, acidification, etc. But also abiotic depletion potential (ADP) was added, based on CML characterization factors\(^{68}\), and JRC used different toxicity factors from those derived from EU emission limit values\(^{69}\).

The formulas and definitions of the RRR mass-based indices are redefined, per environmental impact category and in a holistic a life-cycle context:

- The Re-usability Benefit takes into account, in the denominator, environmental costs of collecting, cleaning, repairing, redistributing, etc. to diminish the re-usability benefit. This benefit, as is the case also with the other parameters below, is then divided by the whole life cycle impact of the product, for a particular environmental category, to find the Re-usability Benefit rate.

- For the Recyclability Benefit a down-cycling ratio k is introduced, which takes into account the diminished recycling efficiency due to contamination of the material during product life. The down-cycling ratio is defined as the ratio of the quality (relevant physical-chemical characteristics, such as tensile strength, surface hardness, etc.) of the recycled material versus the quality of the virgin material.

- The Recoverability Benefit weighs the environmental impacts of heat from incineration of the recycled material against the environmental impact of the average method of heat generation (for space heating and/or for electricity production) to find the impact that is avoided. The impact of the incineration of the recycled mass is then subtracted. The metric for this benefit is energy based (the product of mass and specific heating value).

- For the Recycled Content Benefit the environmental impact of the recycling, e.g. collection, cleaning, shredders, etc., is subtracted from the benefit of using a recycled material over a virgin material.

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\(^{67}\) As opposed to pre-consumer recycled mass, i.e. production waste for which prevention would be the priority strategy, or (as is sometimes used to define recycling rate) the total of pre- and post-consumer recycled mass.

\(^{68}\) van Oers L, Koning A de, Guinée JB, Huppes G (2002): Abiotic resource depletion in LCA. Road and Hydraulic Engineering Institute. Ministerie van Verkeer en Waterstaat, The Netherlands (the authors are from Leiden University, Centrum voor Milieukunde CML)

\(^{69}\) Specifically for copper there is a large difference.
**Hazardous substances**

JRC states that the presence of hazardous substances in a component is not in itself necessarily a problem for end-of-life treatment and mentions the case of brominated flame retardants that can be separated by special equipment.

Problems may arise from the combination of hazardous substances in the component and the available end-of-life treatment methods. A 4-step method is proposed:

- Define a generic list of substances to be considered
- Identify the components embodying the considered substances
- Identify the EoL treatments of the component
- Identify key components, i.e. those that have a content of hazardous substances that are critical for the identified EoL treatments

Once key components are identified suitable strategies for improvement include the provision of information and improvement of their disassembly.

**Durability**

In a simple form durability is synonymous for lifetime extension, but JRC has made an extensive literature review and concluded that it is not easy. JRC performed test cases to get a better grip on the Durability Benefit for ErP with a holistic approach and found that especially for energy-related products the extension of the lifetime may very well result in a negative impact for the product group, if the products that would be replacing the products with the longer life have a better energy efficiency. The method developed is based on the comparison, in a life-cycle perspective, of different scenarios concerning the lengths of the useful life of the product and its potential substitution with better performing alternative products.

**Test cases and stakeholder consultation**

The JRC study entailed methodology development, test cases (washing machines, imaging equipment and LCD-TV) and stakeholder consultation.\(^70\) The test cases showed a 10% or less saving on most impact categories.

At the stakeholder meeting the manufacturing industry (Orgalime, CECED, Digital Europe, EHI) voiced their concern over the administrative burden and the added value of the approach beyond what exists already in MEErP and other legislation. The recycling industry, i.e. the main designated beneficiary from the approach, was also critical of the added value of the approach for their sector, which is moving more and more to shredder-based recycling with only minimal disassembly (and still recovery/recycling rates that meet legal requirements).

The main author of the MEErP-study\(^71\) was positive on the progress that was made on the methodology since the beginning of the study, in particular regarding the introduction of the

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\(^70\) Stakeholder consultation of the project "Integration of resource efficiency and waste management criteria in European product policies - Second phase", Brussels, 10th September 2012. VHK was present at the meeting.
recycling benefit rate \( k \) which is taking into account 'down-cycling', the fact that 'recycled content' now only relates to the content of post-consumer recycled material. The test cases showed the approximate contribution to resources efficiency that can be expected from the RRR effort and Kemna remains critical of the introduction of abiotic depletion potential (ADP) and the way toxicity was handled for copper as both are not in line with EU policy. Also the unrestricted reward of life time extension was perceived as very debatable, as the negative side of the 'durability' --i.e. that it slows the replacement by more efficient products-- may be very important for ErP. Finally, he remarked that the three 200-300 page test-case reports demonstrated that the addition of the RRR-index would add significantly to the costs of the preparatory study, especially given the limited data availability.

Germany reacted overall positively\(^{72} \). The importance of combining the RRR-index with critical raw materials (CRM) was stressed. Although Germany agreed with the majority of stakeholders at the meeting that the relevance of durability was very much depending on the type of product, it is believed that for energy efficient products with a high-impact production such as notebooks it is important. Germany advocated the integration of the indicators in MEErP so they would be incorporated in the Ecodesign preparatory studies. Further research and experience seems to be necessary in order to assess, if a binding declaration of the parameters to the consumers is useful. Time-based indices [regarding disassembly] for the recycling were one of the most promising examples in terms of practicability according to Germany. In a first step requirements on recycled content of plastics are appropriate for voluntary instruments like Ecolabels, because appropriate means of proof are important. Finally, Germany remarked that marking of plastic parts will contribute to an improved recycling only if a manual disassembly and separation will take place (which is often note the case, e.g. in the case of TVs).

### 3.10 BIOIS study

In 2013, the Commission launched a study to develop the RE additions to MEErP following the JRC study.\(^{73} \) The contractor, BIOIS, made the following additions to the MEErP

- Recyclability benefit rate: values according to JRC-IES are implemented in the EcoReport tool to show the potential benefit of a good recyclability. Additional guidance is given how to interpret the results in the context of actual recycling rates and practices.

- Recycled content: Additional data sets for recycled plastics, paper and cardboard (based on publicly available sources) are included in the EcoReport tool.

- Lifetime, additional guidance is given on how to take into account durability and performance indicators when defining the lifetime, analyse typical warranty times for the

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\(^{71}\) René Kemna (VHK) on a personal title.

\(^{72}\) BAM, UmweltBundesAmt, Preliminary Comments on the Project “Integration of resource efficiency and waste management criteria in European product policies – second phase”, 28 September 2012.

\(^{73}\) BIO Intelligence Service (2013), Material-efficiency Ecodesign Report and Module to the Methodology for the Ecodesign of Energy-related Products (MEErP), Stakeholder consultation, prepared for European Commission --DG Enterprise and Industry. Project website http://meerp-material.eu/. The project is to be concluded by September 2013.
product group and the type of lifetime to consider in the analysis (technical lifetime, years of use, etc.).

- **Critical Raw Materials (CRM):** Guidance in which cases the existing CRM index of MEErP should be used in the environmental assessment.

Abiotic Depletion Potential and Material Footprint are not proposed to be included in the MEErP due to lack of robust available data. On durability (lifetime extension) BIOIS demonstrated the same reservations as the MEErP.

In June 2014 a new (protected) version of the EcoReport, incorporating above additions, was published on the BIOIS project website. When adopted by the Commission, all resource parameters that could possibly be integrated are included in the methodology for Ecodesign preparatory studies.

The additions were tested for washing machines and televisions. The test cases showed that they work and also showed a very limited impact. Whether such measures also meet the criteria of Directive 2009/125/EC as regards cost-benefit analysis (economically justified) has not been proven in these studies.

As mentioned before, the new methodology has not been tested in practice and it is as yet uncertain whether it will deliver more and better specific Ecodesign measures.

Currently, the Ecodesign Directive allows the analysis (evidence base) to be proportional and prescribes to identify what is 'significant'. This may be the reason that in most ecodesign studies the default Ecoreport end-of-life values are used as any change in these values often has shown to have (very) limited impacts on the overall environmental performance.

If RE parameters as proposed by the 2012 JRC study (and the 2014 MEErP) are to be tackled in this context this 'proportional/significance' principle would probably—at least for a test period—need to be abandoned and sufficient budget for in-depth study of materials resource efficiency should be allocated.

### 3.11 European Parliament resolution

As may be evident from the previous paragraphs, most studies and measures on resource efficiency focus on the end-of-life rather than the waste-prevention in the production and distribution phase. This may be due to the specific direction of political forces. As an illustration the resolution of the European Parliament from 24 May 2012, reacting on the topic of resource efficiency, is given in the text box below.  

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3.12 Conclusions on RE parameters in EU policy

- The criteria developed under the voluntary EU Ecolabel give an illustration of the type of RE parameters that can be considered in a political context. Most solutions are tailor-made to the product group and a ‘one-size-fits-all’ holistic instrument does not exist. Several criteria such as substance bans, recycled content, disassembly time and/or origin of resources rely on an extensive ‘paper trail’.

- Note that EU Ecolabel is voluntary and Ecodesign measures (and EU Energy Label) are mandatory; in a political context this is a significant difference in what can be achieved.

- The current EU Energy Label and Ecodesign measures have shown that when RE parameters relate to the consumption of non-energy consumables during the use-phase and/or where they relate to a minimum requirement on technical product life, these measures can be successful and enforceable.

- The EU Waste Framework Directive places the highest priority on waste prevention, i.e. design-measures that minimize material resources use through miniaturization, down-sizing and light-weighting. This parameter is missing from the list of RE parameters. Furthermore, when talking of End-of-Life resource efficiency the role of Critical Raw Materials could be more pronounced and explicit.

- The Integrated Product Policy shows that any single RE parameter, including the waste prevention and end-of-life measures should be seen in a Life Cycle Thinking context. In a holistic approach several of the end-of-life design strategies are potentially in conflict with a strategy of waste prevention. Vice versa, extreme material choices to achieve minimal product mass are potentially harmful to RE (see Figure 14).
• RoHS and REACH are two design-oriented pieces of legislation that are a worldwide example for strict regulation of hazardous substances and substances of (very) high concern. Can Ecodesign measures—which also have significant lead times—improve on that and, if so, on what scientific and legal grounds?

• Waste Directives, with WEEE at the forefront of ErP waste treatment, set minimum requirements for recovery and recycling. By definition these are primarily waste-oriented but if the coupling between the 'end-of-pipe' costs and the re-usability/ recyclability/ recoverability of the design of new products can be improved, this could be a powerful instrument.

• The updated Ecodesign methodology for preparatory studies (MEErP 2014, including possible additions by BIOIS) incorporates all possible RE parameters, including those generated by the JRC study, but
  ▪ The methodology has not been applied yet, and
  ▪ The budgets of preparatory studies are currently spent proportional to the relative impact; if RE parameters are to be tackled in ways proposed by the JRC study (and the 2014 MEErP) this principle —and the limited budget available for the preparatory studies—is a barrier to more progress in investigating materials resource efficiency.

• The RE parameters by JRC-IES provide a methodological framework but hardly any input values for that framework. The number and nature of inputs required, and the possible conflicts that these inputs will cause means that the implementation at the level of preparatory Ecodesign studies will be very costly and Commission and Member States will need to find/allocate budgeting for extensions of Ecodesign preparatory studies or for specific RE studies in parallel to Ecodesign preparatory studies.

• The administrative burden of implementing the RE parameters developed by JRC at the level of Ecodesign measures for industry will be prohibitive, i.e. if the preparatory study shows that any of the RE parameters should be regulated there will have to be a translation to specific, tailor-made and simple measures in order to keep meeting such requirements affordable.

• The test cases of JRC and the BIOIS study, which certainly did not tackle the most energy-intensive product groups, show that the resources savings expected from the end-of-life measures according to the JRC methodology on most environmental impact parameters is limited.

• As regards the political dimension with a focus on end-of-life measures it may be beneficial for the Commission to stress in its communication strategy that—although end-of-life measures are important and can be improved—fossil fuels (i.e. energy resources) are very much part of the overall resources efficiency strategy and Ecodesign and mandatory EU Energy Labelling are successful in this respect. Waste prevention is the highest priority in the waste hierarchy.
Beware of contrasting design ‘rules’ and
Find the right balance for each product

**Good light-weighting design**
- Best materials for the load combine specific properties of different materials in one component
- Best shape for the load optimal geometry for the expected force
- Technical function integration reduce the number of components (more complexity, less weight)
- Minimize mechanical joints minimize peak loads
- Miniaturize & be compact especially but not exclusively in electronics
- Optimize for life ‘re-use’ and ‘reparability’ are emergency measures to deal with (partially) oversized products. The right product life should be guaranteed, but –after that– failure should be total.

**Good recycling design**
- Mono-materials per component higher quality scrap (less contamination) after pre-disassembly
- Easy (pre-) disassembly
  - Joints (screws, knock-outs, etc.)
  - Easy accessibility and removal of parts
- Prioritize the above for special parts printed circuit boards, LCDs, batteries, refrigerants, REM, etc.
- Plan for smart shredding for the rest optimize for different shredder routes (forget about the old way of disassembling everything!)

*Figure 14. Potentially conflicting design rules*
4. Legal Barriers

4.1 Introduction

The previous chapter discussed possible resource efficiency parameters to consider in measures developed under the Ecodesign Directive 2009/125/EC, with an emphasis on what already exists. This second section tries to describe whether a legislator can integrate new resource efficiency parameters into ecodesign requirements. For this to take place several aspects can be considered:

1. what is allowed according to Directive 2009/125/EC;
2. what is the relevance of other policy instruments with similar goals;
3. what is allowed from international trade point of view (WTO);
4. what is the available evidence base for legislators?

The legality of possible resource efficiency measures relies on the information collected and presented in preparatory studies: the evidence base should show that requirements are technically and economically feasible and compliance (and verification) is based on widely recognised and available test standards. It is especially regarding these aspects that legislators may face issues when trying to incorporate specific requirements on resource efficiency, as the sources for information on resource efficiency performance are scattered and/or incomplete. For generic (information) requirements the criteria are less strict.

This chapter shows that resource efficiency requirements already adopted or discussed under the Ecodesign Directive may partially, but not completely, overlap with other policy instruments which requires coordination of legislative efforts.

Especially the WEEE Directive, which imposes requirements upon Member States who then must ensure that producers meet certain goals related to collection and proper treatment of WEEE, overlaps with possible resource efficiency requirements related to end-of-life phase of EEE, especially given that producers are also made financially responsible for the collection and treatment of WEEE.

The introduction of resource efficiency requirements, also if related to non-product related production and process methods, is most likely allowed under international trade agreements, although the measures must be shown to be 'necessary' and not differentiate between 'like' products. The debate on whether such requirements are allowed is however not yet conclusive as the jurisprudence evolves on a case-by-case basis.

The above issues are discussed further in the sections below.
4.2 What is allowed under the Ecodesign Directive 2009/125/EC

According the Ecodesign Directive two types of ecodesign requirements can be set: generic and specific requirements. The process for identifying such possible measures are described in respectively Annex I and II of 2009/125/EC.

4.2.1 Generic requirements

Annex B of this report shows that the form of the generic requirements to be set under Ecodesign may be:

1. the supply of information (regarding the manufacturing process, the use of the product and information for treatment facilities)
2. and/or requirements for the manufacturer, involving an assessment of ecodesign activities employed by manufacturer (establishing an environmental profile, performing an environmental benchmarking exercise).

It is important to note that the generic requirements do not pose limit values on any specific parameters. The only limitation mentioned in Annex I is that the generic requirements must "relate to product design" and "focus(...) on significant environmental aspects thereof without setting limit values". The assessment of 'significance' is not further quantified so remains a subjective assessment.

The Annex I does state that the choice of a specific design solution must achieve a reasonable balance between the various environmental aspects and between environmental aspects and other relevant considerations, such as safety and health, technical requirements for functionality, quality, and performance, and economic aspects, including manufacturing costs and marketability, while complying with all relevant legislation. This comment however is not restrictive: There is no penalty identified for not achieving a reasonable balance.

As 'Product design' is defined as "the set of processes that transform legal, technical, safety, functional, market or other requirements to be met by a product into the technical specification for that product" and 'Environmental aspect' as "an element or function of a product that can interact with the environment during its life cycle" it can be understood that the generic requirements cover the complete life cycle, from resource extraction to manufacturing, distribution, use and finally end-of-life.

The resource efficiency parameters identified by JRC fit the parameters and environmental aspects covered by Annex I.

The inclusion of manufacturing is made explicit by the example given in Annex I, Part 2. Requirements relating to supply of information, which states under point (a) "information from the designer relating to the manufacturing process". Point (b) to (d) cover aspects related to the handling of the product itself. Also in 'Part 3. Requirements for the manufacturer', reference is made to "inputs/outputs throughout the product life cycle" which implicitly cover the manufacturing processes as well.
4.2.2 Specific requirements

As regards specific requirements (which introduce limit values) Article 15, item 6 states that "specific ecodesign requirements shall be introduced for selected environmental aspects which have a significant environmental impact".

This again requires an assessment of the 'significance' of the environmental aspect (consumption of resources, emissions, waste arising, possibilities for reuse, recycling, etc.) which —to a large degree-- is subjective. Regarding consumption of energy and possibly water, an assessment of the life cycle cost minimum must be made. The consideration of life cycle costs is not required for non-energy/water aspects.

Therefore if the technical, economic, environmental study finds the impact significant, the related parameter may be covered by specific measures, under the conditions elaborated in Article 15, item 5. These conditions require the analysis to show economic and technical feasibility as well as the potential for improvement, taking into account third country legislation (if relevant). The performance or usefulness for consumers should not be negatively affected.

4.3 Other policy instruments with similar goals

The Ecodesign Directive (and the Energy labelling Directive) is (are) not the only policy instrument(s) available to the European Commission to deal with resource efficiency of products. The RoHS, WEEE, REACH (and possibly to lesser extent) CPR and EPBD can also regulate resource efficiency aspects of products. The EU Ecolabel may introduce product requirements on a voluntary basis.

The possible overlap of regulatory instruments is not a new phenomenon and the discussion on where the mandate of Ecodesign/Labelling ends and that of RoHS/WEEE/REACH/(fill in at will) starts, is as old as the Ecodesign Directive itself. In the case that two instruments address the same product (presence of substances for example) the current stance is that the Ecodesign measure is most often regarded as the more specific measure ('lex specialis') and overrides the other ('lex generalis').

It is therefore the responsibility of the legislator to avoid such overlaps in the first place. In case it does happen, legal services may need to determine which measure overrides the other. The overlap is not in principle forbidden. The Energy Labelling Evaluation study recommended that the joint working plans for Ecodesign and Energy Labelling should consider the planning of other policies in the process. The problem however is that first the study needs to be performed before a possible overlap is found.

The Energy Labelling Evaluation study highlights this issue and recommends to streamline (better: align) the different regulatory processes. It should be recognized however, that each regulatory instrument has a specific focus that may lead to different conclusions on what should be regarded as 'significant' aspects. An example is the fact that the metal lead (Pb) has never been regarded as a major problem in the earliest ecodesign studies as the use-phase impacts often dominated
everything else. But from EEE-waste perspective lead has been shown to be relevant. As long as the scopes of such studies diverge, it can be expected that different conclusions on significant aspects emerge and therefore different measures will be identified.

For resource efficiency this means that other policy instruments besides ecodesign may be helpful or even required to address the issue. These other policy instruments and their possible requirements are (non-exhaustive):

- **RoHS** – restricting use of hazardous substances in EEE through maximum concentration values
- **WEEE** – setting collection rates to member States, requiring manufacturers to finance the collection and treatment, and indirectly urging manufacturers to improve recoverability (incl. recyclability) of products. Furthermore the (recast) WEEE introduced producer responsibility for disposal of EEE, and requires Member States to achieve a certain recovery rate. The REACH Regulation regulates the use of substances and employs a much wider scope (not limited to EEE, but covering all applications of the substances). The CPR and EPBD allow setting of requirements related to building parts and whole buildings. The CPR mainly introduced information requirements to products, but in principle could be used for setting specific limit values. The EPBD applies to whole buildings, new and renovated, and requires Member States to set specific measures to buildings and building components.

### 4.3.1 RoHS- Directive 2011/65/EU

The RoHS directive has been discussed in general terms in Chapter 3. Regulating hazardous substances at EU level is considered to be more effective and efficient than issuing specific measures for each of the products or product groups covered. Specifically, duplicating the efforts of the RoHS directive under Ecodesign would not be efficient and productive.

RoHS has the drawback that it has a list of exemptions for applications where as yet no viable alternatives exist. In the voluntary Ecolabel, aiming at the environmentally best products and being updated every 4 years, these exemptions are an inspiration to promote products that do not need these exemptions.

Ecodesign requirements are mandatory for the whole industry and tend to have similar lead times in preparation and implementation as the RoHS directive. If the policy makers in RoHS are doing their job, which can be expected, there should be no added value in addressing a straight ban on hazardous substances in an Ecodesign regulation.

What can be useful, especially in a transitory period, is to address the physical form in which the exempted substances are present in the product. JRC mentions that— from the strict perspective of resources efficiency—the hazardous nature of certain substances in a component or products is in principle only of interest if the presence of the substance leads to special, unfavourable treatment at end-of-life, e.g. when special (more expensive) precautions in handling are required. In those instances, e.g. the use of amalgam instead of liquid/gaseous mercury in lamps as mentioned in chapter 3, Ecodesign restrictions and/or allowances can be helpful.
4.3.2 **WEEE Directive 2012/19/EU**

The WEEE Directive contains requirements for Member States that help achieving resource efficiency goals. Article 4 addresses specifically product design but contains very little practical guidance on what various concepts mean. It tells Member States should take ‘appropriate measures’ to ‘facilitate’ application of re-use and proper end-of-life treatment ecodesign principles (‘ecodesign’ as a generic concept and not referencing the Ecodesign Directive) and ‘prevent’ manufacturers from blocking re-use and proper treatment unless there are ‘overriding advantages’, for example with regard to the environment and/or safety.

**End-of-life information:** According to Article 15, Member States shall take the necessary measures to ensure that producers provide information free of charge about preparation for re-use and treatment in respect of each type of new EEE placed for the first time on the Union market within one year after the equipment is placed on the market. This information shall identify, as far as it is needed by centres which prepare for re-use and treatment and recycling facilities in order to comply with the provisions of this Directive, the different EEE components and materials, as well as the location of dangerous substances and mixtures in EEE. It shall be made available to centres which prepare for re-use and treatment and recycling facilities by producers of EEE in the form of manuals or by means of electronic media (e.g. CD-ROM, online services).

This information requirement overlaps with Ecodesign Directive 2009/125/EC, Annex 1 (Generic ecodesign requirements), Part 2 (requirements related to the supply of information), item (d). It also overlaps, although having less detail, with the information provisions included in the approved Ecodesign regulation for Ventilation Units.

**In other words, if an Ecodesign regulated product group is in the scope of the WEEE directive—which is often but not always the case—the legal department may argue that such an Ecodesign requirement is a duplication of existing law and could ask the requirement the withdrawn.**

**Removal of relevant components or substances:** Article 8.2 requires Member States to ensure that all separately collected WEEE undergoes proper treatment, requiring for separately collected WEEE, the removal of (see also Annex VII):

- PCB containing capacitors,
- mercury containing components (e.g. switches, lamps),
- batteries,
- printed circuit boards of mobile phones and/or greater than 10 cm²,
- toner cartridges, liquid and paste, as well as colour toner,
- plastic containing brominated flame retardants,
- asbestos waste and components which contain asbestos,
- cathode ray tubes,
- chlorofluorocarbons (CFC), hydro chlorofluorocarbons (HCFC) or hydro fluorocarbons (HFC), hydrocarbons (HC),
- gas discharge lamps,
- liquid crystal displays (together with their casing where appropriate) of a surface greater than 100 cm² and all those back-lighted with gas discharge lamps,
- external electric cables,
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- components containing refractory ceramic fibres (..),
- components containing radioactive substances (..),
- electrolyte capacitors containing substances of concern (..),
- fluorescent coating of cathode ray tubes,
- gases that deplete the ozone layer,
- mercury from gas discharge lamps.

The above means that for most products covered by Ecodesign measures (where the respective scopes overlap) Member States will ensure that producers are responsible for proper treatment as described above. The WEEELABEX project helped formulating standards as to what proper treatment entails.

In other words, if an Ecodesign restricts itself to just mentioning that the above components should be ‘removable’ it implicitly overlaps with WEEE. Only in case other components, not mentioned in WEEE, are mentioned or the concept of ‘removability’ is made more specific, the Ecodesign requirement—if it meets all other conditions posed by the Ecodesign directives—could have an added value and would not be duplicating WEEE.

**Minimum recovery targets:** Article 11 requires Member States to ensure that producers (or parties acting on their behalf) meet the minimum recovery targets set out in Annex V (See Annex V of WEEE, depending on date and category 50% to 80% re-use or recycling and 70% to 85% recovery).

As mentioned in Chapter 3, the practical realization of the minimum targets involves for the manufacturer (with money which ultimately comes from the consumer of course) a financial contribution, which currently is usually made on the basis of weight. What could help, outside the context of Ecodesign, is if this contribution in some way could be made dependable on the re-usability, recyclability and recoverability of the products.

***

Introduction of typical RE ecodesign requirements for the removal of relevant components (PCB capacitors, mercury containing lights, circuit boards, etc.) would help Member States meeting their responsibilities, but would also introduce a burden to manufacturers that they may already feel indirectly, through their contacts with MS via compliance schemes, and their responsibility to finance the collection and treatment of WEEE.

**Following that route, such EU specific requirements may incentivize manufacturers to better differentiate tariffs as applied by WEEE-compliance schemes, so that recyclability is taken into account etc.**

The Ecofys EL/ED evaluation also pointed out that the correct implementation of the waste management requirements under WEEE should take precedence over new resource efficiency requirements because the latter cannot be effective without an effective waste collection and treatment system in place.
WEELABEX

On 28 July 2008, the LIFE committee, an EU panel composed of representatives of the member states and of the European Commission, approved the WEEE Forum’s project proposal. WEELABEX is a four-years, multi-stakeholder project aimed at laying down a set of European standards with respect to collection, handling, storage, recycling, preparation for re-use and disposal of waste electrical and electronic equipment (WEEE) and monitoring the processing companies through audits conducted by auditors trained by the WEELABEX Office.

The Weelabex project has resulted in standards for ‘collection’, ‘logistics’ and ‘treatment’ to be applied by treatment facilities in the context of the WEEE Directive. The standard on treatment has the most direct relation to the design of products. The Weelabix treatment standard (v10.0 of 7 May 2013) consists of two parts, of which part I deals with generic requirements on administrative, organizational and technical level, such as related to (a.o.) handling, storage, de-pollution, treatment of products (WEEE). Part II specific requirements describes the treatment processes related to appliances with CRT displays, flat panels displays, lamps and cooling/freezing appliances (containing CFC’s, HCFC’s, HFC’s or HC’s).

4.3.3 REACH 1907/2006

The considerations for REACH substances of very high concern are similar to those in RoHS.

4.3.4 Construction Products Regulation 305/2011

The Construction Products Regulation 305/2011 (CPR) may overlap with the Ecodesign Directive as regards the setting of limit values, and also with the Energy labelling Directive as regards the provision of information, albeit in scope limited to construction products (but there is an overlap as certain construction products may be within the scope of Energy-related products covered by Ecodesign and Energy labelling).

The possible measures are stated in the articles presented below:

- Article 3 Basic requirements for construction works and essential characteristics of construction products, item 3: "For specific families of construction products covered by a harmonized standard, the Commission shall, where appropriate and in relation to their intended uses as defined in harmonized standards, determine by means of delegated acts in accordance with Article 60, those essential characteristics for which the manufacturer shall declare the performance of the product when it is placed on the market.

- Where appropriate, the Commission shall also determine, by means of delegated acts in accordance with Article 60, the threshold levels for the performance in relation to the essential characteristics to be declared."

- Article 6 Content of the declaration of performance, item 3: additional information of the performance of the product for one or more essential characteristics

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75 The WEEE Forum is a not-for-profit association of 39 WEEE producer responsibility organisations (or ‘producer compliance schemes’) in Europe. The WEEE Forum provides a platform for producer responsibility organisations to take on the challenge of electrical and electronic waste in Europe by fostering ideas and sharing best practices whilst optimising environmental performance through a proper management of WEEE.
• Article 27, item 1. The Commission may adopt delegated acts in accordance with Article 60, to establish classes of performance in relation to the essential characteristics of construction products.

• Article 27, item 3. When provided for in the relevant mandates, the European standardisation bodies shall establish in harmonised standards threshold levels in relation to essential characteristics and, when appropriate, for intended uses, to be fulfilled by construction products in Member States.

The CPR articles are much less clear as to what criteria need to be fulfilled before the Commission can propose to regulate certain parameters. The CPR mechanism is however entirely different to that of Ecodesign, as the CPR issues mandates to standardisation bodies that develop standards that contain the requirements. This means there is less control over the direct form and content of the requirements.

In case there are Ecodesign specific requirements (thresholds under CPR terminology) for certain parameters (essential characteristics under CPR terminology) for which there are already minimum requirements / thresholds in harmonised standards cited in the OJEU under CPR, the ecodesign minimum requirements are directly applicable in Member States and prevail over the thresholds included in hENs, as lex specialis in the field of sustainable development and energy efficiency. As a consequence, the corresponding standards will need to be adapted accordingly (and the revised versions cited in the OJEU under the CPR when adapted).

**4.3.5 EPBD 2010/31/EU**

In case products are covered by Ecodesign implementing measures, then in principle Member States cannot set stricter requirements to those product as that would hamper the internal market. But Article 27 of the Energy Efficiency Directive (EED) 2012/27/EU opened the door to allow Member States to set stricter requirements for building components in the context of building energy performance requirements under EPBD 2010/31/EU, as long as this does not result in unjustifiable barriers to trade.

• According EED Article 27, item 3(2): the following sentence is added to the end of (Ecodesign) Article 6(1) on Free Movement: ‘This shall be without prejudice to the energy performance requirements and system requirements set by Member States in accordance with Article 4(1) and Article 8 of Directive 2010/31/EU.’.

This means that Member States may require a stricter product performance than required under Ecodesign measures covering the same product. As the Ecodesign Directive covers installed energy-using products for heating, cooling, ventilation and lighting and also energy-related products such as thermal insulation, windows and showers/taps used in buildings and relevant for their energy performance, it could be that Member States deviate from the single market principle. Certain Member States want to allow this for space heaters.

However, as long as the EPBD focuses on energy performance only, the setting of stricter resource efficiency requirements for products regulated under Ecodesign is not allowed. An expansion of scope of the EPBD to overall environmental performance, could -in theory- allow setting stricter environmental performance requirements then set under Ecodesign (if any).
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4.3.6 EU Ecolabel

Being a voluntary instrument, the EU Ecolabel scheme has more ‘freedom’ to introduce requirements (criteria) related to resource efficiency as there is no need to show economic feasibility etc.

Resource efficiency parameters have been introduced or suggested for a.o. computers, imaging equipment, and floor coverings.

As an example the RE criteria for desktop computers\(^76\) are:

**Minimum recycled content:** The external plastic case of the system unit, monitor and keyboard shall have a post-consumer recycled content of not less than 10% by mass. See also ‘Packaging’

**Design for disassembly:** This requires fixtures that allow disassembly (screws, snap fixes), easy removal of circuit boards, no coatings on plastics, marking of plastics > 25g, no inseparable metal inlays, list of hazardous substances.

**Packaging:** Must consist of a minimum recycled content.

For floor coverings, depending on the type (textile\(^77\), wood\(^78\), hard floor\(^79\)) criteria may introduce limit values for typical manufacturing parameters such as water emissions and process energy has been introduced. For wooden floor coverings criteria also relate to forest management and waste management. For hard floor coverings (ceramic tiles, etc.) criteria relate to raw material extraction management for natural stones (i.e. quarry impact ratio), finishing operations, water consumption, emissions to air, etc.

4.4 International trade agreements

Although it may be proven that a measure is allowed under the Ecodesign Directive (it meets the criteria formulated in Article 15, item 5 etc.), Ecodesign (and also Energy labelling) measures must be scrutinised under international trade law, i.e. agreed with by the WTO. This is where the difference between product related and non-product related measures becomes relevant.

In most international trade agreements it is allowed to achieve environmental goals by setting requirements to products that are placed on the market that relate to environmental aspects that can be established on the product itself. These may be related to process and production methods if the method can be traced back through physical properties of the product regulated (i.e. traces of pesticides used, or preservation methods, etc.).

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76 Commission Decision of 9 June 2011 on establishing the ecological criteria for the award of the EU Ecolabel for personal computers

77 COMMISSION DECISION of 30 November 2009 on establishing the ecological criteria for the award of the Community Ecolabel for textile floor coverings

78 COMMISSION DECISION of 26 November 2009 on establishing the ecological criteria for the award of the Community Ecolabel for wooden floor coverings

79 COMMISSION DECISION of 9 July 2009 establishing the ecological criteria for the award of the Community eco-label to hard coverings
For **non-product related** process and production methods, the rules – or at least the debate over how to interpret the rules – are much less clear-cut.

The trade rules that the EU has engaged in prohibit parties to introduce barriers to trade and to impose domestic laws upon (products from) other countries where these can be interpreted as barriers to trade. The setting of RE requirements (be it limit values under Ecodesign, or information requirements under Labelling) could be construed a potential barrier to trade where they address parameters of non-product related process and production methods (non-product PPM). These are measures that relate to processes that do not impart any distinguishing characteristics to the final product: For example process emissions or energy use, or the sourcing of materials, which cannot be shown in the physical product itself.

The Ecodesign Directive Article 15, and the Annexes I and II, seem to allow setting of requirements that cover non-product related production and process methods, that can only be verified on the basis of technical documentation, following Article 15, item 7 (see yellow highlighted text below and the references to manufacturing impacts in 2009/125/EC Annex part 2(a) and part 3).

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**Directive 2009/125/EC, Article 15, item**

5. Implementing measures shall meet all the following criteria:

(a) there shall be no significant negative impact on the functionality of the product, from the perspective of the user;

(b) health, safety and the environment shall not be adversely affected;

(c) there shall be no significant negative impact on consumers in particular as regards the affordability and the life cycle cost of the product;

(d) there shall be no significant negative impact on industry’s competitiveness;

(e) in principle, the setting of an ecodesign requirement shall not have the consequence of imposing proprietary technology on manufacturers; and

(f) no excessive administrative burden shall be imposed on manufacturers.

6. Implementing measures shall lay down ecodesign requirements in accordance with Annex I and/or Annex II.

   Annex I presents information on the Method for setting **generic** ecodesign requirements and describes in Part 1 the ecodesign parameters for products, in Part 2 the Requirements relating to the supply of information and Part 3. Requirements for the manufacturer

   Specific ecodesign requirements shall be introduced for selected environmental aspects which have a **significant environmental impact**. Annex II presents information on the Method for setting specific ecodesign requirements

7. The requirements shall be formulated so as to ensure that market surveillance authorities can verify the conformity of the product with the requirements of the implementing measure. The implementing measure shall specify whether verification can be achieved **directly on the product or on the basis of the technical documentation**.
So, although the Ecodesign Directive would allow requirements for non-product PPM, the question remains whether this is allowed under international agreements.

Suppose that an environmental analysis shows that the production phase is the dominant phase in the life cycle of the product\(^{80}\), and that certain production processes are the cause of this dominance. Then the Commission has, according to the Ecodesign Directive, the possibility to address these aspects through implementing measures even if they apply to non-product PPM.

According to the TEMANORD publication, the Ecodesign Directive only allows regulating 'upstream' processes, insofar these are clearly related to product design. An example is the provision of information related to use of recycled materials. Whether the manufacturer used for example benzene or n-Hexane in (one of its) production processes\(^{81}\) is, according TEMANORD, not within the mandate of Ecodesign. TEMANORD views the introduction of such PPM requirements to be treated by Eco-labels and public procurement.

The TEMANORD publication is however not correct when it states on page 178, citing 2009/125/EC Annex I, that only requirements relating product design are allowed, hinting that PPM requirements are not possible. That Annex however clearly states that "in so far as they relate to product design, significant environmental aspects must be identified with reference to the following phases of the life cycle of the product: (a) raw material selection and use; (b) manufacturing," etc.

Of course Ecodesign measures should not be used to regulate manufacturing emissions that are not expected to take place in the product life cycle, but emissions or impacts of manufacturing processes applied in the production of the product appear to be covered by Ecodesign Directive 2009/125/EC. The life cycle assessment includes in principle all flows (inputs and outputs) including that of manufacturing processes.

\subsection*{4.4.1 ‘Like’ products}

Requirements relating to ecodesign, including resource efficiency aspects, may apply to:

1) product properties / performance (PERF)
2) process and production methods (PPM)
   a) which are either product related (can be verified by analysis of physical product or its performance): product PPM
   b) which are non-product related (can be verified by analysis of PPM only): non-product PPM

Requirements on PERF and product-related PPM are generally accepted under WTO/GATT. Such requirements directly apply to the traded goods themselves. As long as domestic and imported goods are traded under the same rules, then such requirements may be set.

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\(^{80}\) See for instance “LCA of an Ecolabeled Notebook – Consideration of Social and Environmental Impacts along the entire life cycle, by GreenDeltaTC GmbH, Berlin, Germany, February 2011” where the production phase is responsible for 80-90% of damages related to human health, ecosystems and resources.

Now, under current trade law, countries have the right to discriminate based on product-related PPMs, as product-related PPMs result in a difference in the commercial or practical substitutability of the product. Countries have to follow certain rules about the process of discrimination, preferably by following international standards when setting restrictions, but the principle is accepted. But WTO law does not allow countries to discriminate among 'like' products, whatever their different environmental impacts. And products that only discriminate at the level of non-product PPM may be considered 'like' products.

On the difference between product PPM and non-product PPM the UNEP-IISD Handbook on Environment and Trade\textsuperscript{82} (2\textsuperscript{nd} ed.) states that

<table>
<thead>
<tr>
<th>Product- and non-product-related PPMs</th>
</tr>
</thead>
<tbody>
<tr>
<td>The distinction between product-related PPMs and non-product-related PPMs may seem like nit-picking, but it is important to understand, since the two have been treated somewhat differently under trade law.</td>
</tr>
<tr>
<td>The distinction rests on how the PPM affects the final product. Consider two products—say two rolls of newsprint. One is produced using 50 per cent recycled content, and the other is produced from 100 per cent virgin fibre. These are two very different PPMs. But the key question is whether the final product has different qualities that would cause it to be treated differently in its use, handling or disposal. If the recycled newsprint performs in every sense the same as the virgin-content product, then the recycled-content process is a non-product-related PPM, since it has a negligible impact on the final product.</td>
</tr>
<tr>
<td>Take, for another example, two apples—one produced organically and one produced with the use of pesticides, some of which are still left on the product as a residue. Again we have two very different PPMs. But in this case, the difference will cause us to have to handle and use (but probably not dispose of) the products differently. Some people might want to peel the chemically treated apple, and border authorities will inspect the levels of pesticide residue to see that they meet health regulations. The organic apple may be subject to tighter border checks aimed at preventing the spread of invasive pests. The different PPMs in this case make a difference to the final product, and they would thus be treated as product-related PPMs.</td>
</tr>
</tbody>
</table>

If in the earlier example of an electronics manufacturer the use of benzene or n-Hexane cannot be proven in the final product (and the product is also not used, handled or disposed differently) then the use of benzene etc. is a non-product related PPM and a measure could be considered a trade-barrier. It depends on how the PPM affects the final product.

The paper by Erich Vranes however shows a different side to this story. In his paper the legal dispute on dolphin-safe tuna led to question, whether dolphin-friendly and non-dolphin friendly tuna are 'like' products or not. If they are the same in all aspects, then the dolphin friendly fishing method is a non-product related PPM, and difficult to implement. But if consumers consider them to be different, because of the production methods, then the fishing method is a product related PPM. The example he provides is the following:

Given that the competitive relationship is inherently influenced by consumer perception, it follows that PPMs which do not leave physical traces in the final product (and which are not product-"related" in any physically ascertainable way) may nonetheless be perceived, by consumers, as being „related“ to the product: if such PPMs are prone therefore to affect the

\textsuperscript{82} http://www.iisd.org/trade/handbook/5_1.htm
competitive relation on the market, then this may constitute an indication that otherwise similar products may be unlike nonetheless.

He explains: "This eventual indication of unlikeness must be balanced with other relevant indications militating in favour of likeness, however. It has rightly been emphasized in recent writings that a product’s different production history may render it unlike other products, even if this will be the exceptional case rather than the rule." (page 14).

We conclude that Vranes argumentation on likeness of products shows that products that differ only when looking at NPR PPM (have dolphins been hurt when fishing for tuna, is benzene used in manufacturing of a phone?) can still be unlike products. And if products are unlike, regulating the NPR PPM may be possible under trade agreements. Of course other agreements apply, and such measures may not be used to create unfair discrimination.

The argumentation by Vranes however applies mainly to labelling which is regarded as a less 'harmful' way of regulating NPR PPM. When applied as ecodesign requirement, and consequentially may constitute a potential barrier to trade for non-compliant products, the regulators will need to forge a strong case for the necessity to cover these NPR PPMs.

We have not found examples of such measures by the EU under Ecodesign or Energy Labelling. Under the EU Ecolabel such measures (criteria) do exist. As far as we know, such EU Ecolabel criteria have not become a dispute under WTO law, requiring settlement.

The jurisprudence continues to grow, as shown by the case of the French Pictogram for recyclable products (TRIMAN):

- According the French ‘Grenelle II’ law (Law 2010-788 art. 199) many products placed on the French market after 1 January 2015 have to carry a pictogram (TRIMAN) which shows how to sort the waste of these products if they are recyclable (show recyclability/sorting instructions for the packaging and other recyclable materials used). A condition is that these products are subject to a Producer’s Extended Responsibility scheme (electrical products are excluded). Complaints have been filed to the World Trade Organisation (WTO) by the United States and Canada about TRIMAN, which they view as a barrier to trade. Six Members of the European Parliament (UK and Spain) have also expressed their concerns about the TRIMAN marking plans and suggested the European Commission to take action against France. The Internal Market EU Commissioner stated that the label might constitute a barrier to the free movement of goods within the internal market.

  The issue is that the pictogram would be both costly and burdensome and would conflict with existing pictograms in other EU Member States (e.g. Green dot) related to handling of waste. The label allegedly would cost around 30 cents per sticker/product placed on the market if the packaging is not adapted for the French market. Moreover, it would confuse the consumer

\[83\] The GATT panel was also asked to judge the US policy of requiring tuna products to be labelled “dolphin-safe” (leaving to consumers the choice of whether to buy the product). It concluded that this did not violate GATT rules because it was designed to prevent deceptive advertising practices on all tuna products, whether imported or domestically produced. (http://www.wto.org/english/tratop_e/envir_e/edis04_e.htm)

with new pictograms risking distracting him from the most important pictograms, e.g. safety warnings.

### 4.5 Conclusions on legal barriers

Although the introduction of RE requirements is in principle possible under the Ecodesign Directive and implementing Regulations, there are constraints.

#### 4.5.1 Conclusion on RE parameters and the Ecodesign Directive

As Chapter 3 has already shown there are examples of 'typical' resource efficiency measures introduced as specific ecodesign measures. Therefore resource efficiency requirements are in principle compatible with the scope and purpose of the Ecodesign Directive, but, depending on the type of requirement proposed, conditions for the setting of requirements apply:

- **Generic requirements** (information and/or ecodesign activities) can be introduced for RE parameters, if it has been established the parameters address significant environmental aspects;
- **Specific requirements** (limit values) require an assessment of significance of environmental aspects and of technical, economic and environmental feasibility of improvement options. For energy and possibly water an identification of the least life cycle cost point must be performed.

One can argue that the criteria for typical resource efficiency requirements are more relaxed than for energy or water consumption (as no LCC calculation is required). However, showing that resource efficiency requirements are technically and economically justified and thus can be introduced is not as easy as it seems.

Assuming a requirement on durability (e.g. flexing a suction hose of a vacuum cleaner) a supporting (preparatory) study needs to:

1. identify durability (product life) as significant environmental parameter and then needs to identify failure of vacuum hoses as a secondary parameter;
2. to show that standards (or at least information allowing comparative assessment) exist to identify hose flexing performance.
3. to show that a requirement on vacuum hose durability can be set, that is technically and economically feasible – it thus needs information on an acceptable minimum performance and impacts on consumer prices;

Therefore the legality of implementing measures is often connected to the evidence provided to support the measure. This evidence is the information contained in preparatory studies, background studies, impact assessments, evaluations and other documents from which the Commission draws its conclusions. The quality of the evidence is crucial to the final measure. Problematic is that the quality ranges from poor to sufficiently high. In case the evidence on which the measure is based is considered of low quality or contested by stakeholders, then the measure may be successfully blocked by stakeholders on account of the measure being unjustified or its feasibility unproven. The criteria for setting requirements set out in Article 15, item 5 (should not
introduce excessive burden, should not affect affordability, should not impact competitiveness, etc.) are repeatedly brought forward in such discussions (even for elementary aspects such as energy efficiency, the collection of relevant data can be quite troublesome).

It will be a challenging task for the consultants doing preparatory studies to 'tick off' each of the 'boxes' covered by Article 15, item 5 (avoid excessive costs etc.) for resource efficiency parameters. Known problems are lack of information on current and possible future environmental performance of products and their impacts (affordability, proprietary technology).

More specifically for the RE parameters under discussion:

- For RRR rates and the RRR Benefit rates to be introduced as generic requirement, the establishment of 'significance' would in principle suffice. However, so far only a very limited number of Ecodesign preparatory studies have established a significance of reusability / recyclability / recoverability. In most studies (including JRC's own) the significance is shown to be limited. This may also be related to the 'proportionality principle' limiting the depth of study of aspects considered less relevant or significant. As an example consultants don't even bother to adapt the default Ecoreport values for recycling and recovery to realistic values. This makes the case for specific requirements on RRR (including benefit rates) even harder as such requirements need to be justified with an adequate assessment of technical and economic feasibility. The data required for such analysis (costs of technical solutions improving RRR) is not available in the public domain. And regarding the end-of-life of products, the parameter score depends on the recycling rates which are determined not solely by product characteristics but also by the recycling (and treatment) technology.

- There are already many products that use recycled content in promotional campaigns (e.g. vacuum cleaners with over 50% of plastics made from recycled materials, coffee makers with over 13% of weight made from recycled material). Are such 'show cases' examples sufficient to show feasibility (for specific measures)? A generic requirement would fit quite well with an often applied declaration of recycled content. Limit values are again harder to justify as not only the cost aspect is quite volatile (prices of recycled material fluctuate and are related to other price mechanisms (virgin material price) outside the manufacturer's sphere of influence) and there is an intricate relation to other product performance aspects (surface quality, food safety, mechanical strength) that make a technical assessment particularly daring. Other manufacturers may question the business model behind the show cases (not the principle, but the actual cost/benefit from using recycled materials – where are they sourced? what do they replace? what does it mean for end-of-life?).

- As regards Durability generic requirements appear feasible. The consultants would have to show that extending the product life would not counteract energy savings by rapid evolution / change in energy efficiency. Also for specific requirements (minimum life time), provided methods exist to establish the technical performance of the product, the evidence may be less burdensome to collect. The most difficult will be to establish the relation between product life and product costs.

- Hazardous substances may be relatively easy to introduce as ecodesign parameter (generic or specific) in the case manufacturers use lists of restricted substances (and even processes) on a voluntary basis and enforce these rigorously. Especially in the ICT sector many examples of
such lists exists and such voluntary measures can be used as proxy for mandatory requirements. The evidence base is easier to identify / collect, but proposing limit values may be contested by industry 'laggards' whilst 'forerunners' may have already implemented such requirements.

However, in several studies the consultants stated to have limited information on the bill-of-materials of the products and the production processes. And even if industries apply List of restricted substances, there can still be a lack of information regarding use (and presence) of hazardous materials (such as certain flame retardants, plasticizers, fillers, etc.). This lack of detailed information generally applies to critical raw materials as well. These findings were supported by the EEB Synergies study that assessed four product groups in detail (personal computers and monitors, televisions, domestic refrigerators / freezers and domestic lighting).

- Light weighting (with various metrics, such as weight or weight per unit of performance) may be good candidate for generic requirements. Product performance and price can be relatively easily tracked as (for most consumer products) information for both aspects can be found in the public domain. For specific requirements the consultants need to show that lighter products (or less material intensive products) setting limit values on weight do not introduce negative effects on other product performance aspects. This may very well be the most difficult part of this RE parameter, as weight is associated with longevity and use of less exotic materials. Therefore, a cross category assessment may be indispensable.

- Regarding the use of Critical Raw Materials (CRM) and materials of certified origin (sustainably sourced biomass materials, but also various minerals – see EU Ecolabel criteria on floor tiles etc.) information requirements may be appropriate. For critical raw materials there is a problem with the information supply, as it is usually not the final manufacturer who decided over the use and content of critical raw materials in components. Usually these are OEM suppliers, several layers 'upstream'. The complexity of providing such a paper trail is deemed comparable to that of compliance to REACH. For the use of materials of certified origin (FSC and similar) the situation is somewhat different as this is often instigated by the final manufacturer on a voluntary basis and the paper trail has a clearer beginning, although it is often quite expensive. As regards ecodesign limit values no study has so far identified a justification to limit or reduce/ban/require the use of certain materials: Use of critical raw materials is often associated with certain benefits (higher energy efficiency, better performance), use of materials of certified origin is often costly and requires an extensive 'paper trail'.

The above paragraphs show that for certain RE parameters the introduction of generic requirements may not be too burdensome (recycled content, durability of specific components, presence /use of hazardous substances, use of materials of certified origin). Where possible the introduction of these requirements would be most efficient through horizontal measures, i.e. across all product groups.

Particularly problematic is the introduction of specific requirements (limit values) for RE parameters as this need to be justified on the basis of a proper technical and economic analysis. For such an analysis data is often lacking / not available in the public domain.
Should it be decided to follow that route, then a better information base needs to be created on especially the cost/benefit analysis of various RE parameters. This would entail information not only of costs of technical solutions to improve RE performance, but also costs of other performance aspects. An exhaustive engineering analysis, based on cost and performance analysis of several RE options may provide a more robust evidence base, but runs into problems as regards resources allocated to studies and the proportionality of the analysis, also enshrined in Article 15, item 4(a):

The depth of analysis of the environmental aspects and of the feasibility of their improvement shall be proportionate to their significance. The adoption of ecodesign requirements on the significant environmental aspects of a product shall not be unduly delayed by uncertainties regarding the other aspects.

Therefore the current studies that provide the evidence base are a balancing act, weighing availability of data, the expected results of possible measures and the available resources (time, money).

4.5.2 Conclusion on RE parameters and international law

Much more than in 'National' (incl. EU) regulations, international trade rules make a distinction between requirements of which performance can be established on the product itself (product related) or not (non-product related). Non-product related PPMs are usually only allowed if the products they discriminate between are 'unlike'. Still, the necessity for such (potentially) trade-restricting rules has to be proven.

For the RE parameters the findings are:

- Regarding the RRR parameters, although they may appear very product related (as they appear to be related to physical properties of the product itself) the measures may be regarded as non-product related PPM upon closer examination. This is because verification of the requirements relies partly on an assessment of activities beyond the product boundaries (i.e. the existence of a re-use scheme- see also Chapter 3 on JRC study). Therefore, for the WTO to accept such requirements, the products have to be regarded as 'unlike' and the requirement has to be necessary (no alternative feasible with less restrictions to trade). This appears to be a major obstacle. A possible solution is to make the assessment of reuse/recovery/recycling less dependent on these extra-product boundary elements (generic values etc.) . This means the measure will be less able to discern between products from different suppliers as each will use the same method and inputs, but is more robust for scrutiny under international trade law.

- Regarding recycled content and/or use of materials of certified origin – this may be considered a product-related PPM if it can be established on the product itself. If it can't be established on the product itself (as in the example of recycled paper) it is considered a non-product related PPM and necessity has to be proven. Requirements related to materials of certified origin may be close to trade barriers (as in the example of dolphin-safe tuna), unless it can be proven that products with/without that feature are not "like".
Regarding durability, light weighting, use of critical raw materials and use of hazardous substances – the performance can probably be established by products tests and the parameter is therefore product-related, which would facilitate acceptance under WTO.

5. Practical and political barriers

The examples given in the previous chapter prove that, at this moment and in principle there are no unsurmountable legal barriers for the EU to introduce binding measures regarding resource efficiency parameters, at least not from the viewpoint of the global trade agreements on WTO and GATT. Also from the point of view of subsidiarity and the single internal market there seems to be a broad consensus that the EU is better equipped than individual Member States to tackle resource efficiency. How this will pan out under a possible future trade agreement with the US that is currently being discussed, is an open question that cannot be answered at the moment.

Generally speaking manufacturers expect any measure to allow a level playing field and not obstruct innovation. For ecodesign requirements, including those possibly targeting resource efficiency of products, this means that standards or at least unambiguous measurement and calculation methods must be in place.

For many resource efficiency parameters the availability of standards (excluding those related to energy consumption and emissions) is patchy at most:

- **Reusability/recyclability/recoverability** are subject to a mandate to standardisation organisations. Several aspects of the current described method (JRC 2012) appear not in line with criteria for a level playing field;
- For establishment of **recycled content** a certain industry practice and relevant standards exist. This parameter is also covered by the mandate;
- **Durability** is very product specific, standards may or may not exist for specific components or products. This parameter is also covered by the mandate;
- The **identification and removal of substances** is partly covered by standards (E.g. WEELABEX)
- For **weight and weight-per-unit-of-performance** standards may exist or can be developed;
- Requirements related to **specific materials** can be based on standards applied in context of RoHS and REACH or on industry practices relating to certificates of origin of materials.
- There are currently no standards identified for the calculation of **end-of-life value**. Aspects of this approach appear not in line with criteria for a level playing field;
- For the **holistic environmental assessment** many standards exist that lay down the method and give guidelines on quality assurance. But this doesn't mean that the results are reproducible when using different software packages, impact assessment methods and databases.
This chapter gives an introduction of the more practical barriers that can be encountered by introducing material resource efficiency parameters in the Ecodesign. As illustration of these problems, the following two paragraphs show the general position of the manufacturers, positions towards specific RE requirements. The third paragraph touches upon the most recent standardization efforts in the field, which may be part of the solution. The final paragraph gives some views of the contractor on the subject, against the background of a long experience on the subject.

5.1 General position of manufacturers

This section shows the positions of three main industry associations: EHI, CECED and DigitalEurope.

5.1.1 EHI position and engagement

EHI and its members have advocated for a series of overarching principles throughout the years:

The calculation methodology for energy efficiency as well as other requirements should be based on scientifically solid data and existing technical standards. The various regulations as well as general policy practice clearly state “product parameters should be measured and calculated using reliable, accurate and reproducible methods which take into account recognised state-of-the-art measurement and calculation methods, including, where available, harmonised standards…”

The heating industry supports the introduction of ‘third party verification’ of test data for ecodesign measures of all space heaters. This requirement should be in place for all central heating technologies in order to ensure a level playing field in the interest of authorities, consumers and industry.

EHI strongly supports the promotion of renewable energy sources; various policies with impact on RES should be aligned and complementing each other

Tailor-made products should be excluded from Ecodesign Directive because of the high variation in their applications, specific characteristics and the very small production runs. In addition, business-to-business products should be excluded from Ecodesign Directive because these products are tailor-made to specific needs and the information flow is already suitable between businesses.

Last, non-standardised products for which tests are not possible – or those products for which laboratories are not equipped to measure and test them and which are not factory assembled – should likewise be excluded from ecodesign.

5.1.2 CECED

CECED generally welcomes the EU Resource Efficiency Roadmap’s focus on waste and notes that the industry has made considerable investments ensuring the recycling and treatment of e-waste,
also by developing WEEE handling and treatment standards at EU level through the EU standardisation process (see WEEE LABEX).

The CECED Principles on Resource Efficiency\(^\text{86}\) are:

1. **Measurability**: CECED wants to limit any RE parameter to product-related only (excluding non-product related PPM)
2. **Enforceability**: CECED argues that again measures should only target parameters that can be directly influenced by the manufacturer: As appliance manufacturers have no direct control over the amount of scrap metal that is embedded into the steel they buy or they have no direct control over the use of resources required to extract minerals, the measures should be product related only.
3. **Relevance**: CECED supports Ecodesign also for resource efficiency, but highlights the most urgent task, which is to address the gaps in the legislation to ensure that all waste is collected and treated. Currently every one of two WEEE products (>50%) receives unknown EOL treatment.
4. **Competitiveness Proofing**: Any new resource efficiency requirements outlined in new legislation must be subject to detailed competitiveness-proofing analysis that carefully analyses how such legislation would impact industry.

### 5.1.3 Digital Europe

DIGITALEUROPE’s objective is to create a level playing field and they issued three recommendations for the EU to support the ICT industry in creating innovative technology solutions with environmental impact. DigitalEurope states the following objectives with regard to material efficiency:

1. **Continue to fund ICT research and innovation**: DigitalEurope is convinced such funding is essential for the development of less resource intensive products and services;
2. **Make resource efficiency regulations technology neutral**: Because of the fast pace of innovation, any policy should be technology neutral. Policymakers should set energy efficiency or recovery targets to achieve their objectives, rather than prescribe a specific process. Let market forces, not government, determine how best to meet EU energy-efficiency targets. We oppose legislation that solely stimulates the resources and waste market at the expense of the ICT sector and gives no environmental benefit;
3. **Use and improve impact assessments**: Policymakers should develop resource-efficiency regulation using impact assessments that rely on common criteria for similar product groups.

\(^{86}\) www.ceced.eu data.be, September 2012
5.2 Positions towards specific RE requirements

Vacuum cleaners (666/2013) / durability, by CECED

When discussing the requirements for what is now Regulation 666/2013 on vacuum cleaners during the February 2013 Consultation Forum meeting, the industry, represented by CECED, presented their opinion on RE parameters:

CECED notes that the Commission has suggested introducing a durability criterion in the Ecodesign measure for vacuum cleaners. We have serious doubts regarding the enforceability of the requirements proposed. Proper verification is a must to ensure a level playing field for all manufacturers.

Testing 1+3 appliances for 500 hours would take at least 40 days, which is too long to enable efficient action regarding non-compliant products. With the current market rotation time of product references for this kind of product, tested references will otherwise risk to have disappeared from the market before the results of the verification of all Ecodesign requirements will be available.

CECED mentions no difficulty with the requirement itself, but with the time needed for its implementation (testing of existing products would take longer than for the models to be replaced by new ones).

As regards the provision of information related to reverse disassembly (repair) and waste treatment, CECED notes:

Presenting instructions on how to access live parts is considered to be a significant safety risk and specifically contradicts the principal elements of the Low Voltage Directive (Directive 2006/95/EC). Repair attempts made by inexperienced individuals may cause injury and/or hazards and/or reduce the performance of the appliance.

In addition, requiring manufacturers to provide information (Point 2(d)) relevant for dismantling, in particular in relation to the motor and any batteries, recycling, recovery and disposal at end-of-life is considered inappropriate. The instruction booklet will never reach any of the recycling, recovery or disposal facilities as recycling requirements request separate collection for paper and WEEE.

Moreover, the requirement to provide this information directly to the recyclers is already provided for in the WEEE Directive (Directive 2012/19/EU). The element of this requirement concerning batteries is already covered in the Batteries Directive (Directive 2006/66/EC).

Here CECED argues the Ecodesign/Labelling requirements need to address trained service personnel or waste treatment facilities and not the average consumer.

Televisions/review of 642/2009, by Digital Europe

When discussing RE requirements for the review of Regulation 642/2009 on televisions during the November 2012 Consultation Forum meeting, the industry, represented by Digital Europe, presented their opinion on RE parameters.
Digital Europe, in a response to the 2012 Ecodesign Consultation Forum meeting, where the review of the existing TV Regulation 642/2009 is discussed, opted to voluntarily introduce the following measures:

1. phase out of CCFL for televisions;
2. introduce a "Hg-free" logo;
3. Indium content declaration;
4. plastic marking required (conditionally, not for all plastic parts).

They did not support the introduction of a dismantlability-requirement. Each issue is explained further below.

Digital Europe noted that **CCFL backlights** are still used for some "low end" television models and for some types of displays other than television, that need to meet certain brightness levels. For televisions DigitalEurope supports a voluntary phase out, including for "low end" televisions. Public displays would be exempted due to performance aspects.

The introduction of a **Mercury-free logo** is supported as it is expected that (flat panel) televisions that are discarded the coming years will contain either CCFL or LED backlights. These types currently cannot be distinguished from each other in treatment facilities, which is problematic as they require different treatment processes. The introduction of a logo indicating that there's no mercury present could allow waste treatment facilities to distinguish between CCFL and LED type televisions.

![Figure 15 Mercury-free logo](http://www.digitaleurope.org/Portals/0/Documents/ENV/EcoDesign/DE%20Response%20CF%20Revision%20TVs%20Regulations_20121106.pdf)

The **indium content declaration** is supported although the economics of indium recycling are questionable (reportedly 0.1 gram can be recovered for recycling, representing some 4 cents per television). However, the declaration would not hamper the market and could help in setting up more economically viable options for indium recycling.

**Plastics marking** can be accepted by the industries, although they question the benefit of this, given that plastics in televisions treated at end-of-life are almost exclusively dealt with in automated (shredding based) processes that do not rely on plastics marking. Marking of large parts is in many cases already done on a voluntary basis and this may include the identification of flame retardants used. However, the identification of fillers and plasticisers is reportedly very difficult as these may be regarded as proprietary technology information of suppliers of plastics. Also the size and position of the marking should be subject to aesthetic and practical

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87 http://www.digitaleurope.org/Portals/0/Documents/ENV/EcoDesign/DE%20Response%20CF%20Revision%20TVs%20Regulations_20121106.pdf
considerations. For instance, for co-injected parts, manual separation is meaningless. Usually these parts are shredded into very small pieces and (automated) treatment processes allow separation / liberation of materials.

Not supported by the television industry is a **dismantlability requirement** (e.g. removal or separation of printed circuit board or other components), neither as specific or generic requirement (information only). The industry sees no justification in providing dismantlability information (e.g. time needed for manual disassembly of parts) as it is not proven that manual disassembly outperforms the refined automated recovery methods currently applied in electronics recycling. Industry thinks that requirements on material specific recycling targets, imposed upon recyclers, are more effective as these better suit the processes applied by recyclers. Such requirements could be imposed on treatment facilities through the WEEE Directive and by reference to relevant standards (see WEELABEX).

### 5.3 Standards for RE parameters

**Generic standardisation process**

Following the introduction of legislation under the New Approach and its successor the New Legislative Framework technical standards underpin implementing legislation.

The Ecodesign Directive 2009/125/EC is an example of legislation that relies on harmonised standards as a means for manufacturers to declare conformity to requirements (of implementing measures) and to carry the CE mark. Standards are crucial for proper implementation as they provide for definitions, testing methods, testing tolerances, calculations and presentations of certain parameters.

When the European Commission identifies a need for standardisation on a given topic, it can issue a mandate. Mandates are requests to the European Standards Organizations (ESOs) CEN, CENELEC and ETSI to develop and adopt European standards in support of European policies and legislation. After adoption the standard may be proposed for harmonisation (which is the act of publishing the references of the standard in the OJ) through which a connection of the clauses of the standard and the parameters regulated by implementing measures is established. This is usually done in an Annex ZA to the respective standard.

Draft mandates are drawn up by the Commission and include consultation of interested parties such as social partners, consumers, SMEs, relevant industry associations, etc. Before being formally addressed to the ESOs, mandates are submitted for opinion to the Member States in the Standing Committee of the 98/34/EC Directive.

In case standards are not yet harmonised at the time the implementation of ecodesign requirements, a transitory method document (a Communication by the Commission) helps market surveillance authorities (and manufacturers as well) with the compliance process, by

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89 http://ec.europa.eu/enterprise/policies/european-standards/harmonised-standards/
identifying the relevant (non-harmonised or draft) standards, as well as certain measurement and calculation procedures.

Although standards play a crucial role in the enforcement of regulations, they are not scrutinised by a public body such as the European parliament. Standards are created by experts representing the national standards bodies (NSBs) and are in most cases populated by experts from commercial parties (manufacturers). Often the process of writing standards is fairly self-regulatory, as the presence of multiple parties that need to arrive at a certain consensus, removes explicit commercial interests from the final document. However, the participation of especially micro-, small- and medium sized enterprises, and non-industry stakeholders such as consumer organisations and other NGOs is notably weak as the threshold for participation (in terms of time and costs) is prohibitive.

Another aspect is the identification of which product characteristics must be considered by the standard. Here there is an apparent difference between the Ecodesign Directive and other regulatory instruments developed under the New Legislative Framework such as the Construction Products Regulation 305/2011 (CPR).

The CPR identifies the 'essential characteristics' of products (such as health, safety and environment) but leaves it to the ESO's to interpret and give meaning to how these characteristics are reflected in product information or performance assessment. Therefore for standards developed under the CPR the information requirements are established by the bodies developing the standards.

The Ecodesign Directive however does not identify 'essential characteristics', but may require the provision of information for minimum efficiency requirements and/or information requirements which can be specified in greater detail, often including a definition of the term that describes the information and the metric (units) to use for expressing the value or performance.

Therefore, in case of standards following the Ecodesign Directive the mandate issued to the standardisation bodies must state these requirements, and the bodies developing the standards must consider these requirements otherwise harmonisation may not take place (the standard would be found not in conformity to the mandate and/or the implementing measure).

The conclusion of the evaluation of the Ecodesign Directive by both CSES (2012) and Ecofys (2014) reveals that there still is a need for better synchronisation between the development process for Implementing Measures and that of measurement and test standards.

The Commission has recognised this issue and provides since 2013 funding for ecodesign experts to observe the process of making standards for various product groups and to report back to the Commission.

Comments specifically for RE related standards

On 8 May 2014 the Commission published a draft mandate/ standardisation request to the European standardisation organisations on standards concerning material efficiency aspects in support of the implementation of Directive 2009/125/EC establishing a framework for the setting of ecodesign requirements for energy-related products. This mandate covers the five RE
parameters as established by the JRC 2012 study. Technical committees will therefore consider the necessary tests to establish performance of products as regards reusability, recyclability, recoverability, durability, recycled content, use of priority resources and use of hazardous substances.

**RRR including benefit rates**

For the RRR (including benefit rates) the parameter requires an assessment of

- Reusability: Disassembly information, proving that binding systems are reversible and the reusable part/component can be accessed and disassembled; Evidence that a commercial reuse and refurbishment system has been established;
- Recyclability : recycling rate of the n\textsuperscript{th} part , estimated by the analyst performing the calculation on the basis of reference values and communications with recyclers; the analyst performing the calculation has to define an EoL scenario .. including an economical interest for dismantling
- Recoverability – similar assessment as for recyclability.

The JRC study largely relies on an 'expert' assessment of the recycling potential of the product. But how much knowledge do designers have of the end-of-life phase of products and its possibilities or limitations.

The RBR (recyclability benefit rate) can only be calculated for bulk and most tech plastics\textsuperscript{90}. For metals no recyclability benefit rate is provided. For complex parts such as electronic circuit boards, where problems with recycling are generally more prominent than for plastics or commodity metals, no recyclability factor is provided.

MEErP 2013 (main report, section 6.1) concludes that the product design parameters reusability, recyclability and recoverability can be influenced by product or component design and can be quantified.

A big issue remains the disassembly of products: Several studies have pointed out that manual disassembly, preceding automated processes (like shredding) can improve the recyclability rate of various materials. But studies have also shown that automated process can achieve 100% recycling rates of certain materials (albeit at the expense of the recycling rate of other materials). Manufacturers, ultimately financially responsible for WEEE take back schemes, favour automated processes.

**Recycled content**

There are several standards in use that allow declaration or certification of recycled content. Process standards and material properties standards help to define recycled material quality. European standards are the EN 15342 to EN 15348 series.

Several organisations have established certification schemes for recycled content which may use various standards. For instance, conformity with SCS Recycled Content's standard is verified by an

\textsuperscript{90} Based on Ecoreport tool made available through the DG ENTR website, version March 2014
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independent organization (third party) following ISO 17011 Accreditation, ISO 17021 Management system certification, ISO 19011 QMS and EMS auditing (and auditor qualifications), ISO / IEC Guide 65 Product Certification. The identification of critical raw materials and of materials of certified origin may follow a similar path.

**Durability**

Durability is also subject to a study by Ricardo-AEA for DG ENV\(^{91}\). Durability as a stand-alone concept has not yet been specifically addressed within EU Product Policy. To date, durability impacts have been included in EU Product Policy only for a very limited number of products, namely light bulbs and vacuum cleaners, through the relevant Ecodesign implementing measures. Durability may also cover upgradeability or reparability. Such parameters, although easy to interpret, are difficult to quantify through performance standards.

A list of standards is being prepared under the abovementioned study.

**Hazardous substances**

The identification of hazardous substances starts with a complete bill-of-materials at substance level. The substances can then be checked according lists of substances as provided under RoHS, REACH, CLP, IEC TR 62635 / 62650 and several Lists of restricted substances (or banned substances) as applied in several sectors.

Part of the parameter deals with identifying treatment of EOL and of key components. This identification can be based on scientific literature or on direct feedback from the recyclers. Information about the disassembly of the components is also necessary.

**Light weighting parameters**

For light weighting measures standards are required for especially the case that the parameters uses a metric which includes the performance. For certain products such standards may exist already (1 kg laundry cleaned), for other products such performance standards may need to be developed (e.g. preservation of various foods).

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\(^{91}\) "The Durability of Products: Task 1 Report Standard assessment for the circular economy under the Eco-Innovation Action Plan, Task 1 – Selection of Products, Date 02.06.2014 DG ENV see: http://productdurability.eu/"
6. Conclusions

In the conclusions a distinction must be made between application of the RE parameters in the analysis, i.e. the preparatory study and subsequent policy making, and the direct application of the parameters in the legislation. In several instances a methodology may be useful in demonstrating the necessity of regulating a parameter, but not suitable for the actual legislative measure.

The main conclusions are:

**Completeness**

- The recently developed RE parameters are mainly oriented to end-of-life of products and are not complete.
- Waste prevention, i.e. the first priority in the EU waste hierarchy and currently an important contributor to diminishing the waste stream, is the most important RE parameter missing.

**Waste prevention**

- Waste prevention includes
  - minimal materials use through miniaturisation and light-weighting of the product, affecting all life-cycle-phases, and
  - minimal (non-energy) resources consumption during the use-phase, e.g. direct use of water, paper and refrigerants, but possibly also indirect (‘related’) resources impacts e.g. linked to food preservation (in fridges), textile wear (in laundry equipment), etc.
- Ecodesign measures regarding savings on non-energy resources consumption in the use-phase have proven to be enforceable, at least for directly consumed resources, legally and in practice. Methodology and measures regarding the weight-saving measures in Ecodesign would need to be developed.

**Durability**

- The JRC scenario-method to establish Durability Benefit of energy-related products seems to take into account the appropriate parameters and considerations, but requires stakeholder consensus on the inputs i.e. regarding the future energy efficiency of the specific product.
- Measures on product durability (life time extension) have proven to be enforceable when formulated in terms of minimum technical life of the product or components according to harmonised test and calculation procedures. Also minimum warranty times and the time period during which spare parts are available can be enforced.

**Hazardous substances**

- The JRC method on hazardous substances entails a multi-stage analysis, first identifying components that —according to RoHS and REACH legislation—are hazardous or of very high concern and then identifying if the processing of these components at end-of-life will be hazardous. This type of analysis can be performed if enough effort (budget) is invested in gathering the necessary input data given the probably large variances between treatment locations.
- Current Ecodesign practice, e.g. in the case of mercury in certain light sources, is to leave banning of hazardous substances to the RoHS and REACH directives and —as appropriate—make certain allowances (e.g. on ignition time requirements) when the hazardous substances
are used in a form that is less hazardous at end-of-life (e.g. amalgam instead of liquid/gaseous mercury).

**Recycled content**
- The JRC-assessment of Recycled content Benefit has been included in the most recent versions of MEErP and, through the Extra Materials facility, its EcoReport-tool. The effort to assess this rate in preparatory studies is more limited than for the RRR Benefit rates. In the same scope also materials with a certified origin (e.g. FSC) could be included and is currently missing.
- The application of recycled content (and similar) in actual measures suffers from similar problems as mentioned for the RRR Benefit rates, but with some differences. First, there is already some standardisation of the (documentation and assessment) process where the recycled content of plastics could be established through declaration through suppliers. Second, although approximate, it could be considered to measure directly or indirectly (e.g. through derived characteristics such as reflectance, surface quality, etc.) the material contamination and thus the approximate recycled content on the product.

**Re-usability, Recyclability, Recoverability (RRR)**
- JRC methods to establish RRR rates and RRR Benefit rates have been integrated as much as possible in the existing methodology for Ecodesign preparatory studies (a.k.a. MEErP). This methodology is new and no completed preparatory studies have been completed where it is used.
- Mass-based RRR rates should be used with caution, as stated in JRC’s own analysis, and RRR Benefit rates are more appropriate for the holistic life-cycle thinking in Ecodesign.
- The data retrieval and development of stakeholder consensus on appropriate input data for the RRR Benefit rates will require a major (specialist) effort and budget in the Ecodesign preparatory studies. Should it be decided to follow this route, the Commission will have to not only raise budgets but also make an exception to the proportionality-principle that it currently applies, i.e. that the research effort is proportional to the environmental gain that can be expected.
- The Ecodesign Directive allows addressing all RE parameters discussed, but requires proof of their significance and (for specific measures) proof of their technical and economic feasibility. Much of the information required for delivering that ‘proof’ has been shown to be difficult to retrieve in the public domain. The evidence base is most likely easiest to collect for measures related to recycled content, durability of specific components, presence /use of hazardous substances, use of materials of certified origin.
- As an alternative to treating re-use, recycling and (heat) recovery in Ecodesign, policy makers could consider to strengthen the coupling with the minimum-requirements from EU Waste Directives, i.e. make the cost contribution of manufacturers to the effort to achieve these requirements (more) depending on design-measures they take to facilitate end-of-life treatment.

**Enforceability in general**
- Should Ecodesign preparatory studies, using the JRC-method and/or other parameters within MEErP, be able to provide robust evidence that justifies introduction of specific RRR measures in legislation, (a set of) specific and tailor-made requirements should be introduced in Ecodesign legislation that could meet legal and practical criteria of enforceability.
- Amongst others this means that the requirements should be technically and economically feasible and preferably relate to parameters that can be assessed with an accurate, reliable
and reproducible test and calculation method at product-level. If they would depend on input from upstream actors (suppliers) or downstream (end-of-life) processes, the administrative burden would be considerable and still the accuracy and reproducibility of measurements would require robust test standards to be in place to guarantee a level playing field.

- International trade agreements emphasize the relation between the proposed measure and its means of verification. Measures that can be verified on the product itself are considered to constitute less of a (potential barrier to trade than measures that can only be verified indirectly as they relate to non-product related production and process methods. Several RE parameters incorporate such non-product related PPMs (for example through a link to End-of-life treatment). There are however measures that may relate solely to the product, such as parameters dealing with durability, light-weighting, presence of substances (hazardous or critical raw materials, etc.).

- In order to facilitate enforceability it may be advantageous to start with –preferably horizontal—measures that expand on known, proven issues and then gradually, after appropriate capacity building, move towards more complex issues on the medium and long term.
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Digital Europe
http://www.digitaleurope.org/Portals/0/Documents/ENV/EcoDesign/DE%20Response%20CF%20Revision%20TVs%20Regulations_20121106.pdf


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Ecofys, 2013-2014, see: www.energylabellingevaluation.eu
Resource Efficiency and the Ecodesign Directive

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ANNEX A: Policy documents

**Roadmap to a resource efficiency Europe**

The Roadmap to a resource efficiency Europe (COM(2011)571)\(^2\) sets out a vision and the general actions required to improve the resource efficiency of the EU.

**The Vision:** By 2050 the EU’s economy has grown in a way that respects resource constraints and planetary boundaries, thus contributing to global economic transformation. Our economy is competitive, inclusive and provides a high standard of living with much lower environmental impacts. All resources are sustainably managed, from raw materials to energy, water, air, land and soil. Climate change milestones have been reached, while biodiversity and the ecosystem services it underpins have been protected, valued and substantially restored\(^3\).

It does not provide a clear definition of resource efficiency (although some indicators at EU level are described), but from the text it is clear that resource efficiency is not limited to waste-related measures, but is embedded in a wider approach aimed at **sustainable production and consumption**, and the **protection/preservation of natural capital and ecosystems**. It mentions concepts like providing consumers life-cycle information, giving companies access to critical resources (including water), stimulation of research and innovation, removal of environmentally harmful subsidies, but also the protection of species, maintaining or improving biodiversity and depletion of natural sources, etc.

In fact the document could just as well be called "Roadmap to a more **sustainable** Europe' as all aspects can be covered by the triple P of "people-planet-prosperity\(^4\)", but that buzzword apparently has reached the end of its useful life, with little chance for re-use.

More specifically the Roadmap to Resource Efficient Europe mentions as role of the Ecodesign Directive the following:

*(p. 7)* Address the environmental footprint of products, building on an ongoing assessment due in 2012 and following a consultation with stakeholders, including through setting requirements under the Ecodesign directive, to boost the material resource efficiency of products (e.g. reusability / recoverability / recyclability, recycled content, durability), and through expanding the scope of the Ecodesign directive to non-energy related products (in 2012);

It seems that although the Roadmap considers resource efficiency to cover a wide range of aspects related to sustainability, when discussing the options for Ecodesign the interpretation is limited to waste-related aspects. At the time of writing the communication (September 2011) the first phase of the JRC resource efficiency study was already completed and it is conceivable that this inspired the ecodesign aspects to be covered under resource efficiency.

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\(^3\) Page 3 of the Roadmap.

\(^4\) In the Johannesburg summit in 2002 the P for profit was replaced by prosperity to better reflect the societal aspects, and not just economic aspects.
Union Environment Action Programme

The second document is the more recent General Union Environment Action Programme to 2020 'Living well, within the limits of our planet' which sets out, in its Annex, the following:

Since 80% of all environmental impacts of a product during its lifecycle originate in its design phase, the Union policy framework should ensure that priority products placed on the Union market are *eco-designed* with a view to optimising resource and material efficiency. This should include addressing, inter alia, product durability, reparability, re-usability, recyclability, recycled content and product lifespan. Products should be *sustainably sourced* and designed for re-use and recycling. Those requirements will have to be implementable and enforceable. Efforts will be stepped up at Union and national level to remove barriers to eco-innovation (COM(2011) 899), and to unlock the full potential of Europe's eco-industries, thereby generating benefits for green jobs and growth.

This Decision repeats the same aspects as studied by JRC 2012, but it adds the aspect of 'sustainably sourced' products, and that these actions should be implementable and enforceable and that barriers to this need to be resolved.

The above leads to conclude that although the EU describes resource efficiency as a concept stretching far beyond waste-related aspects, the context of what resource efficiency means for ecodesign is limited by the interpretation applied in the JRC 2012 study.

As the JRC 2012 study was on both resource efficiency and waste management, it's kind of obvious that the JRC parameters have a focus on waste, whereas the general concept of resource efficiency is interpreted much wider than that.

So, our initial conclusion is that the five parameter sets by JRC 2012 have a too narrow focus on waste-related aspects, to be truly compatible with the overall aim of what now is called 'resource efficiency'.

It would not be correct to interpret the JRC 2012 parameter set as the sole and definite way of handling resource efficiency in Ecodesign. In order to find out whether parameters may be "missing" from the list of the five parameters we look at some other studies, closely linked to the concept of resource efficiency, which are the Circular Economy and the BIOis2013 update of the MEErP with regard to material efficiency. This is covered by the following section.

Circular Economy

Probably one of the most cited sources related to resource efficiency is the Circular Economy approach advocated by the Ellen MacArthur Foundation (EMAF).

The circular economy as advocated by EMAF draws, as a generic notion, from a number of more specific approaches including cradle-to-cradle, bio mimicry, industrial ecology, and the 'blue economy', and has its roots in supply chain management.

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95 DECISION No 1386/2013/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 November 2013 on a General Union Environment Action Programme to 2020 ‘Living well, within the limits of our planet’

96 Annex THEMATIC PRIORITIES Priority objective 2: To turn the Union into a resource-efficient, green and competitive low-carbon economy, item 36.

97 Emphasis (bold) by author

98 Hence the title "Integration of resource efficiency and waste management criteria in European product policies" (underlining by author)
The approach states that the three main barriers to a circular economy are: geographic dispersion, materials complexity, and linear lock-in. Material productivity can be increased by creating inner circles, circling longer, cascaded uses across industries and pure/non-toxic/easier to separate inputs and designs.

According the Circular Economy 2014 publication, the main problems ('leakage points') facing the creation of a circular economy are related to:

1. geographic dispersion: resource extraction, manufacturing, use and disposal take place in different regions, often hampering creation of material loops;
2. materials complexity: difficulties in separating materials, purity, supply issues, identification;
3. linear lock-in: (mis)alignment of incentives, markets of scale.

Part of the above leakages can be addressed through product design, the realm of the Ecodesign Directive, by better linking the design stage to the end-of-life stage (assuming that other improvement options, such as related to use of energy, water etc. have already been identified and addressed).

More concrete this means:

1. closing loops – this is reflected in parameters concerning reuse, recycling and (energy) recovery, including use of recycled content (this includes reducing material complexity through standardisation / modularisation of components, purer materials flows, and design for easier disassembly, as complexity hampers easy recycling);
2. avoiding waste – this is reflected in parameters concerning the avoidance of hazardous substances, but it can also address rucksacks of products (CO2 emissions are waste); 
3. reduce use of materials that are scarce, precious, have limited supply or are otherwise considered unsustainable (this includes ethical and moral principles).

Most 'leakages' however occur within system boundaries that far exceed those of the designer's influence, such as the actual end-of-life processing (although they may influenced by each other directly or indirectly).

Concrete actions undertaken by manufacturers comprise designing products that are easier to refurbish/re-use and recycle (Ricoh copiers), changing the sales channel from product-based to service-based (Philips lighting turntoo, Vodaphone), increased collection of discarded products (Philips lighting, H&M clothing)

The EMAF reports on circular economy acknowledge the current characteristics of especially metal recycling as described by UNEP reports on metal recycling and recycling rates, which show that consumption of specific metals far outweighs the recycling of these, leading to supply shortages, volatile prices, increased burden of resource extraction, etc.

Prevention of material use, light weighting or reducing material input/throughput ("making circles smaller") does not receive as much attention as the abovementioned strategies, and neither does biotic depletion (linked to loss of biodiversity).

The fact that many of the above ecodesign 'input-side' parameters may also be touched upon through the other approaches shows that between concepts like ecodesign and resource efficiency / circular economy are blurred:

- Circular economy advocates an approach where leakages of material flows are reduced by (among others) bringing closer together the locations of manufacturing, use and final treatment – in Ecodesign we could call this optimisation of production and distribution and end-of-life.
- The resource efficiency parameter 'use of priority resources' may be able to calculate the differences between sustainable and unsustainable sourced materials, provided these materials are adequately represented in the calculation tools (both in LCI and impact assessment methods). In Ecodesign we could call this strategy the use of low-impact materials. The difference could be entirely attributable to differences in process and production methods (PPM) – example: sustainably managed natural resources that are depletable such as forests, or crops, or fish, preserves availability of resource for future generations.

CONCLUDING: The Circular Economy does not give a set of parameters to take into account when designing products. It does provide general guidelines and examples (product cases). The guidelines do not deviate strongly from or bring new aspects into the concept of ecodesign.
ANNEX B: Ecodesign procedures and definitions

Directive 2009/125/EC: General Procedure

The introduction of ecodesign requirements is bound to a procedure and criteria described in article 15, spelling the steps required for drafting measures.

Item 1 and 2 of Article 15 describe the criteria related to eligibility of the product to be covered by a (draft) measure. Besides a significant market and environmental impact, also a 'significant' environmental improvement potential needs to be presented, taking into account:

a) the absence of other relevant Community legislation or failure of market forces to address the issue properly;
b) a wide disparity in the environmental performance of products available on the market with equivalent functionality.

Item 3 and 4 set criteria to the procedure for developing measures, requiring a technical, economic and environmental assessment (referred to as 'preparatory study'), that considers the product life cycle, impacts on SMEs, etc., an appropriate consultation of stakeholders, etc.

Item 5 is most relevant as this describes criteria applicable to the measures themselves. It is stated that implementing measures shall meet all the following criteria:

a) there shall be no significant negative impact on the functionality of the product, from the perspective of the user;
b) health, safety and the environment shall not be adversely affected;
c) there shall be no significant negative impact on consumers in particular as regards the affordability and the life cycle cost of the product;
d) there shall be no significant negative impact on industry’s competitiveness;
e) in principle, the setting of an ecodesign requirement shall not have the consequence of imposing proprietary technology on manufacturers; and
f) no excessive administrative burden shall be imposed on manufacturers.

Annex I: Generic requirements

Generic ecodesign requirements aim at improving the environmental performance of products, focusing on significant environmental aspects thereof, without setting limit values.

Implementing measures may require information to be supplied by the manufacturer that may influence the way the product is handled, used or recycled by parties other than the manufacturer. This information may include, as applicable:

a) information from the designer relating to the manufacturing process;
b) information for consumers on the significant environmental characteristics and performance of a product, accompanying the product when it is placed on the market to allow consumers to compare these aspects of the products;
c) information for consumers on how to install, use and maintain the product in order to minimise its impact on the environment and to ensure optimal life expectancy, as well as...
on how to return the product at end-of-life, and, where appropriate, information on the period of availability of spare parts and the possibilities of upgrading products; and
d) information for treatment facilities concerning disassembly, recycling, or disposal at end-of-life.

Information should be given on the product itself wherever possible.

As can be seen, information relating to manufacturing processes are specifically addressed.

CONCLUSION: Generic information requirements may cover non-product PPM (i.e. manufacturing processes).

The requirement could be that:

1. manufacturers of products must perform an assessment of the product model throughout its lifecycle, establishing the product’s ecological profile;
2. manufacturers must use the above assessment to evaluate alternative design solutions and the achieved environmental performance\textsuperscript{100} benchmark this against a reference (benchmark) ecological performance, identified by the Commission

Manufacturers must make use of this assessment to evaluate alternative design solutions and the achieved environmental performance of the product against benchmarks.

When setting generic requirements in accordance with Annex I, the Commission must identify the relevant ecodesign parameters from among those listed in Part 1, the information supply requirements from among those listed in Part 2 and the requirements for the manufacturer listed in Part 3.

Until this date the Commission has issued generic requirements related to proper installation, use and discarding of products\textsuperscript{101}, but has not yet requested manufacturers to perform an environmental assessment, resulting in the creation of an ecological profile.

\textbf{Specific: described in Annex II.}

Specific ecodesign requirements aim at improving a selected environmental aspect of the product. Annex II specifically mentions typical resource efficiency related requirements like a limit on quantities of a given material incorporated in the product or a requirement for minimum quantities of recycled material.

When setting specific requirements, Annex II of Directive 2009/125/EC requires a technical, environmental and economic analysis of products available on the Community and international markets, identifying the technical options for improving the environmental performance of the product, keeping sight of the economic viability of the options and avoiding any significant loss of performance, on which basis specific requirements may be set. Only for requirements related to energy (or water or other consumables)

The Commission has been mandated to introduce specific ecodesign requirements, which may cover resource efficiency aspects, as long as can be proven that it doesn’t constrain the economic viability and significant loss of performance (and of course the avoidance of excessive costs, affordability, use of proprietary technology, as stated in Article 15, item 5-6).

\textsuperscript{100} ‘Environmental performance’ of a product means the results of the manufacturer’s management of the environmental aspects (resource consumption, emissions, incl. waste or other pollution, and possibilities for reuse, recycling and recovery of materials or energy) of the product, as reflected in its technical documentation file

\textsuperscript{101} [insert references: i.e. personal computers, electric motor driven equipment (fans, pumps, etc.)]
In preparing implementing measures laying down specific ecodesign requirements pursuant to Article 15, the Commission must:

1. perform a technical, environmental and economic analysis, to identify the technical options for improving the environmental performance of the product (parameters to be based on Directive 2009/125/EC, Annex I, part 1);
2. when setting requirements, the performance of products available on international markets and benchmarks set in other countries’ legislation should be taken into account;

Only for energy and other resources relevant in the use phase, such as water, Annex II requires the setting of requirements based on a least life cycle cost.

So far, generic requirements have only been introduced as information requirements, for the provision of (mainly) technical and performance related information. We could not identify an example where the provision of information applicable to the life cycle of the product has been required.

Specific requirements have been implemented on wide scale

It appears that – on the basis of the procedure introduced for ecodesign requirements in general - both generic and specific requirements need to comply with the same set of criteria related to impacts.

Only the method for setting requirements appears to be different, as the setting of specific requirements requires a calculation of life cycle costs. This approach appears to be problematic with regard to specific resource efficiency requirements.

**Resource efficiency in the Ecodesign Directive**

From an administrative point of view there is no need to investigate the need to integrate resource efficiency aspects in the Ecodesign Directive, as the Directive already accommodates the setting of resource efficiency requirements. An overview of all listed ecodesign parameters in Directive 2009/125/EC (which includes parameters related to resource efficiency) is shown below.

However, history shows that specific ecodesign requirements in implementing measures under Directive 2009/125/EC have focused on the following ecodesign parameters:

- Consumption of...
  - energy (virtually all measures have introduced a minimum energy efficiency requirement and/or an information requirement related to this)
  - water (maximum water consumption requirement (example
  - other resources
- Emissions during use (NOx from fuel fired appliances, GWP of refrigerants)
- Use of substances (mercury in bulbs and television backlights)

And have not addressed issues related to:

- weight and volume
- use of materials from recycling activities
- quantity and nature of consumables needed for proper use and maintenance;
- ease for reuse and recycling (etc.)

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102 See Directive 2009/125/EC, Article 2, definition 26
incorporation of used components;
avoidance of technical solutions detrimental to reuse and recycling of components and whole appliances;
extension of lifetime (etc.);
amounts of waste generated and amounts of hazardous waste generated;
emissions to soil (etc.)

Parameters means product characteristics or properties (physical like weight, presence of materials, use of energy) which can be covered by specific / generic requirements.

A requirement for minimum energy efficiency relates to the environmental parameter energy consumption during use. A requirement limiting emissions to air, may relate to maximum emission limits during use, but in principle also emissions generated during other life cycle phases.

**Definitions under the Ecodesign, WEEE and Waste Directive**

The following definitions relate to terms defined under the Ecodesign, WEEE and Waste Directive. The main terms are:

1. prevention
2. reuse
3. waste (incl. hazardous waste)
4. collection (incl. separate collection)
5. treatment (incl. removal)
6. recovery
7. recycling (incl. energy recovery)
8. disposal
### Definitions

**Table 1**

<table>
<thead>
<tr>
<th>Term</th>
<th>Ecodesign DIRECTIVE 2009/125/EC:</th>
<th>WEEE recast DIRECTIVE 2012/19/EU</th>
<th>Waste DIRECTIVE 2008/98/EC</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>prevention</td>
<td>means measures taken before a substance, material or product has become waste, that reduce: (a) the quantity of waste, including through the re-use of products or the extension of the life span of products; (b) the adverse impacts of the generated waste on the environment and human health; or (c) the content of harmful substances in materials and products;</td>
<td></td>
<td></td>
<td>&quot;Ecodesign&quot; is considered a preventive approach, but the actual term is not defined in 2009/125/EC</td>
</tr>
<tr>
<td>reuse</td>
<td>means any operation by which a product or its components, having reached the end of their first use, are used for the same purpose for which they were conceived, including the continued use of a product which is returned to a collection point, distributor, recycler or manufacturer, as well as reuse of a product following refurbishment</td>
<td>means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived</td>
<td></td>
<td>Reuse under Ecodesign is defined with more precision than reuse under the WEEE or Waste Directives. Neither Directive refers to reused products being waste. Example of reuse is second hand use. For reuse the product is not 'placed on the market'.</td>
</tr>
<tr>
<td>preparing for re-use</td>
<td>means checking, cleaning or repairing recovery operations, by which products or components of products that have become waste are prepared so that they can be re-used without any other pre-processing</td>
<td></td>
<td></td>
<td>(see above)</td>
</tr>
<tr>
<td>waste</td>
<td>means any substance or object in the categories waste electrical and electronic</td>
<td>means any substance or object</td>
<td></td>
<td>Directive 2006/12/EC is repealed by</td>
</tr>
</tbody>
</table>

For WEEE recast 2012/19/EU, the definitions of 'hazardous waste', 'collection', 'separate collection', 'prevention', 're-use', 'treatment', 'recovery', 'preparing for re-use', 'recycling' and 'disposal' laid down in Article 3 of Directive 2008/98/EC shall apply.
<table>
<thead>
<tr>
<th>Term</th>
<th>Ecodesign DIRECTIVE 2009/125/EC.</th>
<th>WEEE recast DIRECTIVE 2012/19/EU</th>
<th>Waste DIRECTIVE 2008/98/EC</th>
<th>Remark</th>
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<tbody>
<tr>
<td>set out in Annex I to</td>
<td></td>
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<td></td>
<td>Directive 2006/12/EC which the holder discards or intends, or is required, to discard. (2006/12/EC, Annex I, Categories of waste: residues, date for use expired, materials spilled, lost, use banned by law, etc.).</td>
</tr>
<tr>
<td>equipment’ or ‘WEEE’</td>
<td></td>
<td></td>
<td></td>
<td>means electrical or electronic equipment which is waste within the meaning of Article 3(1) of Directive 2008/98/EC, including all components, sub-assemblies and consumables which are part of the product at the time of discarding which the holder discards or intends or is required to discard Directive 2008/98/EC. So the definition of waste under 2009/125/EC could be interpreted to become the interpretation of waste according 2008/98/EC.</td>
</tr>
<tr>
<td>hazardous waste’</td>
<td>Hazardous waste’ means any waste</td>
<td>means waste which displays one or more of the hazardous properties listed in Annex III (i.e.: explosive, oxidizing, flammable, irritating, harmful, toxic, carcinogenic, corrosive, infectious, etc.)</td>
<td></td>
<td>2008/98/EC Covers the same ‘H’ classification as 91/689/EEC</td>
</tr>
<tr>
<td>collection</td>
<td>means the gathering of waste,</td>
<td></td>
<td></td>
<td>Mentioned once in 2009/125/EC in context of reuse</td>
</tr>
<tr>
<td></td>
<td>including the preliminary sorting and preliminary storage of waste for the purposes of transport to a waste treatment facility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>separate collection</td>
<td>means the collection where a waste stream is kept separately by type and nature so as to facilitate a specific treatment</td>
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<td></td>
<td>(see above)</td>
</tr>
<tr>
<td>treatment</td>
<td>means recovery or disposal</td>
<td></td>
<td></td>
<td>Study writer concludes that removal is a treatment activity (‘prior to recovery or disposal’)</td>
</tr>
<tr>
<td></td>
<td>operations, including preparation prior to recovery or disposal;</td>
<td></td>
<td></td>
<td>Study writer concludes that removal is a treatment activity (‘prior to recovery or disposal’)</td>
</tr>
<tr>
<td>removal</td>
<td>means manual, mechanical, chemical or metallurgic handling with the result that hazardous substances, mixtures and components are contained in an identifiable stream or are an identifiable part of a stream within the treatment process.</td>
<td></td>
<td></td>
<td>Not defined under 2009/125/EC</td>
</tr>
<tr>
<td>Term</td>
<td>Ecodesign DIRECTIVE 2009/125/EC:</td>
<td>WEEE recast DIRECTIVE 2012/19/EU</td>
<td>Waste DIRECTIVE 2008/98/EC</td>
<td>Remark</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------</td>
<td>----------------------------------</td>
<td>-----------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>recovery</td>
<td>means any of the applicable operations provided for in Annex II B to Directive 2006/12/EC of the European Parliament and of the Council of 5 April 2006 on waste</td>
<td>means any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy. Annex II sets out a non-exhaustive list of recovery operations E.g. use as fuel or energy generation, solvent reclamation/regeneration, recycling/reclamation, recovery of components (acids, bases, catalysts), refining, land treatment purposes, use of waste resulting from above operations, storage pending above operations</td>
<td>Directive 2006/12/EC is repealed by Directive 2008/98/EC. So the definition of recovery under 2009/125/EC could be interpreted to become the interpretation of recovery according 2008/98/EC.</td>
<td></td>
</tr>
<tr>
<td>recycling</td>
<td>means the reprocessing in a production process of waste materials for the original purpose or for other purposes but excluding energy recovery</td>
<td>means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations</td>
<td>The definition in 2008/98/EC is more elaborate than 2009/125/EC, but the same basic idea is contained (original or other purpose, excluding energy recovery)</td>
<td></td>
</tr>
<tr>
<td>energy recovery</td>
<td>means the use of combustible waste as a means to generate energy through direct incineration with or without other waste but with recovery of the heat;</td>
<td></td>
<td>Energy recovery is not defined under 2008/98/EC but is mentioned several times as recovery option</td>
<td></td>
</tr>
<tr>
<td>disposal</td>
<td>means any operation which is not recovery even where the operation has as a secondary consequence the reclamation of substances or energy. Annex I sets out a non-exhaustive list of disposal operations: E.g. landfill, biodegradation, deep injection, surface impoundment, release into water/seas/oceans, incineration, permanent storage other processes prior to these.</td>
<td></td>
<td>Disposal is not defined under 2009/125/EC but is mentioned several times as possible end-of-life stage.</td>
<td></td>
</tr>
</tbody>
</table>
The table below shows the environmental parameters as identified by the Directive 2009/125/EC (first column) and whether these have been applied in specific requirements in implementing measures under 2009/125/EC (second column) and whether they are identified as resource efficiency parameters in the DG JRC study\(^\text{103}\) (third-ninth column).

Table. Overview of environmental parameters in 2009/125/EC and their application in ecodesign requirements and/or resource efficiency parameters in the DG JRC studies

<table>
<thead>
<tr>
<th>Ecodesign parameters acc. Directive 2009/125/EC, Annex 1, part 1, item 1.3</th>
<th>Has been applied as specific ecodesign requirement</th>
<th>Has been elaborated as resource efficiency parameter in the DG JRC studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) weight and volume of the product;</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>b) use of materials issued from recycling activities;</td>
<td>no</td>
<td>✓</td>
</tr>
<tr>
<td>c) consumption of energy, water and other resources throughout the life cycle;</td>
<td>yes (use phase)</td>
<td>✓ (all phases, but priority materials only)</td>
</tr>
<tr>
<td>d) use of substances classified as hazardous to health and/or the environment (etc.);</td>
<td>yes</td>
<td>✓</td>
</tr>
<tr>
<td>e) quantity and nature of consumables needed for proper use and maintenance;</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>f) ease for reuse and recycling</td>
<td>no</td>
<td>✓ ✓ ✓</td>
</tr>
</tbody>
</table>

Check JRC with Annex I of 2009/125/EC

As a check, the resource efficiency parameters as proposed by JRC 2012 can be compared to parameters already present in the Annexes of the Ecodesign Directive. This comparison shows that the JRC 2012 study has not introduced new concepts to design for resource efficiency.

<table>
<thead>
<tr>
<th>Parameters identified in Directive 2009/125/EC, Annex I, Part 1., item 1.3</th>
<th>Covered by JRC 2012 ?</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) weight and volume of the product</td>
<td>No, although light weighting or dematerialisation are known ecodesign strategies, contributing to resource efficiency</td>
</tr>
<tr>
<td>b) use of materials issued from recycling activities</td>
<td>ii) recycled content</td>
</tr>
<tr>
<td>c) consumption of energy, water and other resources throughout the life cycle</td>
<td>iii) use of priority resources</td>
</tr>
<tr>
<td>d) use of substances classified as hazardous to health and/or the environment (etc.)</td>
<td>iv) use of hazardous substances</td>
</tr>
<tr>
<td>e) quantity and nature of consumables needed for proper use and maintenance</td>
<td>No, but parameter is already addressed by some ecodesign measures</td>
</tr>
<tr>
<td>f) ease for reuse and recycling (etc.)</td>
<td>i) reusability / recyclability / recoverability</td>
</tr>
<tr>
<td>g) incorporation of used components</td>
<td>Yes, although not as specific indicator. Where JRC addresses reusability rates of products, it can be assumed that it promotes the use of used components.</td>
</tr>
<tr>
<td>h) avoidance of technical solutions detrimental to reuse and recycling of components and whole appliances</td>
<td>i) reusability / recyclability / recoverability</td>
</tr>
<tr>
<td>i) extension of lifetime (etc.)</td>
<td>v) durability</td>
</tr>
<tr>
<td>j) amounts of waste generated and amounts of hazardous waste generated</td>
<td>No, but parameter is already addressed by some ecodesign measures (example televisions and household lamps: indication of mercury content). Waste is also addressed by RoHS (and WEEE for end-of-life aspects), but not as product-specific parameter. Reduction of waste, including hazardous waste, are known ecodesign strategies, contributing to resource efficiency.</td>
</tr>
</tbody>
</table>
Developing proper indicators may be hampered by limited knowledge of ultimate fate of products, parts and materials

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>k)</strong> emissions to air (etc.)</td>
<td>No, but parameter is already addressed by multiple ecodesign measures, however only for emissions during use-phase.</td>
</tr>
<tr>
<td><strong>l)</strong> emissions to water (etc.)</td>
<td>No, but parameter could in principle be addressed if emissions can be quantified and addressed by product-specific indicators, similar to ‘emissions to air’. The current set of regulated products however, showed no relevant emissions to water or soil. This may change if scope is enlarged to non-energy related products.</td>
</tr>
<tr>
<td><strong>m)</strong> emissions to soil (etc.)</td>
<td></td>
</tr>
</tbody>
</table>

When we make the comparison the other way around we find that JRC 2012 does not address:

- weight and/or volume
- consumables
- waste (including hazardous)
- and emissions (air, water, soil)

Regarding consumables, waste and emissions it can be noted that - if proven significant from life-cycle perspective - measures developed under ecodesign have addressed this (example consumables: duplex printing in the Voluntary Agreement for imaging equipment; example waste: indication of mercury in lighting products; example emissions: maximum emission limits for NOx, CO, particles etc. in various space heating equipment). It is therefore understandable that JRC did not prioritise these parameters.

This leaves the weight/volume of products as the main ecodesign-parameter not addressed by the five resource efficiency parameters.
Another assessment on the completeness of the resource efficiency parameter set has been made by BIOis 2013 in their study for the update of the MEErP, focusing on material efficiency\textsuperscript{104}. The study assessed several material-efficiency-related indicators, including possible barriers to their implementation. A literature review resulted in some 31 possible parameters for resource efficiency.

However, as many parameters address the same issue and certain parameters were deemed too difficult to be turned into a practical approach, the study identified some 10 parameters of "high-relevance" for ecodesign. Ultimately the study resulted in the amendment of the MEErP for just four parameters: Recyclability benefit rate (indicator), recycled content (indicator), lifetime (guidance) and critical raw materials (indicator) as the other parameters were too difficult, if not impossible, to implement as practical requirements.

Table 2 Material efficiency parameters identified in MEErP 2013

<table>
<thead>
<tr>
<th>High-relevance material efficiency parameters (based on table 18 and table 39)</th>
<th>Comments / explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of material used over life cycle</td>
<td>Consumption of materials per functional unit</td>
</tr>
<tr>
<td>MIPS\textsuperscript{105} Material Inputs Per unit Service</td>
<td>BIOis 2013 states that characterisation factors are missing. MIPS measures the material demand and material efficiency of products and services in five different categories of resource extraction and usage covering both unused and used materials.</td>
</tr>
<tr>
<td>Material Footprint</td>
<td>BIOis 2013 states that characterisation factors are missing. Material Footprint is a single aggregated indicator, consisting of the abiotic and biotic resources as well the erosion caused by agri- and silviculture</td>
</tr>
<tr>
<td>Environmental impacts of extraction, production and end-of-life of materials</td>
<td>Abiotic Depletion Potential: mineral, fossil</td>
</tr>
<tr>
<td>Recyclability benefit rate</td>
<td>IMPLEMENTED in MEErP 2013, by adding calculation in Ecoreport plus guidance in recycling rates and practices Credits allocated to end-of-life scenarios were changed: re-use: 75% credit; material recycling: 40% credit; energy recovery: 30% credit (not applicable to metals)</td>
</tr>
</tbody>
</table>

\textsuperscript{104} As the study was limited to material efficiency only, the use phase was excluded (thus excluding resources like energy, water, or materials contained in other ‘consumables’ such as printing paper, detergents, filters, lubricants, etc.).

\textsuperscript{105} Lettenmeier M et al. (2009) Resource productivity in 7 steps
### Resource Efficiency and the Ecodesign Directive

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Benefit Rate</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recoverability of materials/product</td>
<td>Recoverability benefit rate</td>
<td>BIOis 2013 states that recoverability was difficult to interpret, as recovery entails various treatment options, of which recycling, but also incineration with heat recovery are possible routes</td>
</tr>
<tr>
<td>Origin of materials</td>
<td>Recycled content, Re-used components</td>
<td>IMPLEMENTED in MEERp 2013 by adding datasets (indicators) for materials with recycled content: office paper, HDPE recycled, PVC recycled &amp; PET recycled</td>
</tr>
<tr>
<td>Raw materials with sustainable origin</td>
<td>BIOis 2013 states that a definition of sustainable origin missing</td>
<td></td>
</tr>
<tr>
<td>Reusability of components/product</td>
<td>Reusability benefit rate</td>
<td>(not explained why not implemented)</td>
</tr>
<tr>
<td>Reparability and durability of components/product</td>
<td>Lifetime and warranty</td>
<td>IMPLEMENTED in MEERp 2013, by adding clarification on how to take durability, warranty and lifetime into account</td>
</tr>
<tr>
<td>Critical raw materials (not in table 39)</td>
<td>IMPLEMENTED in MEERp 2013, by providing guidance when existing CRM index should be used</td>
<td></td>
</tr>
<tr>
<td><strong>Medium relevance parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumption of materials</td>
<td></td>
<td>Is Ecoreport input</td>
</tr>
<tr>
<td>Waste generated</td>
<td></td>
<td>Is Ecoreport output</td>
</tr>
<tr>
<td>Performance and durability parameters</td>
<td>These parameters were dismissed during a prioritisation step in Chapter 6.3</td>
<td></td>
</tr>
<tr>
<td>Time of disassembly</td>
<td></td>
<td>Parameter is subject to standardisation mandate</td>
</tr>
<tr>
<td>Consumables needed</td>
<td></td>
<td>Is Ecoreport input</td>
</tr>
<tr>
<td><strong>Low relevance parameters</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight of product</td>
<td></td>
<td>Is Ecoreport input</td>
</tr>
<tr>
<td>Weight utility ratio</td>
<td></td>
<td>Is Ecoreport input</td>
</tr>
</tbody>
</table>

The conclusion of the BIOis2013 study mentions the need to further develop and align methodological and data gaps, such as the development of life cycle inventories and/or characterisation factors, and homogenising (harmonising) existing methods and tools used in the context of environmental product policy such as the PEF/OEF studies, Ecolabel/GPP studies and the MEERp for Ecodesign and Energy labelling. This conclusion overlaps with conclusions drawn in the context of the 2011 update of the ecodesign methodology (MEERp 2011) and the 2012 evaluation of the Ecodesign Directive by CSES.

**CONCLUDING:** The BIOis2013 study on material efficiency in MEERp gives a lot more resource (material) efficiency parameters to work within the context of ecodesign: covering various input-related parameters (taking into account product weight and composition) than the JRC 2012 parameters. In the end however, the study ruled out many parameters because of perceived difficulties for implementation. If certain barriers are overcome (development of methods, calculation factors, definitions) then the implementation of such parameters could be reconsidered.
A number of dismissed parameters however should be relatively easy to implement, as these can be directly linked to the calculation performed by the Ecoreport (that is part of the MEErP), such as:

- the weight of the product\textsuperscript{106} or even consumption of materials per functional unit or function of performance, including consumables;
- the amount of waste generated, including hazardous waste;
- the (sustainable) origin of materials – provided that agreement exists on how this should be defined, declared and verified. The problems are quite similar to declaring recycled content, which was considered relatively unproblematic and included in the 2013 update of MEErP;

\textsuperscript{106} This includes the ‘Weight utility ratio’ which focuses on the packaging.
ANNEX E: Minutes of 3rd SH meeting
Evaluation Energy Labelling and Ecodesign

Minutes of the Review of the Energy Labelling and Ecodesign Directives
Third Stakeholder Meeting – Day 1, 18 February 2014
Centre Borschette, Room 0A - Rue Froissart 36, 1040 Brussels

Potential scope expansion to non-energy related products and means of transport
João Fong (ISR – University of Coimbra)

Stamatis Divos (ECOS)
No need to rush to regulate these products but Green NGOs do not want an a priori exclusion. There are different stages suitable to address the need (or not) to cover these new products. It should be the role of the various stages of the work plan to assess if we want (or not) to regulate these products. So the revision should not exclude these possibilities to choose. For example, food products would be difficult (to test and implement) but other product groups such as shoes, detergent, furniture, etc. could be good candidates (even to assess embedded energy). The CSES study has addressed this, and the present report should refer to it in this part.

Hans Paul Siderius (Netherlands Enterprise Agency)
The current analysis is too narrow and I agree with ECOS that it is narrower than the CSES study. The current analytical framework is used to assess the feasibility of extending the scope whereas it is clear that this very methodology needs to be improved in order to cover non-energy related products. Given this analytical framework, the conclusion may be that there is no use to extend the scope. This is too short and the report should raise the issue as the CSES study did, i.e. paying attention to what instruments are needed to have good policies and measures on non-energy aspects (of course, not everything is to be solved by ED and ELD). Second route: what needs to be developed to achieve these goals. Both are missing in the current analysis/report and the result is too restrictive.

I fully agree with ECOS, we should not rush into a long list of products that could be covered by ED and ELD. We already have a lot of on energy aspects that need to be tackled in the products on our existing list (it would be better to further improve the current methodology)

Mitsubishi Electric Europe B.V.
B2B products: we don’t like the conclusion that they could be labelled, especially for highly customised products (such as escalators). The big appliances (e.g. air conditioners) are already covered by ED, so what would be the benefit of having a label (since the report say there is an untapped potential)?

João Fong (ISR University of Coimbra)
There already exist regulations including labelling in Germany or from ISO.

Laura Spengler (Oekopol GmbH, Germany)

Support ECOS and NL. 1) The methodologies are not a reason not to expand the scope, 2) I disagree with the report conclusion saying that as long as the methodology is not adapted, we can't extend the scope. There is time to improve the methodology.

Joao Fong (ISR University of Coimbra)

We are not saying the problem is the methodology but that, at this time, it would be difficult because we first need to improve the methodology. Also we say the scope could be extended.

Mike Walker (DEFRA, UK)

There is still a huge amount of untapped potential with energy related products but if we look at non-energy products, it will dilute our activity and what we are trying to achieve.

Carlos Lopes (Swedish Energy Agency)

The major impact is not only in the use phase (contrarily to what is said in the report). For these products, we need to develop the methodology with more data. It's a wrong signal to the Commission because resources should be put on developing methodologies. The issue is not so much the scope of this directive. We may want to use the same approach for non-energy related products, but it could be done within or outside the ED Directive.

Milena Presutto (ENEA, Italy)

Agreed with UK. There is a lack of added value and it is extremely premature to extend the scope of the Directive. My fear is that we lose the capability of the ECOREPORT tool by extending it. It's acceptable to open to non-energy related parameters for energy products but not to non-energy related products.

Laurent Zibell (IndustryAll European Trade Union)

We support certification and standardisation schemes because they shift competition from price to quality. Regarding the extension to B2B products, we should consider the number of homogeneous products produced; if they are customised, there is no need for a label, but if there are millions of products, there is no reason not to have labels.

Extending the scope is difficult to ensure value added across the chain but environment and social issues could be integrated as energy is. The way the products are manufactured is extremely important (working condition and environmental impact of product manufacturing are important).

Pernille Schiellerup (CLASP)

I congratulate the consultancy team, because a lot of elements are clearly communicated in the report. There is an amount of encouragement and an amount of “déjà vu” in the last 15 to 20 years.

When the report speaks of increasing the level of ambition: we know this is an effective set of instruments, however, the pace and the level of compliance should make us stop for a while and reflect on whether the framework is really delivering or whether now is a good moment to strategically think of issues that we are discussing for the last 20 years.
Resource Efficiency and the Ecodesign Directive

The team should more systematically look at the diagnosis and see that data quality and analysis come back very often, as well as the issue of evidence base – across the piece not just in the context of compliance or in the context of the preparatory study. We would have a better chance of solving the problem of lack of adequate data and analysis.

The team should also look at the issue of compliance more systematically: many studies have commented on what is needed to improve it – with long lists of recommendations, but now we need a strategic thinking on the acceptable level of compliance in Europe, link that to the level of monitoring and verification, think about who should do what. Think about the constraints we are aware of and propose a set of options for the future.

Hans Paul Siderius (Netherlands Enterprise Agency)

On B2B products: 1. The ‘difficulty’ of the product is not necessarily a reason not to label a B2B product. I have not seen a product for which ED requirement can be set and then it would be "too difficult" to have a label for (other reasons are possible not to have a label, but not the difficulty of the product). 2. Also in the B2B market labels can boost innovation and market transformation. Not all industrial buyers are experts on the products they buy. So we need to look on a case-by-case basis (but not exclude a priori). They are already in the scope (it is rather a discussion on the work plan and we could start with one or two, not immediately a lot of them).

Anne-Claire Rasselet (ORGALIME)

1. We would prefer focusing on the current scope of the directive. We are only half way through in the amount of products that are supposed to be labelled.
2. We need more evidence to justify the expansion to non-energy parameters.
3. Market surveillance would be more complex if the directive’s scope is expanded.

Ines Oehme – (Federal Environmental Energy - UBA, Germany)

For some products, it would be helpful to introduce an energy classification on the nameplate - as for the motors (i.e. it does not need to be a label).

Matteo Rambaldi, CECED (Domestic appliance industry)

1. On the scope, no problem for CECED but the Ecodesign is not adapted to products that don’t consume any energy because ED relies on LCC analysis, return on investment etc. – so there needs to be an expense, i.e. ED cannot cover non-energy related products.
2. With regards to the level of ambition: it would be very risky to go beyond the Least LCC point – this has been already discussed by stakeholders and agreed on the methodology. Now LLCC is criticised but it is logical that there is a phase out of products on the market before the date of the phase out. If industry is supportive of these tools it is because we had a winning deal – and the LLCC is a value that should not be changed. It would be a risk to change towards the Equal LCC (some consumers may never recuperate their investment). So be careful with being more ambitious.