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Strategies against obsolescence

Ensuring a minimum product lifetime and improving product service life as well as consumer information

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Summary

Products that are replaced before reaching an optimum lifespan or service life require more resources and result in greater amounts of waste. For some years now this phenomenon has been discussed under the term of “obsolescence”. The term obsolescence covers several reasons as to why a product is no longer in use:

- defects due to lack of performance of materials or components (material obsolescence),
- lack of interoperability of software and hardware (functional obsolescence),
- the desire for a new item despite the fact that the old one is still functional (psychological obsolescence), and
- refraining from carrying out repairs on grounds of cost, if the gap between the cost of repairing an item and the cost of a new item is too small (economic obsolescence).

The service lives of many electrical and electronic appliances, such as refrigerators, smartphones or television sets, are indeed getting ever shorter. This has been shown in a study commissioned by the German Environment Agency and conducted by the Öko-Institut e. V. and the University of Bonn (Prakash et al. 2016a), which investigated 13 product groups of electrical and electronic appliances. There are many reasons for premature new purchases. Especially in the area of consumer electronics and in information technology, technological leaps or the desire for a new device often trigger new purchases. At the same time, however, increasing numbers of appliances fail within the first five years of their service life – for example, the number of large household appliances being replaced within the first five years of their service life due to a defect increased from 3.5 % in 2004 to 8.3 % in 2013. A consumer survey conducted as part of the study which looked at the product groups of washing machines, television sets, notebooks, electric kettles, and handheld electric mixers showed that approximately one third of the interviewees were dissatisfied with the products’ lifetime. Given that with the current state of energy efficiency of new products, products with a long service life still are, in a significant majority of cases, more environmentally friendly and thus more resource-saving, as they avoid the additional manufacturing of new products.

Strategies against obsolescence must simultaneously address the issue in two main areas:

- strategies for achieving an assured minimum lifetime and an extension of product lifetime, and
- strategies for extending product service life on the part of the consumers.

With this position paper, the German Environment Agency presents its recommended actions. These are largely based on two studies commissioned by the German Environment Agency:

- a study by Prakash et al. (2016a) on the impact of the service life of products on their environmental impact (creation of an information basis and development of strategies against obsolescence) and
- a study by Schlacke et al. (2015) on strengthening sustainable product consumption through adaptations in civil and public law.

The core recommendations are as follows:

1. **Establishment of product standards with regard to minimum lifetime, potentially initially for product components as a first step:**
   The EU Ecodesign Directive (Directive 2009/125/EC) already offers a suitable regulatory framework for product-specific requirements in terms of the lifetime of energy-related products. When existing regulations are under review or new regulations are being passed, requirements for product lifetime or at least for the lifetime of components particularly prone to defects should be set out where appropriate and verifiable.

2. **Introduction of a disclosure requirement with regard to the availability of spare parts and repair services:**
   Consumers would be in a better position to assess the reparability of a product at purchase if they were given information on the period of time for which spare parts will continue to be available and on their cost. Therefore the German Environment Agency expressly supports the EU Commission's announcement in its Circular Economy Action Plan to explore the possibility of relevant horizontal requirements under the Ecodesign Directive.

3. **Introduction of a mandatory obligation to indicate a guaranteed lifespan (manufacturer's duty to issue a guarantee statement):**
   It should be made mandatory on manufacturers to indicate a guaranteed lifespan for their product (manufacturer's duty to issue a guarantee statement; German: Herstellergarantieaussagepflicht). This should include the possibility to indicate a "zero" period and to not offer guarantee cover. If a period greater than "zero" is indicated, this represents a material guarantee that is binding for the manufacturer.

4. **Improved framework conditions for repairs:**
   Available spare parts, repair instructions and diagnostic software should always be available also to independent repairers and repair initiatives as well as to re-use centres. The provisions in force with respect to motor vehicles (Regulation (EC) No 715/2007) set an example in this regard. The relevant provisions should also be applied to electrical and electronic appliances.

5. **Reduced value added tax for repair services:**
   The EU Directive on the common system of value added tax already makes limited provision for reduced VAT rates for locally provided, labour-intensive repair services (e.g. minor repair services for bicycles, shoes, clothing and household linen). The utilisation of the existing scope available to Germany under EU law would be a first step. Additionally, an examination of the possibility of extending reduced VAT rates to other repair services should be undertaken and introduced into the European-level discussions.

6. **Tax deductibility of repairs outside the household**
   In future, labour costs for the repair of household goods should be tax-deductible in the same way as household services within the framework of income tax, even if the repair takes place outside the household.

7. **Strengthening product appreciation:**
   Measures and initiatives contributing to extended product service lives, continued use and joint use of products should be afforded greater support. This includes i.a. structural funding for such initiatives, for example as part of the implementation of the German "National Programme for Sustainable Consumption" adopted by the German government in February 2016. Measures to promote re-use should be strengthened as part of the advancement of the circular economy (implementation and update of the waste prevention program and legal foundation).

Overview of Recommended Actions

Measure	Instrument	Options for implementation	Specific to product groups / horizontal	Actors addressed	See Chapter
Achieving an assured minimum product lifetime					
Standardisation	Development of testing standards	Mandate M/543 Ecodesign Directive (energy-related products)	Horizontal and, subsequently, specific to product groups	European standardisation organisations CEN and CENELEC	2.1.2
UBA Core Recommendation: Minimum requirements	Establishment of product standards with regard to minimum lifetime, potentially initially for product components as a first step	Ecodesign Directive (energy-related products) Also possible by statutory ordinance based on section 8 of the German Product Safety Act (ProdSG) in conjunction with standardisation	Specific to product groups	Legislator, also manufacturers	2.1.3 2.3.2
Improving consumer information					
Information on lifespan (with consideration being given to limitations with regard to verifiability for the more long-lived products)	Mandatory obligation to indicate the lifespan based on established standards insofar as it is practicable for market surveillance authorities to verify compliance	Ecodesign Directive or Energy Labelling Directive (energy-related products)	Specific to product groups	Legislator, also manufacturers	2.2.1
Declaration of specific usage and maintenance requirements	Horizontal information requirement under the Ecodesign Directive with regard to the lifespan of wearing parts, safety functions, and restrictions on usage	Ecodesign Directive	Specific to product groups or horizontal	Legislator, also manufacturers	2.2.2
UBA Core Recommendation: Information on spare parts and repair services	Mandatory information on the availability of spare parts and repair services	Could be implemented for energy-related products by means of horizontal regulation under the Ecodesign Directive	Horizontal	Legislator, also manufacturers	2.2.3
Horizontal legislation					
UBA Core Recommendation: Information on guaranteed lifespan	Manufacturer's duty to issue a guarantee statement	Preferably as part of Article 6 of the Consumer Sales Directive; if implemented on a national basis (permissible): addition of a subsec. 3 to section 443 German Civil Code (BGB) Additionally, if necessary, information on the availability of spare parts and repair services; for energy-related products this could also be implemented by means of a horizontal regulation under the Ecodesign Directive	Horizontal	Legislator, also manufacturers	2.3.1
Establishment of standards through the German Product Safety Act (ProdSG)	Establishment of product standards with regard to lifespan in conjunction with standardisation		Horizontal and specific to product groups	Legislator, also manufacturers	2.3.2
Improved enforcement of product requirements	Extension of legal standing with regard to provisions on consumer protection	Extension of German Act on Prohibitory Injunctions (Unterlassungsklagengesetz, UKlaG)	Horizontal	Legislator, also environmental organisations	2.3.3

Measure	Instrument	Options for implementation	Specific to product groups / horizontal	Actors addressed	See Chapter
Improving reparability					
Reparability, minimum requirements	Minimum requirements for the reparability of products (information on availability of spare parts see Chapter 2.2.3)	Ecodesign Directive (energy-related products)	Specific to product groups	Legislator, also manufacturers	2.4.1
UBA Core Recommendation Improved framework conditions for repairs	Ensure access by independent repairers and re-use centres to spare parts, repair instructions, tools, and diagnostic tools, e.g. by transferring the relevant provisions as part of Reg. (EC) No. 715/2007	Ecodesign Directive or a repairs directive to be established	Horizontal for electric and electronic appliances	Legislator, also manufacturers	2.4.2
Mandatory stocking of spare parts for a specified period	Research needs				2.4.3
Information on reparability	Classifying evaluation and indication of reparability	Ecolabel, Ecodesign Directive, Energy Labelling Directive	Specific to product groups or horizontal	Research / standardisation, also legislator and manufacturers	2.4.4
UBA Core Recommendation: Incentivising repairs by lowering cost of repairs	Reducing the VAT rate for repair services Tax deductibility of repairs outside the household			Legislator	2.4.5 2.4.6
Extending product service life					
Making full use of the products' technical lifespan in practice	Innovative service models		Product-specific	Manufacturers	2.5.1
UBA Core Recommendation: Promote re-use	Establishment of viable cooperations between municipalities and the social economy sector, establishment of professional structures and working methods	Federal waste avoidance programme with participation from the regional states (Länder)	Horizontal	Policy arena / re-use centres / municipalities / public bodies responsible for waste management (so called "öffentlich-rechtliche Entsorgungsträger" (örE))	2.5.2
UBA Core Recommendation: Strengthening product appreciation	Support for social innovations, German Federal Ecodesign Award; Ecodesign Kit	National Programme for Sustainable Consumption	Horizontal	Policy arena / designers / consumers	2.5.3
Exploring strategies to combat functional obsolescence					
Exploring strategies to combat functional obsolescence	Research needs				2.6

Abbreviations

AEPL	Average Expected Product Lifetime
BGB	Bürgerliches Gesetzbuch (German Civil Code)
CEN	Comité Européen de Normalisation (European Committee for Standardization)
CENELEC	Comité Européen de Normalisation Électrotechnique (European Committee for Electrotechnical Standardization)
FKZ	Forschungskennzahl (research project code)
MTTF	Mean Time To Failure
OJ	Official Journal of the European Union
ONR	ON-Regel (ON-Rule)
ProdSG	Produktsicherheitsgesetz (Product Safety Act)
StiWa	Stiftung Warentest (a German consumer organisation engaged in investigating and comparing goods and services)
UBA	Umweltbundesamt (German Environment Agency)
UFOPLAN	Umweltforschungsplan (Environmental Research Plan)
UKlaG	Unterlassungsklagengesetz (German Act on Prohibitory Injunctions)
UWG	Gesetz gegen den unlauteren Wettbewerb (German Act against Unfair Competition)

1. Context

Not only the quantity of products used in private households, and electrical and electronic appliances in particular, has increased in recent years, but apparently there have also been changes in both our consumer behaviour and in the range of product quality available. Products that are replaced and/or discarded before reaching an optimum lifespan or service life require more resources and result in greater amounts of waste. For some years now this phenomenon has been discussed under the term of "obsolescence". The term obsolescence covers several reasons as to why a product is no longer in use:

- defects due to lack of performance of materials or components (material obsolescence),
- lack of interoperability of software and hardware (functional obsolescence);
- the desire for a new item despite the fact that the old one is still functional (psychological obsolescence), and
- refraining from carrying out repairs on grounds of cost, if the gap between the cost of repairing an item and the cost of a new item is too small (economic obsolescence).

Analyses commissioned by the German Environment Agency of trends in the lifespan and service life for electrical and electronic appliances in 13 different product groups (Prakash et al. 2016a) have confirmed that the first useful service life of a range of product groups examined has declined in recent years (e.g. TV sets or large household appliances such as washing machines, dishwashers, freezers and refrigerators).

The researchers found that an increasing amount of electrical and electronic appliances are being replaced despite the fact that they are still in good working order. Technological leaps are often a trigger for new purchases, for example in the case of TV sets. Even in the case of large household appliances, one third of the appliances were still fully functional when they were replaced, with the desire for a better appliance being the primary reason for a new purchase.

At the same time the number of large household appliances being replaced within the first five years of their service life due to a defect increased from 3.5 % in 2004 to 8.3 % in 2012.

An online consumer survey conducted by the researchers covering the product groups of washing machines, TV sets, notebooks, electric kettles and handheld electric mixers showed that approximately one third of the interviewees were dissatisfied with the products' lifespans. An average of 11 % of the interviewees indicated that the product's lifetime was far too short and 19 % of interviewees had expected the products to have a longer useful life.

It is clear that with the current state of energy efficiency of new products, products with a long service life are, in a significant majority of cases, more environmentally friendly and more resource-saving, given that they avoid the additional manufacturing of new products. For washing machines, for example, the embodied energy and greenhouse gas emissions associated with a machine with a five year service life are 40 % higher than those for a machine used for twenty years[1] (Prakash et al. 2016a).

However, for this result to be meaningful it is crucial that the long-lived product is indeed being used for a longer period. Generally, higher quality materials are used in the manufacture of products designed to have a long service life and spare parts must be manufactured and kept available for several years. Moreover, such products must undergo endurance tests and other assessments that are more cost intensive and time-consuming. If products designed for a long service life are being replaced prematurely, this may result in adverse environmental impacts. Strategies against obsolescence must therefore simultaneously address the issue in two main areas:

- strategies for achieving an assured minimum lifetime and extension of product lifetime, and
- strategies for extending product service life on the part of the consumers.

Therefore the strategies recommended here place a duty on the manufacturers to increase transparency with regard to the anticipated product lifetime. In addition, politicians are called upon to impose minimum durability and minimum quality requirements on products, parts and components, and to improve the framework conditions for repairs. However, it is also down to the consumers to use products for as long as possible for the benefit of the environment and resource conservation. The implementation of strategies against obsolescence is a task for society at large to be tackled by way of collaborations between the policy arena, manufacturers, the scientific community and consumers, with a view to developing a culture of sustainable product design and use.

The recommended actions set out below are largely based on two studies commissioned by the German Environment Agency (UBA):

- a study by Prakash et al. (2016a) on the impact of the service life of products on their environmental impact (creation of an information basis and development of strategies against obsolescence) which proposes strategies with a focus on electrical and electronic appliances, and
- a study by Schlacke et al. (2015) on strengthening sustainable product consumption through adaptations in civil and public law, which developed overarching legal instruments.

Where a particular measure is only suited to specific product ranges this will be noted in the text.

2. Recommended actions

In light of the findings by Prakash et al. (2016a), for reasons of environmental protection and resource conservation the German Environment Agency considers necessary the introduction of measures to assure minimum product lifetimes or component qualities. The analysis on economic obsolescence has shown that the cost of repairs (cost of spare parts and labour) compared to the cost of new products does indeed in many situations lower the willingness to repair items and results, or may result, in the end of a product's service life. Considering this background, the first priority must be a reliable minimum product lifetime during which repairs will not or will only very rarely be necessary (see Chapter 2.1).

Moreover, there is a need to lowering barriers to repairs being carried out. This is not only taken to mean the technical feasibility of repairing an item (product reparability) but also the availability of repair services, the information required to carry out repairs including diagnostic software tools, as well as the provision of affordable spare parts for adequate periods of time. The increasing complexity of modern products and remote-controlled software-based error diagnostics are a great challenge for independent repairers. Therefore, there is a need to improve the framework conditions for independent repair services (see Chapter 2.4).

Other important instruments include measures to improve consumer information (e.g. on the availability of spare parts or unambiguous declarations of wearing parts) with a view to supporting decisions by consumers to purchase products with longer lifespans (see Chapter 2.2).

Moreover, this report includes recommendations for legal provisions, and horizontal provisions in particular (see Chapter 2.3). The legislation in force already contains provisions addressing product lifespans, but only insufficiently and selectively so. A manufacturers' duty to declare and commit to a self-determined guaranteed product lifespan (duty to issue a guarantee statement) would be expedient. Product safety legislation could also aid the implementation of environmental standards. The establishment of product standards (e.g. with respect to product lifespan) under the German Product Safety Act (ProdSG) would be conceivable. An extension of legal standing with regard to provisions on consumer protection to environmental organisations would appear useful with a view to improvements in the enforcement of product requirements.

However, in order to achieve extended product lifetimes and service lives, consumers must also make their contribution by using products for as long as possible, by repairing (e.g. in repair cafés) items or getting them repaired, or by passing items they no longer use on to other users (e.g. in swap shops) (see Chapter 2.5).

These recommendations will be further expanded upon below. Recommendations considered by the German Environment Agency as being particularly promising are highlighted as "UBA Core Recommendations" in the chapter headers.

2.1 Achieving an assured minimum product lifetime

Consumers must be able to rely on a certain minimum product lifetime during which repairs will not or will only very rarely be necessary. Minimum requirements for product lifespans are suited to achieving this aim.

2.1.1 Basic principles governing product lifetime

Product lifetime is generally a predictable quantity. However, it is important to differentiate between the different processes used to determine a product's lifetime.

The bathtub curve is widely used to describe product failure rates:

- Early failures occur in the early life of a product and are mostly due to manufacturing faults. Frequent early failures indicate insufficient quality control.

- Random failures occur during the product's characteristic service life and are attributed to faulty maintenance, maloperation or critical unplanned stresses. Electronic components in particular may fail, for example, due to overheating.

- Wear-out failures occur in the late life of a product and are attributed to material ageing and material fatigue (also see Prakash et al. 2016a, p. 72/73).

The more manufacturers design products for critical applications and the more they test externally supplied components, manufacturing processes and, where possible, also the finished products as part of their quality assurance, the more likely they will be able to eliminate or minimise the occurrence of early and random failures.

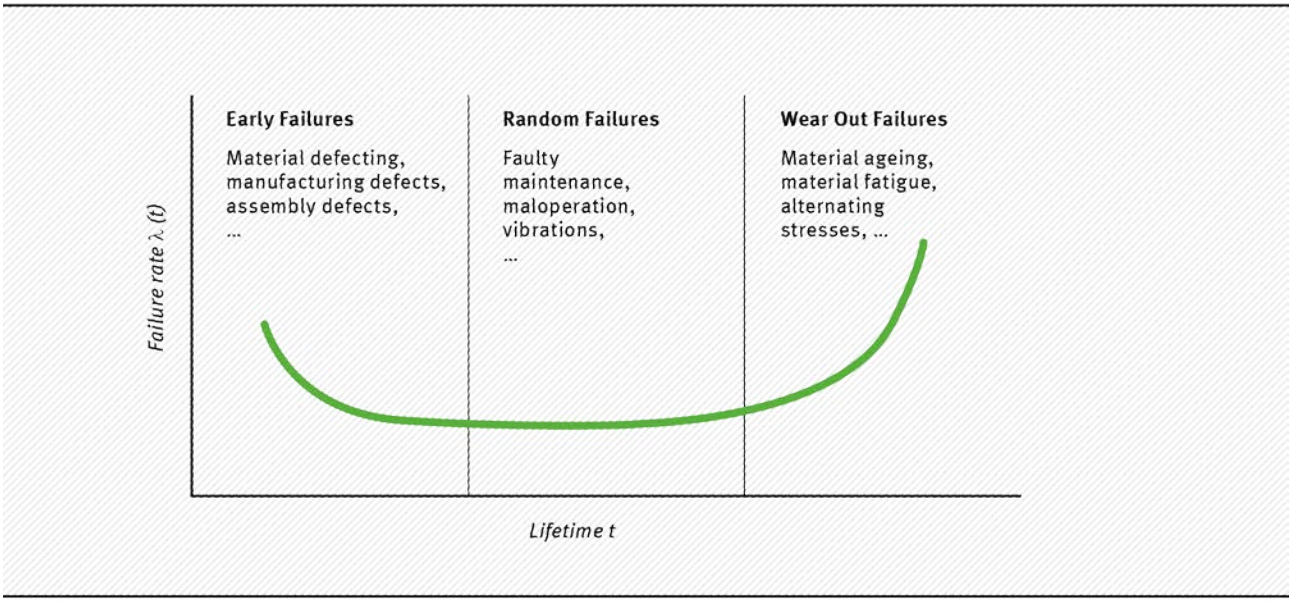
It is customary to forecast a product's Mean Time To Failure (MTTF), also termed "average expected product lifetime" (AEPL). The MTTF, for example, is used as part of conformity assessments for the safety of machinery (under EN ISO 13849-1). It is however a statistical metric/indicator determined by means of trials or statistical empirical values for component failure. It is not a factually guaranteed minimum lifetime or a timespan of guaranteed failure-free operation.

The latter can mostly only be determined or guaranteed by means of product testing. For products of low usage intensity, endurance tests are feasible and are used, for example, in product tests conducted by the Stiftung Warentest consumer organisation or are a component of the requirements that need to be met for a product to be awarded an eco-label. For example, a hairdryer must pass a 400-hour endurance test to be awarded the German Blue Angel (Der Blaue Engel) eco-label. For some products it is necessary to conduct a range of different tests in order to be able to make statements as to their lifespan and durability. For vacuum cleaners, for example, these include the lifespan of the motor, the impact resistance of the nozzle, the minimum durability of the hose with repeated bending, and the ability to withstand the impact of slamming into door sills and jambs.

For more long-lived electric appliances (greater than 10 years) with high usage frequency (e.g. TV sets: 4 hours per day) or appliances in continuous operation (such as refrigerators and freezers), lifetime test procedures for end products are often at the limit of feasibility, especially with regard to the duration of endurance testing. For example, endurance testing for a TV set for a ten-year service life with four hours of operation time per day would take more than 1.5 years. Similarly, at the end of the 1990s the European standardisation organisation CENELEC rejected the proposal to standardise the lifetime test procedures for washing machines, arguing that the procedure would be too time-consuming and cost-intensive. The Stiftung Warentest conducts such tests as part of their product tests. Assuming an average of 184 wash cycles per year, the organisation completes 1840 wash cycles representing a ten-year lifespan, which takes approximately nine months of testing at a correspondingly high cost.

Figure 1:

Bathtub curve of failure rate (Weibull distribution)



Source: Prakash et al. 2016a, p. 73

2.1.2 Development of measuring standards

In order to set minimum requirements and check for compliance, appropriate (measuring) standards are needed. Some standards already exist for components of electrical and electronic devices. Safety standards for household appliances for example contain requirements and tests for the quality and durability of individual components; these do however focus mostly on safety (with a view to avoiding hazardous situations) and less so on the appliances' functionality. Lifetime-related tests for the entire product are often lacking. This is an area where action is needed. We are expecting significant advancements in this regard as a result of the standardisation mandate M/543[2] on material efficiency aspects for energy-related products[3], which has been adopted in December 2015. The deadline for the implementation of the mandate is March 2019. Even though the mandate addresses horizontal (not product-specific) standards, it can reasonably be expected to generate momentum for and implementations of specific product standards.

For energy-related products where lifetime testing of the final product is not feasible, lifetime or quality tests for components are an important step forward. Therefore it is advisable that existing safety standards and standards at the component level be analysed and adapted, as required, with a view to their suitability for lifetime and durability testing. To this end, the focus could initially be restricted to components and parts known to be prone to defects and wear.

In the development of standards it is important to take into consideration the constraints of real-life usage and possibly also of critical operating conditions. These include, for example, thermal peak loads or peaks in supply voltage.

Standards and tests for the usability of non-energy-related products are also already in existence. These include, for example, tests for abrasion resistance of home fabrics such as upholstery fabrics or tests for the wipe-resistance of paints.

2.1.3 UBA Core Recommendation: Establishment of minimum requirements

The Ecodesign Directive[4] already offers a suitable legal framework for laying down product-specific requirements for the lifetime of energy-related products. Initial requirements have been established, for example, for the operational motor lifetime of vacuum cleaners[5].

With its action plan for the circular economy[6] the EU Commission announced that it will promote, amongst other aspects, the reparability, upgradability and durability of products and develop, as appropriate, product requirements in its future work under the Ecodesign Directive. The German Federal Government should actively support these processes to ensure that such requirements will be integrated in all existing and future product group-specific implementation measures. When establishing minimum requirements under the Ecodesign Directive, it is important to ensure verifiability (reproducibility and testing effort) so as to enable market surveillance authorities to verify compliance with such requirements.

As was shown in Chapter 2.1.1, the testing duration, in particular, for more durable products can be a limiting factor. Therefore it will probably not be possible to introduce requirements for the lifetime of final products into all existing implementation measures. In such cases, minimum requirements for the quality or lifetime of particularly important or susceptible components or design requirements improving reparability can be important steps forward. Using the example of refrigerators and ovens, Boulos et al. (2015) have shown that this approach may be less costly and time-consuming than the development of entirely new standards at the level of the final product.

However, the Ecodesign Directive affects only those energy-related products for which concrete requirements have been set out in product-specific implementation measures. For all products that are responsible for significant proportion of energy consumption, regulations already exist or the rulemaking procedure is in progress[7].

Therefore, lifetime should be considered as an important aspect when regulations are adopted or reviewed. However, it will probably not be possible that product-specific implementation measures will be adopted for all energy-related products, especially for smaller devices, or to integrate lifetime requirements for final products into existing implementation measures as outlined above. Moreover, the scope of the Ecodesign Directive is currently limited to energy-related products. Complementary measures such as the manufacturer's duty to issue a guarantee

statement, as described in Chapter 2.3.1, could mitigate these limitations as well as the constraints in terms of verifiability described earlier.

2.2 Improving consumer information

Lifetime is one of several planning parameters taken into account in the process of designing and manufacturing components and parts of appliances. Since consumers do not have access to the underlying data, this lack in transparency results in consumers not being able to make purchasing decisions based on their own needs (asymmetric information). Therefore measures to improve consumer information are important instruments that allow consumers to make purchasing decisions in favour of long-lived products. However, it must be feasible for the market surveillance authorities of the federal states (Länder) to verify compliance with such information requirements. Therefore, the rather more long-lived products in particular are subject to the same restrictions with regard to verifiability as those described in Chapter 2.1.1 with regard to minimum lifetime. Based on current knowledge, the options for action outlined in Chapters 2.2.1 and 2.2.2. can only favourably be applied to specific individual product groups.

2.2.1 Disclosure of product lifetime

The Ecodesign Directive provides for certain information requirements, for example on the lifetime of lamps[8] or the number of charging cycles that the batteries of notebook computers can withstand[9]. Product lifetime testing for final products will only be possible with justifiable time expenditure for a proportion of energy related products, for which it will also be possible to introduce product-specific information requirements, (e.g. under the Ecodesign Directive or the Energy Labelling Directive[10]). In certain cases, information requirements for components can be expedient (e.g. information on the lifetime of a motor or the number of charging cycles a battery can withstand).

Product endurance tests regularly conducted by independent testing institutes, such as for example the Stiftung Warentest, also contribute to improved market transparency. For example, the tests conducted by the Stiftung Warentest have significantly contributed to establishing and maintaining a de facto minimum lifetime of ten years for washing machines with average usage – at least for brand-name washing machines in Germany (Prakash et. al 2016a).

2.2.2 Declaration of specific usage and maintenance requirements

Predetermined breaking points, in the sense of safety functions or known maximum service lives or capacities of wearing parts (e.g. the capacity of ink sponges in inkjet printers[11]) should be clearly evident to the end consumer, as should be the conditions under which the predetermined breaking points or wearing parts fail as well as the intervals (usage periods, usage cycles, or threshold values) at which maintenance should be performed. This also includes information on constraints on usage, such as for example the short-term operation of handheld electric mixers. Such information must be evident to the consumer at the time of purchase. For energy-related products, implementation measures under the Ecodesign Directive would be well-suited to effecting such information requirements.

2.2.3 UBA Core Recommendation: Information on spare parts and repair services

Consumers would be in a better position to assess the reparability of a product at purchase if they were given information on which spare parts will be available for which period of time and at which cost. Therefore the German Environment Agency expressly supports the EU Commission's announcement in its Circular Economy Action Plan to explore the possibility of relevant horizontal requirements under the Ecodesign Directive.

2.3 Duty to issue a guarantee statement and other legal instruments

In addition to the measures proposed in the previous two chapters, the German Environment Agency considers necessary additional, and in part overarching, legal instruments.

As part of the debate on obsolescence there are currently discussions on a potential extension of the statutory warranty period (beyond a two-year period), possibly in combination with an extension of the period for the reversal of the burden of proof (beyond a six-month period[12]). Adjustments to the statutory warranty period and the period for the reversal of the burden of proof are generally legally permissible. However, there are limitations and therefore there are certain doubts as to whether the warranty legislation is indeed suited to sufficiently addressing premature product failure[13].

Warranty legislation affects the relationship between buyer and seller. However, it is the manufacturer who has a direct impact on product characteristics such as the product's lifetime. Moreover, statutory warranty only covers defects that were present when the goods changed hands; it does not cover subsequent wear and tear. It is the view of the German Environment Agency that it would be more expedient to address the manufacturer and to build on guarantees that are independent of the presence of a defect at the time of the transfer of the products.

2.3.1 UBA Core Recommendation: Manufacturer's duty to issue a guarantee statement

The German Environment Agency recommends the introduction of a "duty to issue a guarantee statement" (German: Herstellergarantieaussagepflicht). This instrument was developed as part of a study commissioned by the German Environment Agency and conducted by Schlacke et al. (2015) on strengthening sustainable product consumption through adaptations in civil and public law.

The "duty to issue a guarantee statement" is designed to make it mandatory on manufacturers to indicate a guaranteed lifespan for their product. This should include the possibility to make a so-called "zero statement", i.e. to indicate a "zero" period and to not offer guarantee cover. In this case there would be a mere duty of disclosure which would be associated with an adverse impact. If a period greater than "zero" is indicated, this represents a material guarantee that is binding for the manufacturer. If the product's lifetime falls short of the stated period, the buyer has the right to demand reparation under the warranty (e.g. reimbursement of the sales price, replacement of the item, or repair).

Minimum standards for the nature and detailed design of the "duty to issue a guarantee statement" would need to be set out in law. The instrument should preferably be established at the European level where it could be linked to the Consumer Sales Directive[14] which in its Article 6 establishes minimum requirements for guarantees set out in consumer contracts. This Directive only sets out minimum standards. In accordance with Article 8 (2) Member States may adopt more stringent provisions, i.e. national provisions could be introduced, in which case we propose the addition of a subsec. 3 to section 443 German Civil Code (BGB).

This instrument is designed in an open manner. The manufacturers are free to decide on the exact duration of the guarantee period; it is not envisaged that there be provisions on minimum lifetimes. The manufacturer's declaration would provide consumers with a better basis for making purchasing decisions. While the warranty under sales law governs the relationship between seller and buyer, this instrument would allow for claims to be made directly against the manufacturer, thus holding liable those that are responsible for the product constitution. The fact that the product would be guaranteed to be free of defects not only at the time of purchase but for the entire warranty period is another advantage.

2.3.2 Standard-setting by means of the Product Safety Act

For products that are not already covered by a regulation implementing the Ecodesign Directive, the establishment of environmental standards under the German Product Safety Act[15] (ProdSG) could be considered. The ProdSG has thus far focused on safety and health. However, section 8 ProdSG offers the opportunity to establish statutory product requirements for the purposes of environmental protection (e.g. requirements with regard to product lifetimes). Such statutory ordinances could refer to standards established by private standardisation institutes where concrete examples already exist (e.g. requirements for the service life and durability of components and parts of electrical household appliances).

This instrument could be used to establish material product standards. Additionally, such product standards would be conformant with the term of "usual quality" of section 434 subsec. 1, s. 2, no. 2 German Civil Code (BGB). Non-compliance with a product standard would constitute a defect within the meaning of section 434 BGB with the resultant rights to warranty (e.g. repair, replacement), which are however limited to a period of two years at present.

As under the Ecodesign Directive (see Chapter 2.1.3), standard-setting under the ProdSG would be a lengthy process and conceivable only in specific instances. It does however offer a significant potential to draw on the already existing specifications contained in technical standards which in part already specify sustainability related product requirements. Moreover, this approach would allow for the utilisation of the expertise held within the standardisation organisations.

2.3.3 Extension of legal standing of civil associations

In order to ensure the effective enforcement of product requirements, we recommend that legal standing with regard to provisions on consumer protection according to the German Act against Unfair Competition (Gesetz gegen den unlauteren Wettbewerb, UWG)[16] and the German Act on Prohibitory Injunctions (Unterlassungsklagengesetz, UKlaG)[17] be extended to the compliance with the information obligations mentioned in 2.2 and the guarantee statement mentioned in 2.3.1. Environmental organisations, especially those that are recognised under section 3 of the Environmental Appeals Act (Umwelt-Rechtsbehelfsgesetz)[18], should be encouraged and supported to be included within the list of qualified entities under section 4 of the UKlaG, that entitles them also to remedies under section 8 subsec. 3 no. 3 UWG.

The extension of legal standing of civil associations provides for the judicial enforcement of the instruments proposed. Consumers often shy away from individually asserting their rights because they have suffered only minor damage or because of the risk of litigation. The proposed instrument would widen the circle of those who have legal standing and contribute to establishing an additional supervisory entity for monitoring compliance with product lifetime requirements. Moreover, it would facilitate the integration of the rights of consumer and environmental organisations respectively, which is necessary for achieving sustainable consumption as a cross-sectional task.

2.4 Improving reparability

The repair of a product during its period of use, e.g. by replacing failed components or even just a single wear part, avoids the entire product turning into waste. This contributes, in particular, to the intensive utilisation of environmental resources used in manufacturing the product and to reductions in the quantity of resources used per service unit. Moreover, the expansion of repair offers can make relevant contributions to job creation and may also encourage a stronger bond between owner and product. The repair services sector has seen major structural change in recent years. There has been a significant decline in product repair service offers on the part of specialist dealers and professional craftsmen, i.e. the "classic" repair entities, and the major manufacturers' service offers are focussed on fewer and fewer centralised maintenance centres. At the same time, however, self-organised repair initiatives are springing up in more and more locations, and specialised internet-based fora for information exchange are being established (Jepsen & Rödig 2015).

Therefore, support for and the expansion of repair offers are key activities as part of the "Federal waste avoidance programme with participation from the federal states (Länder)".

2.4.1 Establishment of requirements for the reparability of products and information on the availability of spare parts

Reparability in the sense of access to and replaceability of defect components or components susceptible to wear (e.g. rechargeable batteries) should be examined by product group under the Ecodesign Directive and should be made subject to regulation, as appropriate. In addition to other product information, consumers should have available prior to or at the time of making a purchasing decision information on the availability and cost of spare parts and repair services so as to enable them to select products appropriate to their needs (see Chapter 2.2).

2.4.2 UBA Core Recommendation: Improved framework conditions for independent repairers and repair initiatives

The framework conditions for independent repairers should also be improved. Specifically, available spare parts, basic repair instructions and tools should always also be available to distributors of spare parts, repair facilities and re-use centres. The provisions in

force with respect to motor vehicles (Regulation (EC) No 715/2007[19,20]) set an example in this regard. It is customary in the motor vehicle sector to make available diagnostic tools and detailed repair information for a nominal fee. The relevant provisions should also be applied to electrical and electronic appliances. However, there is a need to examine in detail whether there may be a need for restrictions in this regard to be placed on certain product categories. This measure could be implemented under the Ecodesign Directive or under a yet to be developed Directive on the repair of electrical and electronic equipment.

Additionally, a significant number of repair initiatives have been established based on civil society engagement. For reasons of cost it is likely that repairs of appliances in certain product groups will only be carried out if the consumers themselves are able to do so (e.g. changing a smartphone display), which also necessitates access to repair instructions and spare parts.

2.4.3 Mandatory stocking of spare parts

While motor vehicles, for example, are goods with a high purchase price, where from the economic point of view it is usually worthwhile for the owner to effect repairs during the normal service life, the situation is very different when it comes to electrical and electronic appliances. The high cost of spare parts and labour vis-à-vis the decreasing prices for new products often lower the willingness on both sides to effect repairs. From time to time there are products, especially those with a low purchase price, for which no spare parts are available at all. The measure described in Chapter 2.4.2 refers to cases in which manufacturers make spare parts available to their own repair services. Additionally, the question should be examined as to whether there should be an obligation to keep spare parts available for a certain period of time for certain product groups or products retailing above a certain price. This will require, in particular, studies on the monetary cost and socio-economic impact of such provisions, and on the possibility to enforce such provisions for products imported into the European Single Market.

2.4.4 Introduction of an assessment and communication of the reparability of electrical and electronic equipment

The German Environment Agency will examine the introduction of an assessment and communication of the reparability of electrical and electronic equipment (based for example on the ONR 192102[21] standard issued by the Austrian Standardisation Institute or on the iFixit scorecard system) into product policy instruments (such as eco-labels, the Energy Labelling Directive, or information requirements under the Ecodesign Directive). The ONR 192102 standard was developed with a view to household appliances and consumer electronics (white goods and brown goods). It contains minimum criteria and assessment criteria, particularly with regard to the ease of effecting repairs. Points are awarded for assessment criteria that have been met and, provided that the minimum criteria have also been met, these points result in a "good", "very good" or "excellent" score. iFixit is a Californian company with representation in Germany and which also offers German language information. The company developed its "iFixit scorecard" specifically for information and communication technology equipment, such as smartphones, tablets and computers. This is also a points-based system with a maximum score of 100. Following the completion of the assessment, the point score is divided by ten and rounded to an integer, resulting in a score on a scale ranging from 0 to 10.

Such information enables consumers to choose devices in accordance with their needs. Moreover, such information also raises the general awareness of repair options, which – insofar as they are available – will then be availed of more frequently.

The "Standardisation Request M/543 to the European Standardisation Organisations as Regards Ecodesign Requirements on Material Efficiency Aspects for Energy-related Products in Support of the Implementation of Directive 2009/125/EC of the European Parliament and of the Council" also covers the aspect of the ability to access or remove certain components, consumables or assemblies from products to facilitate repair or remanufacture or re-use. The German Environment Agency will assist the implementation of the standardisation mandate and examine in how far suitable standards in this regard are being developed and whether these are suited to serve as minimum requirements or information requirements.

2.4.5 UBA Core Recommendation: Reduced VAT rate for repair services

Repairs are relatively expensive compared to the price of new products. Lowered repair costs could therefore provide an incentive for repairs to be carried out. The VAT rate represents a potential point of intervention. A reduced VAT rate for repair services can contribute to lowering the cost of repairs. The EU Directive on the value-added tax system[22] already makes limited provision for this in respect of locally provided labour-intensive repair services (minor repair services for bicycles, shoes, leather goods, clothing and household linen including mending and alterations). The utilisation of the existing scope available to Germany under EU law would be a first step. Additionally, an examination of the possibility of extending reduced VAT rates to other repair services should be undertaken and introduced into the European-level discussions.

2.4.6 Tax deductibility of repairs outside the household

In order to promote repair, it is necessary to balance the unfavourable price relationship between labour-intensive repair work and the purchase of new products, which are often produced in automated manufacturing or low-wage countries. In addition to VAT (see above), income tax is also a suitable instrument for this purpose. Labour costs for the repair of household items (including large electrical appliances) can already be claimed as craftsmen's services within the frame of tax relief according to § 35a paragraph 3 Income Tax Act[23] (EStG). In the future, labour costs for repairs carried out outside the household should also be tax-deductible in the context of income tax. This requires an extension of § 35a EStG. For this purpose, a catalogue of household goods should be drawn up (particularly including electrical and electronic equipment), for which labour costs of repair can be taken into account within the tax return.

2.5 Strategies for extending product service life

In addition to the strategies for extending product lifetimes or achieving assured minimum lifetimes (see previous sections), measures and models designed to prolong the service life of products are also relevant, given that from an environmental point of view, in the worst cases, the more long-lived products could be unfavourable if their technically possible lifespan is not being exhausted in real life, for example for reasons of functional or psychological obsolescence.

Wieser & Tröger (2015, p. 75) described a downward spiral of consumer expectations with regard to product lifetime as follows: *A vicious circle arises in the interaction of consumers and manufacturers: the consumers' bad experiences when it comes to product lifetime reinforce their suspicion that "planned obsolescence" is a real thing and thus diminish the consumers' trust as well as their willingness to spend more money on a long-lived product or to have an item repaired. Moreover, advertising and rapid product development cycles impact social standards and leads consumers to feel that they are old-fashioned and lagging behind technological developments. At the same time, the low demand for long-lived products in turn reinforces the producers' sentiment that consumers always want the latest product, which results in the manufacture of products with even shorter lifespans. This interaction thus results in a continuous and worrying downward spiral of consumer expectations with regard to lifetime and producer expectations with regard to service life, which finds expression in ever faster cycles of replacement purchases. (translation by UBA)*

2.5.1 Innovative service models

Innovative service models offered by manufacturers (e.g. leasing, rental, after-care) can contribute to achieving that the technical life of a product is fully exhausted in practice (e.g. by means of refurbishing and renewed placing on the market for lease or hire, guaranteed repairs by the manufacturer or improved alignment between software and hardware solutions). Moreover, the service models listed above offer the potential to positively impact the market for longer-lived and higher quality products.

2.5.2 UBA Core Recommendation: Re-use

Municipal and social enterprises for the re-use of products also significantly contribute to prolonging

product service lives and thus to waste avoidance, which is why such enterprises are being addressed as part of the National Waste Avoidance Programme. The results of the waste avoidance dialogues under the heading of "Fostering re-use"[24] – as part of a current research project assessing the implementation of the waste avoidance programme and developing suitable communications strategies and recommended actions[25] – highlight the need for creating appropriate technical, economic and organisational framework conditions to strengthen this area. In particular, there is a need for the creation of viable cooperations between the municipalities and the social economy with a view to establishing professional structures and working methods as well as access to requisite repair information and affordable spare parts. The creation of a professional market for used appliances necessitates the availability of sufficient numbers of appliances for resale. The Federal Government, the federal states (Länder) and the municipalities should create framework conditions allowing to provide their own devices for reuse in case they should no longer need them. This could be achieved by means of recommendations or administrative orders stipulating that purchased appliances that are no longer being used but that are still functional are to be passed on to re-use centres. Moreover, it is necessary for the used appliances to be refurbished/repaired to a high quality standard so as to allow for the users of re-used products to be given a promise of quality. Work on a cooperation and umbrella branding strategy for this area is currently underway as part of a project on re-use and repair centres in Germany ("Wiederverwendungs- und Reparaturzentren Deutschland (WiRD)"). Measures to promote re-use should be strengthened as part of the advancement of the circular economy (implementation and update of the waste prevention program and legal integration). In this context, consideration should also be given to measures to strengthen preparations for re-use with a view to reintroducing into the circular economy products that legally have become waste but which are still fit for use.

2.5.3 UBA Core Recommendation: Strengthening product appreciation

As the study by Prakash et al. (2016a) has shown, often the length of a product's service life is also dependent on psychological and cultural factors. The reasons for purchasing new appliances include not only the need to replace defective ones but also the mere desire for improved functionality or utility compared to an earlier model. In the eye of the user, the product, even though it is still fully functional, may appear antiquated because technical advancements have rendered it "obsolete" in its social (beneficial) functionality or because it is no longer fashionable.

To counteract these developments, issues need to be tackled in different areas. Product developers need to design products that have a timeless design and the operating software of which can be updated, and they need to choose modular designs that allow for products to be brought up-to-date at the technical, functional and aesthetic levels without the need for complete replacement; in this way the products can continue to be attractive to the user, both in terms of their practical utility function and as a social symbol (cf. UBA 2002).

The growing significance of product design, i.e. the integration and reconciliation of monetary, material, functional, environmental and cultural aspects of product design, necessitates greater attention being paid to environmental communication, be that in a company context and in design education or with a view to a more comprehensive understanding on the part of the consumer, for example as part of general education for sustainable development. The German Environment Agency has developed a variety of instruments with a view to mainstreaming environmental criteria as a design principle in product development as well as in the minds of the consumers. The German Federal Ecodesign Award, which was launched in 2012, recognises innovative products and concepts that embody high ecological and aesthetic aspirations and positively impact on everyday culture and consumer behaviour. The competition aims at fostering sustainable production and sustainable consumption and is an engine of social and technical innovation.

Since 2015 the German Environment Agency has been offering a structured pool of materials – the "Ecodesign Kit" – containing information and study materials for students and teachers of product design. Detailed background information as well as illustrative practical examples and calculations are designed to offer users insights into the environmental relevance of their decisions and to convey specific tools which allow them to integrate environmental aspects into their design decisions.

In addition to the rather more technical, product-specific innovations, a rising number of initiatives have emerged in the area of social innovation, offering far-reaching alternatives to the throwaway mentality (cf. UBA 2014). Repair cafés, in which people come together to repair defect items, have become widespread, as have swap shops where users exchange products they no longer need. These initiatives instil in participants a heightened appreciation of products and impart important knowledge on construction methods and repairs. Therefore, it is important to expand these initiatives and to support and strengthen their ideals and structures, for example by making available premises as "DIY workshop spaces" in local contexts, or by supporting socio-spatial networks composed of actors in the environmental, economic and social spheres. This would also strengthen the consumers' requisite overall self-reliance and self-efficacy with respect to sustainable consumption. A policy designed to overcome obsolescence should therefore, amongst other measures, contribute to providing structural support to such initiatives, for example as part of the implementation of the National Programme for Sustainable Consumption adopted by the Federal Government in February 2016.

2.6 Exploring strategies to combat functional obsolescence

The design of software architecture determines the amount of hardware required. Software can be prudent or wasteful in its use of hardware resources. Depending on how intelligently software was developed, it may for example require lesser or much greater amounts of processing power and disc space. As a result, the hardware may not only operate at lower performance parameters but it may also be possible to use it for longer, thus buckling the "bigger, faster, higher" trend. Especially when it comes to information and communications technology as well as electronic devices for entertainment purposes, the issue of software is often the reason, in the sense of functional obsolescence, as to why devices the hardware of which is basically still functional are being replaced. With respect to the question as to how software can contribute to longer product service lives, Prakash et al. (2016a) identified for example the following approaches: Development of innovative and especially of modular software solutions; provision of software drivers for sufficiently long periods; support for independent software and hardware initiatives as well as the creation of legal certainty as to their usage and sale; compulsory hardware and software updates; standardisation; error diagnostics functions and new software solutions. More research is needed in this area. A current research project on the "development and application of assessment criteria for resource-efficient software, taking into consideration existing methodologies"[26] will contribute to this field.

3. References

Boulos et al. (2015): Boulos, S.; Sousanoglou, A.; Evans, L.; Lee, J.; King, N.; Facheris, C.; Iraldo, F.; Nucci, B.; Donelli, M. (2015): The Durability of Products – Standard assessment for the circular economy under the Eco-Innovation Action Plan. Commissioned by the European Commission, DG Environment.

Jepsen und Rödig (2015): Jepsen, D.; Rödig, L. (2015): Wirksame Unterstützung von Reparaturnetzwerken. AbfallvermeidungsDialoge 2014-17. Ergebnisprotokoll der Dialogveranstaltung vom 2. Juni 2015. Im Auftrag des Umweltbundesamtes. Download at: www.umweltbundesamt.de/dokument/protokoll-3-abfallvermeidungsdialog-2-juni-2015.

Prakash et al. (2016a): Prakash, S; Dehoust, G.; Gsell, M.; Schleicher, T.; Stamminger, R. (2016): Einfluss der Nutzungsdauer von Produkten auf ihre Umweltwirkung – Schaffung einer Informationsgrundlage und Entwicklung von Strategien gegen Obsoleszenz. Im Auftrag des Umweltbundesamtes. Texte 11/2016. Dessau-Roßlau. Download at: www.umweltbundesamt.de/publikationen/einfluss-der-nutzungsdauer-von-produkten-auf-ihre-1.

Prakash et al. (2016b): Prakash, S.; Antony, F.; Köhler, A.; Liu, R.; Schlösser, A.; Proske, M.; Stobbe, L.; Schischke, K.; Zedel, H. (2016): Ökologische und ökonomische Aspekte beim Vergleich von Arbeitsplatzcomputern für den Einsatz in Behörden unter Einbeziehung des Nutzerverhaltens (Öko-APC). Im Auftrag des Umweltbundesamtes. Forschungskennzahl (UFOPLAN) 3712 95 301. Dessau Roßlau.

Schlacke et al. (2015): Schlacke, S.; Alt, M.; Tonner, K.; Gawel, E.; Bretschneider, W. (2015): Stärkung eines nachhaltigen Konsums im Bereich Produktnutzung durch Anpassungen im Zivil- und öffentlichen Recht. Im Auftrag des Umweltbundesamtes. Texte 72/2015. Dessau-Roßlau. Download at: www.umweltbundesamt.de/publikationen/staerkung-eines-nachhaltigen-konsums-im-bereich.

UBA (2002): UBA – Umweltbundesamt (Hrsg.) (2002): Nachhaltige Konsummuster – Ein neues umweltpolitisches Handlungsfeld als Herausforderung für die Umweltkommunikation. Mit einer Zielgruppenanalyse des Frankfurter Instituts für sozial-ökologische Forschung. Erich Schmidt Verlag GmbH.

UBA (2014): UBA – Umweltbundesamt (Hrsg.) (2014): Soziale Innovationen im Aufwind – Ein Leitfaden zur Förderung sozialer Innovationen für nachhaltigen Konsum. Download at: www.umweltbundesamt.de/publikationen/soziale-innovationen-im-aufwind.

Wieser und Tröger (2015): Wieser, H.; Tröger, N. (2015): Die Nutzungsdauer und Obsoleszenz von Gebrauchsgütern im Zeitalter der Beschleunigung. Arbeiterkammer Wien. Wien.

4. Footnotes

1. The underlying assumptions for this comparison are a 10 % increase in energy efficiency for new appliances every 10 years and a 35 % lower requirement for materials in the manufacture of a short lived washing machine (five years) compared to a washing machine with a 20 year lifespan.
2. European Commission (EC): Commission Implementing Decision of 17.12.2015 on a Standardisation Request to the European Standardisation Organisations as regards Ecodesign Requirements on Material Efficiency Aspects for Energy-related Products in Support of the Implementation of Directive 2009/125/EC of the European Parliament and of the Council, C(2015) 9096 final. Note: The scope of Directive 2009/125/EC (Ecodesign Directive) is limited to energy-related products, which is why this paper often references this product sector.
3. "Energy-related product" means any good that has an impact on energy consumption during use which is placed on the market and/or put into service, and includes parts intended to be incorporated into energy-related products covered by this Directive which are placed on the market and/or put into service as individual parts for end-users and of which the environmental performance can be assessed independently. Electrical and electronic devices are a subset of "energy-related products".
4. Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (OJ L 285/10 of 31.10.2009, p. 10)
5. Commission Regulation (EU) No 666/2013 of 8 July 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for vacuum cleaners (OJ L 192 of 13.7.2013, p. 24).
6. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Closing the loop – An EU action plan for the circular economy' (COM(2015) 614 final).
7. See for example http://www.umweltbundesamt.de/themen/wirtschaft-konsum/produkte/oekodesign/produktgruppen (German only).
8. For example: Commission Regulation (EC) No 244/2009 of 18 March 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for non-directional household lamps (OJ L 76 of 24.3.2009, p. 3).
9. Commission Regulation (EU) No 617/2013 of 26 June 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for computers and computer servers (OJ L 175 of 27.6.2013, p. 13).
10. Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products (OJ L 153 of 18.06.2010, p. 1).

11. The printheads of inkjet printers must be cleaned at regular intervals. During this process, ink residues are transferred into a tray or to an absorbent sponge, both of which have a limited capacity. If these components are not replaceable and effectively end the product's service life once they reach their capacity, this must be known to the consumer at purchase.

12. Called for by the German Green Party (Bündnis 90/Die Grünen) fraction, amongst others, in the German parliament (Bundestag); cf. Bundestagsdrucksache 17/13917 of 12.6.2013. This was based primarily on the expert report on planned obsolescence commissioned by the Green Party faction and prepared by Schridde, Kreiß and Winzer, Geplante Obsoleszenz: Entstehungsursachen, Konkrete Beispiele, Schadensfolgen, Handlungsprogramm. Gutachten im Auftrag der Bundestagsfraktion Bündnis 90/Die Grünen, 2013, which even calls for the „abolition of the reversal of the burden of proof in warranty legislation" (ibid. p. 86).

13. See Schlacke et al. 2015, p. 217 ff.

14. Directive 1999/44/EC of the European Parliament and of the Council of 25 May 1999 on certain aspects of the sale of consumer goods and associated guarantees (OJ L171 p. 12), last amended by Article 33 of the amending Directive 2011/83/EU of 25.10.2011 (OJ L 304 p. 64).

15. Act on making products available on the market of 8 November 2011 (Federal Law Gazette I page 2178, 2012 I S. 131), as amended by Article 435 of the ordination of 31 August 2015 (Federal Law Gazette I p. 1474). – Gesetz über die Bereitstellung von Produkten auf dem Markt (Produktsicherheitsgesetz – ProdSG) vom 8. November 2011 (BGBl. I S. 2178, 2179; 2012 I S. 131), zuletzt geändert durch Artikel 435 der Zehnten Zuständigkeitsanpassungsverordnung vom 31. August 2015 (BGBl. I S. 1474).

16. Unfair Competition Act in the version published on 3 March 2010 (Federal Law Gazette I page 254), as amended by Article 4 of the Act on Improvement of Civil Law Enforcement of Consumer Protecting Privacy Law Regulations of 17 February 2016 (Federal Law Gazette I page 233). – Gesetz gegen den unlauteren Wettbewerb (UWG) in der Fassung der Bekanntmachung vom 3. März 2010 (BGBl. I S. 254), zuletzt geändert durch Artikel 4 des Gesetzes zur Verbesserung der zivilrechtlichen Durchsetzung von verbraucherschützenden Vorschriften des Datenschutzrechts vom 17. Februar 2016 (BGBl. I S. 233).

17. Act on injunctions for infringements of consumer and other rights (Act on Prohibitory Injunctions) in the version published on 27 August 2002 (Federal Law Gazette I page 3422, 4346), last amended by Article 3 of the Act implementing the Directive on the comparability of fees related to payment accounts, payment account switching and access to payment accounts with basic features of 11 April 2016 (Federal Law Gazette I page 720). – Gesetz über Unterlassungsklagen bei Verbraucherrechts- und anderen Verstößen (Unterlassungsklagengesetz – UKlaG) in der Fassung der Bekanntmachung vom 27. August 2002 (BGBl. I S. 3422, 4346), zuletzt geändert durch Artikel 3 des Gesetzes vom 28. April 2017 (BGBl. I S. 969).

18. Act concerning supplemental provisions on appeals in environmental matters pursuant to EC Directive 2003/35/EC (Environmental Appeals Act) in the version published on 8 April 2013 (Federal Law Gazette I p. 753), last amended by Article 1 of the Act amending the Environmental Appeals Act to implement the judgment of the European Court of Justice of 7 November 2013 on case C-72/12 of 20 November 2015 (Federal Law Gazette I page 2069). – Gesetz über ergänzende Vorschriften zu Rechtsbehelfen in Umweltangelegenheiten nach der EG-Richtlinie 2003/35/EG (Umwelt-Rechtsbehelfsgesetz – UmwRG) in der Fassung der Bekanntmachung vom 8. April 2013 (BGBl. I S. 753), zuletzt geändert durch Artikel 3 des Gesetzes vom 30. November 2016 (BGBl. I S. 2749).

19. Regulation (EC) No 715/2007 of the European Parliament and of the Council of 20 June 2007 on type approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information (OJ L 171 of 29.06.2007, p. 1).

20. Significant additions and amendments with regard to access to repair information and diagnostic software have primarily been effected by means of Regulation (EU) No. 692/2008 and Regulation (EU) No. 566/2011.

21. ONR 192102: Label of Excellence for Durable, Repair-Friendly Designed Electrical and Electronic Appliances: 2014-10-01.

22. Council Directive 2006/112/EC of 28 November 2006 on the common system of value added tax (OJ L 347 of 11.12.2006, p. 1).

23. Income Tax Act (EStG) of 8 October 2009 (Federal Law Gazette I p. 3366,3862), as last amended by Article 9 of the Act of 14 August 2017 (Federal Law Gazette I p. 3214). – Einkommensteuergesetz (EStG) vom 8. Oktober 2009 (BGBl. I S. 3366, 3862), zuletzt geändert durch Artikel 9 des Gesetzes vom 14. August 2017 (BGBl. I S. 3214).

24. http://www.umweltbundesamt.de/abfallvermeidung-reparatur.

25. "Bewertung der Umsetzung des Abfallvermeidungs-programms und Entwicklung geeigneter Kommunikations-strategien und Handlungsempfehlungen", FKZ 3714 32 3240 (in German).

26. "Entwicklung und Anwendung von Bewertungsgrundlagen für ressourceneffiziente Software unter Berücksichtigung bestehender Methodik", FKZ 3715 37 601 0 (in German).

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