JRC TECHNICAL REPORTS

Integration of resource efficiency and waste management criteria in European product policies – Second phase

Final Executive Summary with logbook of comments from stakeholders

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December 2012

Report EUR 25654 EN

Joint Research Centre

European Commission
Joint Research Centre
Institute for Environment and Sustainability

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This publication is a Reference Report by the Joint Research Centre of the European Commission.

JRC 77356

EUR 25654 EN

ISBN 978-92-79-27979-9

ISSN 1831-9424

doi: 10.2788/72553

Luxembourg: Publications Office of the European Union, 2012

Printed in Italy

Table of Contents

Final Executive Summary

The objective of the project is to support the European Commission with the integration in European product policies (including the Ecodesign policy) of measures aimed at improving resource efficiency and end-of-life of products. In particular, the project aims at developing and testing a series of concise documents for use as reference methods for measuring/assessing and verifying the performances of products according to the following parameters:

- recyclability/recoverability/reusability (RRR),
- recycled content,
- recyclability/recoverability/reusability benefits (RRRB),
- use of hazardous substances,
- durability.

The methods[1] are derived from those developed during the first phase of the project (Ecodesign Phase 1 – EP1[2]). The methods have initially been refined according to:

- preliminary comments received from stakeholders[3]
- results of the applications to new product groups[4] as case studies
- extensive review of the scientific literature to identify relevant international standards published or currently under development.

The methods have subsequently been refined according to comments received:

- during the stakeholder event[5] (a summary of the comments is given in Annex 1 to the present report)
- during the stakeholder consultation period[6] (the complete logbook of received comments is attached to Annex 2 to the present report)

Annexes 1 and 2 to the present report also list the replies to comments and the related implementations/changes in the project's reports).

The analysis of each method has been subdivided into:

- Introductory part, which analyses additional relevant references for the revision of the method;
- Developed method, including the description of main indices and potential variants;
- Procedure for the verification of the calculation of indices
- Guidance documents (in the Annexes) summarizing methods and main indices

[1] Report n°3 – from Chapter 1 to Chapter 5.
[2] Project: "Integration of resource efficiency and waste management criteria in the implementing measures under the Ecodesign Directive". http://lct.jrc.ec.europa.eu/assessment/projects
[3] Report 3 - Annex 7
[4] Report n° 2 – Chapters 5, 6 and 7
[5] Stakeholder event held in Brussels, Committee of the Regions, Jacques Delors Building, 10th September 2012.
[6] Stakeholder consultation (17/08/2012 – 21/09/2012) based on draft reports n° 2 and 3 (available at JRC webpage: http://lct.jrc.ec.europa.eu/assessment/assessment/newecodesign)

Main outcomes concerning the developed methods are:

- *RRR*[7]: the method from the EP1 project has been largely revised to be in line with recommendations of the technical report IEC/TR 62635. However, some minor deviations and advancements compared to the IEC technical report have been proposed concerning: the modelling of reuse, the setting and analysis of EoL scenarios and the development of some restricted indices (related to some specific materials/parts) in order to ensure the consistency and comparability among results of different analysis.
- *RRR Benefits*[8]: a set of environmental indices has been developed. These indices combine the indices for RRR with life-cycle data about the impacts of production of primary and secondary materials. Compared to methods from the EP1 project, the RRR Benefit rates developed here embody the full life cycle impacts of the product. These indices allow for the calculation of the benefits potentially achieved by the reuse/recycling/recovery of product parts.
- *Recycled content*[9]*:* the method of calculation of the index from the EP1 has not been modified. The research therefore focused on the procedure for the verification. A survey of available references, including various standards and labelling scheme, has been performed in order to identify potentially relevant and robust documentation to be provided in order to support claims from the manufacturer. An additional index has moreover been developed: the recycled content benefit. It allows assessing in a life-cycle perspective the potential environmental benefits related to the use of recycled materials.
- *Use of hazardous substances*[10]*:* the method from the EP1 has been largely revised. In particular it is now focused on the reduction of the risks of use of hazardous substances in the EoL of the product more than on the assessment of the limitation/substitution of substances in the product. The method has therefore been related to the composition of the product (BOM and disassemblability of parts) and EoL treatments that the product parts will undergo. The scope is the identification of criticalities in the EoL of key parts containing such substances.
- *Durability*[11]*:* this method was considered for the first time in this report and is still at an early stage of development and testing.. The method is original and it is based on similar approaches already presented in the scientific literature for some case-study products. In particular the method is based on the comparison, in a life-cycle perspective, of different scenarios concerning the lengths of the useful life of the products and their potential substitution with better performing alternatives. However the method does not take into account consumer behaviour (e.g. "fashion items")[12]. Some general and simplified indices have been developed. The outcome of the method is an assessment if and to what extent it is environmentally sound to prolong the useful life of a given product.

Concerning the methods and indices developed, conclusions can be summarized as follows:

- The methods are applicable to the exemplary products with available data.

[7] Report 3 – Chapter 1.
[8] Report 3 – Chapter 2.
[9] Report 3 – Chapter 3.
[10] Report 3 – Chapter 4.
[11] Report 3 – Chapter 5.
[12] These aspects can be part of further research.

- It is possible to analyse the performance of products on the basis the various indices such as: RRR rate (including RRR for plastics and/or CRMs) RRR Benefit rates, Recycled content, Recycled content Benefits, presence of hazardous substances in components, durability indices;
- The definition of representative EoL scenario(s) represents a key step for most of the methods. This definition requires a detailed analysis of current EoL treatments at the EU level, to be based on information from recyclers and manufacturers. Also a dynamic analysis of future and/or alternative scenarios can be relevant, especially when there isevidence of change in the EoL scenario(s) in the near future, for example, due to economic reasons and/or technological evolution.
- The outcomes from the application of the methods can be used to identify and assess potentially relevant requirements. To this end, a method has been illustrated and discussed[13]. The method combines the application of the various indices to a selected product group, first to identify 'hot spots' (key components and/or product parameters that are significant in terms of relevant life-cycle impacts and/or improvement potential) and afterwards to assess, among the typologies of requirements previously defined[14], those that could produce relevant environmental benefits (both at the case-study product level and at the product group level).
- The simplified index for the environmental assessment of durability[15] has been applied in order to assess the potential benefits/drawbacks of extending the operating time of the analysed products. Although simplified, this method is scientifically robust for the scope of the assessment, as proved by similar applications in the scientific literature. However, in order to address potential uncertainties due to unavailability of data, it is recommended to analyse different scenarios based on sufficiently large variations of key parameters.It is highlighted that the general method for the environmental assessment of durability can be applied when additional data about the case-study are available (through e.g. estimations and/or extrapolations).

The project's methods have been applied to some exemplary products in order to test their applicability, their relevance and usefulness at the product level, for possible future application in relevant EU product policies and to draw some recommendations at the method level. The analysis has been preceded by a 'high level environmental assessment'[16] consisting of a review of studies in the scientific literature and a further analysis of flows of materials within the EU-27 to identify relevant materials and products for their environmental impacts within the EU-27. The 'high level environmental assessment' has formed the basis for the selection of three case-studies potentially relevant for the project scopes[17], and in particular:

- 'imaging equipment' (limited to the analysis of the recycled content);
- 'washing machine - WM' (for the analysis of RRR, use of relevant resources, use of hazardous substances and durability);

[13] Report 2- Chapter 4
[14] The analysis of potential Ecodesign requirements for resource efficiency of product is illustrated in Report 2 – Chapter 3.
[15] Report 3- Section 5.3.2.
[16] Report 2 – Chapter 1.
[17] Report 2 – Chapter 2.

- 'LCD-TV' (for the analysis of RRR, use of relevant resources and use of hazardous substances).

From the analyses of the case-studies, the following conclusions have been drawn:

- '*imaging equipment' case-study*[18]:
  - A multi function ink jet device has been analysed. Data about the case-study have been derived from the Ecodesign preparatory study on imaging equipment.
  - The product is largely composed of plastic parts (about 50%). Furthermore, energy consumption for the production and manufacturing of such plastic parts is very relevant (accounting for about 50-60% of the global life-cycle energy requirement – GER). These are the two conditions for the potential relevance of introducing recycled materials in the product's manufacturing.
  - Environmental benefits from the use of recycled materials are relevant in a life-cycle perspective for the energy consumption.
  - Potential requirements regarding a minimum threshold of 'recycled content' of plastic parts can be relevant in a life-cycle perspective. The enforcement of such requirements could be partially eased by declarative requirements about recycled content of product, but it is recognised such an approach may not currently be possible for all type of EU product policy[19].
  - According to feedback from recyclers, requirements on the recycled content of plastics could stimulate the recycling of these materials. However, it is generally observed that the verification of requirements concerning the recycled content is a complex key issue, that would currently only be based on self declaration of the manufacturer supported by technical documentations [20].
  - Furthermore, according to some stakeholders, measures based on recycled content could be potentially in contrast with some legislation concerning the use of hazardous substances that are currently restricted or under phase-out.
- '*Washing machine*' case-study[21]:
  - The performances of two case-studies WMs have been analysed, for various indices (the RRR rates, RRR benefits rates, hazardous substances[22] and durability[23]). Data for the case-study have been obtained from a recycler and complemented by information from the scientific literature.
  - Two main EoL scenarios have been identified for the product group: 1) one scenario is based on pre-dismantling (or soft-shredding) plus some mechanical treatments and sorting; 2) the

[18] Report 2 – Chapter 5.
[19] The enforcement of such requirement also requires a more comprehensive market analysis (including different products) to assess the availability of recycled plastics for the manufacturing and technical feasibility of using recycled plastics in the product.
[20] Verification should be based on a declaration of the manufacturer supported by technical documentations (see Report n° 3 – Chapter 3 for further details).
[21] Report 2 – Chapter 6.
[22] Report 2 – Chapter 5.
[23] Report 1- Chapter 2

other scenario is largely based on different shredding phases (with hand picking of relevant parts) followed by automatic sorting.

- It has been observed that current EoL treatments are affected by relevant losses of copper and precious metals in the PCBs and some losses of metals (copper, steel and rare earths) in the motor. Certain innovative parts (e.g. LCD screen) can represent a problem for the treatment in some recycling plants.
- In order to improve the EoL performance of the WM, three potentially relevant ecodesign requirements have been derived from the assessment:
  - Firstly, the improved disassemblability of PCBs would allow a large amount of PCBs to be preventively manually dismantled (instead of being shredded) with higher recycling rates for copper, gold, silver, and PGMs. For example, the analysis showed that more than 70% of gold and PGMs and more than 80% of silver in the WM, currently lost in the EoL treatments, could be recycled thanks to this requirement. The following Table A illustrates some estimated additional masses of recycled metals due to the application of the requirement on the disassemblability of the PCBs.
  - Secondly, the improved disassemblability of motors would allow a larger recycling rate (+5%) of embodied metals (steel and copper). Furthermore, this requirement would be essential for the separation of neodymium magnets (when embodied), once commercial recycling routes of rare earth would be established.
  - Finally, the improved disassemblability of LCD screens would allow an easier separation of the LCD reducing the risks of contamination of other recyclable parts.

Table A. Benefits in terms of additional recycled masses for the washing machine case-study due to the application of the requirement on the disassemblability of the printed circuit boards

	copper	silver	gold	palladium	platinum
A. Overall quantities of metals yearly used in the EU27 [10^3 kg/year]	3,525,910	12050	130	720	
B. Overall quantities of metals yearly used in the washing machines [10^3 kg/year]	2,735	10.39	1.76	0.52	0.11
C. Overall benefit (additional recycled mass) [10^3 kg/year]	478.67	4.18	0.63	0.19	0.039
Mass fraction (C/A) [%]	0.01%	0.03%	0.48%	0.03%	
Mass fraction (C/B) [%]	17.5%	40.3%	35.7%	36.7%	

- Furthermore, the simplified durability index has also been tested on the WM case-studies[24]. The application demonstrated that the extension of the operating time generally produces environmental benefits, even if it delays the replacement with a more energy efficient product. The benefits are, however, largely variable, mostly depending on the selected impact category and on the efficiency of the replacing product. For example, the extension of the operative life of the WM1 of 4 years reduces the life-cycle GWP by 3%, in comparison to the replacement with a new product 10% more efficient.

[24] Report 1 – Chapter 2.

- In order to extend the lifetime of WM some potential product policy criteria could include:
  - Non-destructive disassemblability of key functional components (hot spots) and their reparability and/or possibility of substitution.
  - Adoption of product specific standardized procedures for the measurement of the durability (when available).
  - Availability of extended warranties on the products (or some of their hot spots).
  - Provision of information about disassembly/repairing to the users

- *'LCD-TV' case-study*[25]:
  - The performances of a case-study LCD-TV with compact fluorescent lamps have been analysed, for various indices (the RRR rates, RRR benefits rates, hazardous substances). Data for the case-study have been obtained from a recycler and complemented by information from the scientific literature.
  - The existing EoL treatments for LCD-TVs are currently based on a full manual dismantling of the devices. This current EoL scenario allows high values of the RRR and RRR benefits rates. However, as underlined by several stakeholders there is evidence of intensive research to move towards scenarios based on mechanical processing (pre-shredding and shredding with manual/mechanical sorting). However these new scenarios are still under development and their representativeness at the EU level is not known.
  - In order to achieve high EoL performances of the LCD-TV in the future, some potentially relevant ecodesign requirements have been derived from the assessment. Firstly the improved disassemblability of key parts (PCBs, lamps, LCD screen, and PMMA board) is discussed. This would allow the costs of disassembly to be reduced and to make the disassembly-based EoL scenario more economically competitive in the future. These requirements could be separately enforced or, otherwise, cumulative requirements (for two or more key parts) could be set. The following Table B illustrates the benefits due to the application of the requirements on disassemblability of key parts, in the different situations of evolution of the End-of-Life scenario. Furthermore, the disassemblability of such parts allow the preparation of waste for further recycling processes, currently under research and/development, as the recycling of rare earths from lamps.

[25] Report 2 – Chapter 7.

Table B. Benefits in terms of additional recycled masses for the LCD-TV case-study due to the application of the requirement on the disassemblability of key components in different scenarios (situations B[26] and C[27])

Material	X. Benefits in term of additional recycled mass		Y. Overall amount of materials used in the LCD-TVs [10^3 kg/year]	Z. Overall amount of materials used in the EU [10^3 kg/year]	Fraction of the additional recycled material compared to the uses in LCD-TVs (X / Y) [%]		Fraction of the additional recycled material compared to the overall uses in the EU (X / Z) [%]	
	Situation B [10^3 kg]	Situation C [10^3 kg]			Situation B [%]	Situation C [%]	Situation B [%]	Situation C [%]
Steel	128	256	73,143	79,926,821	0.2%	0.3%	0.00016%	0.00032%
Aluminium	104.7	209.4	13,090	5,020,336	0.8%	1.6%	0.002%	0.004%
PMMA	10,055	20,111	53,487	180,002	18.8%	37.6%	5.6%	11.2%
ABS	2,064.3	4,128.5	51,607	752,039	4.0%	8.0%	0.27%	0.55%
Copper	357	714	5,701	3,525,913	6.3%	12.5%	0.01%	0.02%
Silver	2.94	5.89	18.3	12,050	16.1%	32.2%	0.024%	0.049%
Gold	1.0	2.0	7.0	130	14.3%	28.6%	0.77%	1.53%
Palladium	0.214	0.429	1.5	720	14.7%	29.4%	0.03%	0.06%
Platinum	0.012	0.024						

- A declaration of the content of indium in LCD is proposed as potentially relevant ecodesign requirement. This declaration is intended to contribute to the increase future recycling rate by facilitating information flows across the supply chain and recyclers.
- Another potentially relevant ecodesign requirement highlighted by the case study is the improvement of marking of large plastic parts (according to ISO 11469 and 1042-2 standards), in which marking is clearly visible and easily located. This would allow current recyclers to sort recyclable plastics from non-recyclable ones. Furthermore, an adequate marking including the content of flame retardants (according to ISO 1043-4) could contribute to an increased recyclability of plastics.
- Finally, a potential requirement of a threshold for the Recyclability rate for plastics is discussed. This requirement would underpin the use of more recyclable plastics in the product. An exemplary threshold of 80% has been discussed. However, further analysis of various products on the market is necessary before the actual setting of thresholds (to be potentially differentiated by TV dimensions).

[26] Thanks to application of requirements on the disassemblability of some TV parts, an additional share of 20% of the overall LCD-TV is assumed to be dismantled in the future instead of being shredded and mechanically sorted

[27] Thanks to application of the requirements on the disassemblability of some TV's parts, an additional share of 40% of the overall LCD-TV is assumed to be dismantled in the future instead of being shredded and mechanically sorted

Annex 1 – Summary of comments on the project's reports n° 2 and 3 received orally during the stakeholder event[28] (10/09/2012)

Number of the comment and stakeholder	Comment/question	Oral answer given that the event	Further action to be taken with regard to the reports
Presentation on the methods for RRR, RRR Benefits, Hazardous substances			
1. Several	Ask clarification on data, data quality (source, geographic relevance, etc.) of data used for the calculations of RRR, as well as typology of recyclers consulted.	Clarifications have been given.	None (details already given in Report 2)
2. Several	Ask clarification whether economic viability of recovery (e.g. recycling, reuse of components) routes have been considered or not.	Clarifications have been given.	None (details already given in Report 2)
3. Several	Ask clarification on the life cycle approach used and on the links with other existing methods (e.g. MEErP tool), especially on diverging LCIA impact categories considered	It has been explained why fuller LCA methodologies in addition to the Ecoreport tool of the MEErP methodology were used in order to capture resource (including CRM) efficiency performances of products.	Selection of the indicators will be clarified in Report 2.
4. One NGO	How non-technical aspects linked to re-use of the whole product (rather than components) (e.g. fashion), have been addressed.	They have not been addressed	None (out of scope, as described in Report 3)
5. One MS	How was weighting of environmental indicators performed?	LCIA results were not weighted. It could however be done in the future, when weighting factors are available.	None (results always presented as disaggregated)
6. Several NGOs	How and why the scope of the method concerning hazardous substances has been reduced compared to Phase 1.	The study focused on the management of components containing hazardous substances during their EoL treatments, mainly in order to maximise synergies and reduce overlaps with other existing policies (e.g. WEEE, RoHS, REACH)	None (out of the scope of the Phase 2 project)
7. One manufacturer	Concerning the Durability, why the benefits are compared to life cycle impacts (including use phase) and not only compared to the production phase?	The method aims to identify whether lifetime extension for a particular product is beneficial from a life cycle perspective. This is why the denominator of the equation concerns the full life cycle of the product and not the production phase only.	None
Analysis of case-studies: Washing Machine			
8. Several	Ask clarification concerning the downcycling factor k used, and the source of data.	Clarification have been given, and the justification for using k=1 for case-studies has been given. Data coming from the recycling sector will be needed in the future for more precise determination of "k" values.	None (details already given in reports 2 and 3)
9. Several	How the time of dismantling (e.g. 40 seconds for washing machine) could be measured, for example for verification?	A standard on being able to measure dismantling time (valid at the design stage and at the recycling stage) will have to be developed.	None (details already given in the description of the requirements and in Annex 5 of Report 2)
10. One MS	Ask clarification on representativeness of EoL performances in a country.	Data used are representative of an average European scenario (based on communication from recyclers and association of recyclers).	None (Description and representativeness of EoL scenarios already discussed in report 2)
11. One recycler	Was the "slow shredding" process considered in the study?	The process "slow shredding" is called in the report 2 "pre-shredding" and it has been considered.	None

[28] Stakeholder event held in Brussels, Committee of the Regions, Jacques Delors Building, 10th September 2012.

Number of the comment and stakeholder	Comment/question	Oral answer given that the event	Further action to be taken with regard to the reports
12. One recycler	What is meant by "extraction by manual dismantling"?	Some components have to be extracted before the product is shredded or pre-shredded. So far, only manual dismantling has been observed at recycling plant. Information concerning advanced and robotized dismantling technologies is welcome.	None (explanation mentioned in the notes of requirements in Report 2) (no further information received by stakeholders following event)
13. One recycler	At recycling plant, there is a combination of man labour and of automatic technologies (sometimes for H&S reasons). Modularity of products is always welcome and communication between manufacturers and recyclers should be increased.	Combination of man labour and automatic technologies has been considered in the EoL scenario. Improvement of communication among manufacturers and recyclers is one of the key issues underlined in the Reports	None
14. Several MS	Discuss whether the requirement on dismantling time is verifiable or not. One MS argues that it is not, based on the BoM and on a standard. One other argues that a video posted on the Internet by a manufacturer showing a dismantling could be enough (it would be better than a sheet of paper).	Dismantlability time is a verifiable parameter. The development of a standard for the measurement of disassembly time and its implementation in a verification process will be part of future development of the study.	None
Analysis of case-studies: LCD-TV			
15. One manufacturer	Ask clarification on the performances (yields) of the scenarios considered, especially on Scenario 2 (future)?	The performances considered are presented in the report. For the shredding-based scenario, as stated in the report, the yields for metals are the ones used in the WM case study for the shredding scenario, since no other information was available. Any updated information on actual performances of this scenario is welcome.	None (no further information received by stakeholders following event)
16. One manufacturer	Ask clarification on how the flame retardants (FR) have been taken into account in the case study.	Due to lack of information concerning the BoM of LCD-TV, no FR was considered in the case study. If they had been considered, the RRR and RRR Benefits indicators would have been lower (because of current higher losses)	None
17. One recycler	Ask clarifications on the benefits of marking plastic parts. Will provide details on some innovative technologies concerning sorting of plastics with brominated flame retardants.	It was observed that some recycling plants sort plastics, based on plastic's marking. Details on performances of innovative technologies are welcome.	None (no further information received by stakeholders following event)
18. One recycler	Why setting the limit of marking to only 200g where some standards set this limit to 25g?	Standards already existing were considered. However, the requirement focuses on an improved "marking" (e.g. larger, more visible). According to communication from recyclers it is assumed to apply this improved marking only to large plastic parts. The limit of 200g was proposed, but can be potentially modified according to additional information from recyclers.	Clarified in Report n° 2 (notes in the section 7.2.3).
19. One consultant	Were the results discussed with manufacturers? How long did the study take?	Results of the case studies were discussed with manufacturers and association of manufacturers, before the launch of the consultation. The length of the study was 12^{th} months, including development of methods and case-study applications.	-
20. One MS	The MS welcomes the way to address Critical Raw Materials contained in LCD-TV in this study.		None-
21. One manufacturer	Ask clarification whether the results concerning LCD-TV are still valid for other types of displays.	Other products (other BoM, other technologies) would produce other results and other benefits for the requirements. The typologies of requirements are potentially valid also for other types of displays (e.g. dismantlability for Plasma TV)..	None
22. One NGO	How was re-use addressed in the case study	It was not addressed since no re-use of post-consumers waste was identified for this case study.	None
23. Several recyclers	Recyclers agree that shredding Based scenario will grow in the future for many reasons (volume, economy of scale, H&S). However, man labour will still play a key role during pre-treatment in order to create concentrated flows.	-	None. (this validated some of the assumption made in the study about future development of EoL scenarios for TVs)

Number of the comment and stakeholder	Comment/question	Oral answer given that the event	Further action to be taken with regard to the reports
Presentation of project's methods (second part): Recycled content and application to imaging equipment case-study			
24. Several manufacturers	Ask clarification on how to trace recycling content from suppliers	Traceability is only possible thanks to documentation. Producers of recycled polymers can contribute to share documentation showing how recycled plastics are used in new manufacturing. Verification possibilities will have to be carefully considered depending on the different product policies such criteria could be applied under.	None
25. One manufacturer, one recycler	Ask clarification on the quality of recycled polymers, depending on the content	Parts can be made with recycled polymers with very high recycled content. Recycled polymer has got its own quality and it might not be always possible to use it for all parts in a product	None
26. Several members states, one manufacturer	Ask clarification on the difficulty to verify the requirement on recycled content (e.g. for all parts contained in a product)	The study suggestion is not to put a requirement on all plastics contained in a product, but rather to focus on a few large parts. Verification possibilities will have to be carefully considered depending on the different product policies such criteria could be applied under. The requirements on recycled content can be more suitable for some product's policies (e.g. voluntary labelling) rather then others (e.g. mandatory policies).	None
27. Several recyclers and one MS	Recyclers support this type of requirement since it brings important benefits and because it would create an output market for the recycled polymers.	-	None
28. One NGO	NGO suggests testing the feasibility of the requirement and the benefits associated to it through voluntary agreement (e.g. Imaging equipment)	-	None
Presentation of project's methods (third part): Durability			
29. Several	- How a product re-using old components can pass substances restriction regulations (e.g. RoHS)? - How is remanufacturing (in the case of service selling) and upgradability of product addressed?	The method for durability focused on the benefits of potential extension of the operating time. Reuse and remanufacturing of products are out of the scope of the method, but potentially relevant for the method on reusability.	A note has been inserted about the scope of the method on durability in Report n°3
30. One NGO	This study on Durability is welcome although some other products more relevant for durability than WM could have been analyzed. In the future, the analysis should also look at sustainability performances (e.g. job creation, etc.)	-	None
31. Many	This study is welcome by many stakeholders who argue that it could be very beneficial to also look at its potential benefits for the Waste Framework Directive.	-	None

Annex 2 – Logbook of further written comments received during the stakeholder consultation[29]

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
1. Belgian Federal Public Service for health, food chain safety an environment	1.General	*Policy* We welcome this study, it contributes to the inclusion of environmental impact other than energy use in Ecodesign (ED). It will serve in review of exiting Ecodesign legislation on energy using products (EuP) and allow extension to non-energy related products (non-ErP). Meanwhile, the experience can certainly be tested for energy related products (ErP) such as windows, cables and tapware. We welcome the announced revision of the recent MEErP to accommodate not only Critical Raw Materials (CRM), but also to accommodate other material impacts such as Abiotic Depletion Potential (ADP). The Commission should draw up a Communication to clarify the practical interface with WEEE, the F-Gas Regulation and RoHS and to compare the theoretical scope and actual coverage of these legislations with Ecodesign. It is not good that RoHS (Article 11 manufacturers design appliances in such a way that waste batteries and accumulators can be readily removed) and WEEE ('removal' means manual, mechanical, chemical or metallurgic handling) impose different requirements on the disassembly/recyclability of batteries. To assure proper stakeholder involvement and availability of expertise and data concerning RE, a renewed call to interest for the Ecodesign Consultation Forum (CF) should be send, specifically targeting: designers, certification firms and the waste treatment sector. Decision 2008/591/EC on the CF needs to be adapted to allow a more important number of members. We note that improving individual product (groups) doesn't limit the numbers brought on the market. For toxic substances general 'bans' might be more effective. Introduction of quota's or caps for waste could deliver EU environmental policy objectives faster and with high certainty. *Project scope* Ecodesign measures on material efficiency could oblige minimal reusability/recyclability/recoverability, only if the extraction or growing of new virgin material is more impacting to the environment. Note that resource efficiency should go beyond this. Other aspects such as sustainable sourcing (E.g. FSC, bioplastics, organic crop, …), design for longlivability (increased weight and/or durable materials), energy efficiency (lower use phase impact) and design for lightweight (foaming, lightweight materials) are considered to be independent variables but could influence each other in opposite direction. Final criterion should be overall environmental impact over the life cycle of a product. E.g. a reusable product could be less recyclable, but could be more material efficiency over its lifecycle. The separate collection of EEE is part of the EoL, but can be excluded for the calculation of RRR. Actual 'reuse/recycling/recovery' rates are influenced by economic factors and technology development, but also by user's behaviour and collection. The latter could have decisive impact: a product with high recyclability could be an economical loss and have a high environmental burden if not collected.	-
	2. General	Requirement on disassembly of key components for recycling seem to be included in the WEEE directive (however see previous remarks). Further disassembly depends on RRR and economic parameters at the moment of End of Life (EoL). Separability should be covered by recyclability/recoverability.	The WEEE Directive sets a list of components to be treated, addressed to recycling companies. The proposed products requirements are addressed to product manufacturers, and could contribute to improve efficiency of EoL treatments. These product requirements are consistent with Article 4 of the WEEE Directive.

[29] Stakeholder consultation (17/08/2012 – 21/09/2012) based on draft reports n° 2 and 3 (available at JRC webpage: http://lct.jrc.ec.europa.eu/assessment/assessment/newecodesign)

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1. Belgian Federal Public Service for health, food chain safety an environment	3. General	Maximum content of hazardous substances can be covered by RoHS.	No requirement has been discussed about maximum content of hazardous substances See also response to comment n° 6 in Annex I
	4. General	Identification of key components for durability, accessibility for non-destructive disassembly for replacing and provision of spare parts for a sufficient time seem indispensable to allow repair. However the logistics for servicing and man hours for repair seem to be too expensive. Comparative life cycle costing should be done between provision of a service by buying cheaper lower quality products which a replaced by new ones, and buying a more expensive high quality product which can be repaired.	Life cycle costing considerations were out of the scope of the current project but could be relevant for next developments of the project.
	5. General	Because they don't depend on conversion coefficients, mass based RRR declarations could serve as a step stone to minimum requirements (threshold requirements) on RRR Benefits. Information requirements (declarations) are soft. Measures based on RRR benefit indices target environmental impacts related to material use best. The annex gives an example of how minimal RRR could be set.	-
	6. General	In time, a weighting system for environmental impacts should be developed to allow the introduction of a cumulative benefits indicator. This seems indispensable if consumer communication on 'resource efficiency' wants to be done. Weighting factors for RRR Benefits should not be determined in standardisation but in policy development.	Not weighting among impacts has been applied. We agree that weighting is implying policy decisions. --- The term weighting was avoided in the reports
	7. General	Not only standards for RRR calculation should be elaborated. The possibility to distinguish virgin from secondary material though a physic-chemical analysis of bulk material, impurities or contaminants should be investigated (e.g. http://www.okcompost.be/data/pdf-document/doc-29e-a-C14.pdf).	The C14 method is used for biobased materials. It is not clear how this could be extended to other materials.
	8. General	Industry initiatives to set up a Chain of Custody (CoC) to allow verification of the RC should be supported (e.g. http://www.fsc.be/nl/fsc-label-en-garantie/het-fsc-label_8.aspx)	-
	9. General	Market surveillance based on paper declarations on RRR seems feasible. However it is a good idea to test paper requirements in (more) voluntary instruments such as Voluntary Agreements (VA) and the EU Ecolabel. What's more, in VA it is possible to work with averages or requirements on product ranges instead of requirements for single products. This leaves more liberty to industry to reach the same environmental objective.	On verification issues see comments n° 14 and 26 in previous Annex I.
	10. *Information to recyclers*	ED could set requirements for manufacturers to provide information on composition, disassembly and RRR could help recyclers and feedstock providers to recycle and recover more materials in a more efficient way. Standard rules or guidance and a format to create scheme such as an "Exploded view" or "fishbone diagram" or a BOM should be developed. This information could be gathered in a single free public website to assist recyclers in organizing EoL treatment.	We agree on the relevance of providing information. This has been underlined in several parts of the reports (e.g. in the case-studies analysis of Report 2 and in Report 3 concerning the illustration of IEC/TR 62635. Additional analysis of key information will be part of future projects
	11. *Information to recyclers*	Mandatory labelling of parts and components could also contribute to better recycling.	
	12. *Information to recyclers*	The importance of design for disassembly and recyclability in ECD cannot be underestimated. Recyclability/recoverability of a product is different from the recyclability/recoverability of materials, i.e. the aggregation of 'recyclable materials' into a product does not necessarily imply a 'recyclable product'. Product developers and manufactures in the whole value chain should work together with recyclers and companies providing waste management and treatment services. The latter should provide sufficient information to characterize activities at EoL treatment facilities, to enable manufacturers to implement effective Environmental Conscious Design (ECD).	-
	13. *Information to recyclers*	Due to the variety of end of life treatment practices, it is finally left to the recycler to identify components or parts that may lead to improved recovery. However, the manufacturer should use scenario feedback from recyclers when calculating the recyclability and recoverability rates. These EoL scenarios should be based on a mass balances taking into account emissions. An estimate of the purities/composition of material outputs should be provided. Error rate should be given. Unless separate waste collection and treatment are under the control of a manufacturer, EoL should be treated in a generic way, using average or representative process data. The influence of design on sorting and collection and on applied EoL techniques are difficult to quantify. Better waste collection cannot be attributed to a single product. There is no guarantee that a product is treated as it would have been optimally intended, once it ends up in the waste stream.	This was the approach followed to set the EoL scenarios. Analysis was however limited by the availability of public data on the treatments. Data used are however representative of the European context. Further steps of the research will also focus into more updated data, including new emerging technologies for EoL.

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1. Belgian Federal Public Service for health, food chain safety an environment	14. *Information to recyclers*	Manufacturers should provide relevant product information on disassembly, recycling and recovery and on product composition. Information should be readily available on a single free public website. Instructions for disassembly, and a disassembly scheme such as the "Exploded view" or "fishbone diagram" should be made available, as well as any other information concerning the dismantling procedure (dismantling steps, tool(s), personal protective measures, etc)". Ideally a product and its packaging are characterized by its Bill Of Materials (BOM), indicating any hazardous substances or impurities degrading the quality of recyclates or prohibiting recycling all together. The BOM comprises the list of parts, their mass, and in case of purchased components, the supplier. For RRR calculation a product and its components should be decomposed as far as possible, up to the most elementary level (i.e. up to the mono-material) to provide a maximum of useful information for ECD and EoL treatment. Information on subassemblies, components and parts should be passed on down the supply chain in disaggregated form, to maintain a maxim of information for downstream decision makers. Ideally information is also available on the product or components. There should be warning labels on product parts that impose a risk to person handling the waste, threaten the quality of the recycling process or require pretreatment. Basic safety information and disassembly instructions should be given. Material of single recyclable materials should be marked together with the weight of the component.	We agree that such type of information would largely simply the calculation of the indexes. However it has been observed that manufacturers raised some concerns about difficulties in collecting and publishing detailed information on the BOM.
	15. RRR Methodology	Material can only be considered to be recycled if it is not • going to landfill during the EoL processing (e.g. any residual waste at the treatment plant), • being incinerated during the EoL processing (e.g. plastic in metal smelting, waste oil), • being recovered after the EoL processing (e.g. waste of ceramics recovered as granulate for construction), • ending up in the wrong material stream (e.g. copper impurities in iron; contaminating polymers in plastic).	We agree on this list except for the third point (recovered after EoL processing). To our view this is an example of recycling of materials with evident downcycling. --- Applicability of downcycling factor in the RRR Benefit indexes has been illustrated/clarified. However, downcycling factor of 1 has been applied in the analysis of case-studies, because of lack of data.
	16. RRR Methodology	Inaccurate calculation will hinder good decision making and distort the market. For example, if a ferrous waste stream contains material that is sieved out, and contains plastic that goes into the smelting, gives a product that contains important amounts of metal impurities, calculation on the initial waste input will give far more flattering results than calculations based on final iron output/content. A superior EoL treatment, recovering the fine fraction, avoiding impurities and recycling the plastic content would yield the same recyclability based on the input waste. It would give justified better results if recyclability is calculated on material content in pure material output streams (e.g. iron, plastic, copper, …).	Materials to be recycled generally have some impurities and these will be part of the production process of alloys with sufficient properties. The presence of impurities and the quality of the recycled materials can be captured by downcycling facts.
	17. RRR Methodology	Recyclability and recoverability should be mass based, in the case of chemical modifications or transformations molar based figures or atom efficiencies should be used. Energy recovery should be expressed in joules. It should take into account any waste heat recovery. The recyclability of consumables such as batteries, oil, toner, refrigerants, filters, coffee capsules, …) and packaging should be given, but treated separately. There is a policy need to address consumables, as they are out of the scope of the WEEE Directive and of the Packaging Directive.	Energy produced by energy recovery (in Joules) was considered in RRR Benefits calculations. The two case studies on which RRR and RRR Benefits were tested (LCD-TV and washing machines) did not include consumables.
	18. Flame retardant	Belgian recyclers confirm recycling of plastic containing flame retardant is commonly done.	According to communications for recyclers and data from the scientific literature, selective sorting and recycling of plastic with flame retardants is still currently not widely performed: although some experimental plants have been developed, their performances and representativeness in EU is not clear. Assumptions will be revised when quantitative data and documentation on these innovative processes will be available.
	18. Indium	We investigated the proposal to oblige TV manufacturers to indicate Indium (In) content on their LCD screens. Currently In is not recycled in Belgium, an In declaration on LCDs would not change that. Information could be helpful but it is not seen as a major issue. We didn't find evidence of In recycling elsewhere. A 3 year TNO project investigating possible recycling of In from LCDs would start late 2012.	Recycling of indium is not performed yet, but there are evidences of a growing interest in it. It is highlighted that some recyclers mentioned this as a priority strategy to support Indium recycling (see also other comments from recyclers attached to this log-book)

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1. Belgian Federal Public Service for health, food chain safety an environment	19. Annex	Requirements could be set at the current material cost level to avoid rebound effects. Material efficiency gains by increased recyclability will lower resource prices and thus give rise to higher resource demand (basic economy law). It is assumed that Ecodesign would correct market failures that prevent ecologic and economic benefits in sustainable material management from being made. In this assumption the economies made could be invested in additional End-of-Life (EoL) improvements whilst keeping costs level. In other words more expensive product designs with lower EoL costs to the owner (charges for recyclable waste are reckoned to be less than for residual waste) or responsible producer (e.g. WEEE & Packaging). Further on it is supposed that commodity prices won't decrease and EoL treatment will become less expensive due to economies of scale and innovation. So the overall net benefit of recyclability is expected to grow. 'EoL-efficiency' could be used to determine the level at which minimal reusability/recyclability/recoverability requirements should be set. In the 'EoL-efficiency' approach treatment costs together with the value of the resulting recyclates, the cost of residual waste and the price of virgin material being replaced can be used to identify the optimal set of: • design features, • material use and • waste treatment scenarios. 'EoL-efficiency' for a product gives the amount of materials recycled per euro spent (kg/€ and/or mol/€) for a certain EoL scenario. To calculate optimum EoL-efficiency for the product, consumables (batteries, oil, toner, refrigerants, filters, …) or packaging, EoL cost (€) and recyclability (%) should be estimated for different possible scenarios, e.g.: • Logistics and incineration/landfilling • Logistics separate collection and only metals separation (residuals incineration/landfilling) • Logistics separate collection, shredding and separation (residuals incineration/landfilling) • Logistics separate collection, pre-treatment, shredding and separation (residuals incineration/landfilling) • Logistics separate collection, dedicated disassembly, shredding and separation (residuals incineration/landfilling) 'EoL-efficiency' can be improved by applying: • Environmental Conscious Design (ECD) (changing design, substituting materials) • collaboration between producers and waste management companies • better End-of –Life (EoL) techniques (disassembly, recovery, separation, treatment) • improved separate waste collection (sorting quality, higher volumes). This optimal 'EoL-efficiency' set grants the largest economic benefits when recovered/recycled/reused. A maximal amount of material is estimated to be treated at minimal costs. As explained in the first paragraph minimal recyclability requirements should be set at a level beyond the optimal 'EoL-efficiency' with minimal economical costs to a level with constant economical costs, i.e. the current costs for waste management.	Detailed economic assessment of requirements was out of the scope of the project

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2. CECED (European Committee of Domestic Equipment Manufacturers)	1. Report 2 - General	Which of the potential requirements suggested in each of the case studies seems more robust for early implementation in mandatory and voluntary product's policies and which one requires more work and why?) The household appliance industry supports the ambition to improve the efficient use of resources across all sectors. The JRC research has defined some potential new requirements for energy related products, in order to improve recycling and with a special focus on critical raw materials. JRCs' proposed requirements are based on their identification of areas with the highest potential for improvement. CECED appreciates the fact that a thorough study like this one examines the technical and scientific background of the complex field of resource efficiency. CECED thus has taken the opportunity to review the findings of the JRC work with particular attention on the conclusions of the washing machine case study. The proposed requirements from the washing machine study have three components: - certain components such as electrical circuit boards, motors and LCD screens should be manually dismantled at the recycling stage; - declaration of certain materials; - declaration of recycling ratio. It is impossible to assess the robustness for early implementation in product policy without: 1) Ensuring measurability and comparability – the work needed to ensure a sound basis for measurement and verification across the range of products affected. 2) Benefit analysis to ensure the potential improvements in recyclability are not outweighed by increased resource use at other stages, including new components, production or use phase (with energy efficiency). In addition, as a general remark: new requirements in product policy are not the only way to improve resource efficiency, or maybe not even the key ones. There are improvements that should be made to end-of-life legislation that would enhance levels of recycling and recoverability. Proper recycling at the end-of-life is one of the key element of the resource efficiency, however it is estimated that 2/3 of WEEE escapes official treatment channels and is handled by operators different than producers. Those operators, not under the obligation of the WEEE Directive, are not required to treat WEEE in accordance with treatment requirements. As seen from this, the biggest potential for increasing and improving recycling is by ensuring that all and any WEEE is covered by the same treatment and recovery requirements. Industry has made considerable investments ensuring the recycling and treatment of e-waste. This has been further enhanced in recent years by the development of WEEE handling and treatment standards at EU level through the EU standardization process.	1) Key issues of a procedure for dismantlability have been addressed in Report 2 – Annex 5. Standards for the measurements of the dismantling time could be mandated to CEN/CENELC. 2) the project assesses potential environmental benefits related to requirements on dismantlability, potentially relevant (for precise figures, see the executive summary at the beginning of this report)
	2. Report 2. Section 5.6	The setting of the requirements on recycled content should follow a more comprehensive market analysis to assess: - the availability of recycled plastics for manufacturing, - the technical feasibility of using recycled plastics in the product, - the feasibility of verifying such requirement. With currently established methods it is very difficult to verify recycled content in a material on a product. Ideas about paper trail are either very tricky to verify (inside EU) or even not possible to verify (outside EU).	The case-study illustrated potential benefits in a life-cycle perspective that could be achieved by introducing recycled plastics. --- Difficulties related to the verification have been emphasised in section 5.6. Verification possibilities will have to be carefully considered depending on the different product policies such criteria could be applied under. The requirements on recycled content can be more suitable for some product's policies (e.g. voluntary labelling) rather then others (e.g. mandatory policies).

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2. CECED (European Committee of Domestic Equipment Manufacturers)	3. Report 2 – section 6.2, Table 32	T > x sec or T< x sec. It should be mentioned here, that there is a lack of definition of how this time is measured. This definition should be given in a standard.	The Table relates to the EoL scenario for the product and summarizes the assumptions for the analysis. --- The need of standards for the measurement of disassemblability for some potential requirements has been emphasised in section 6.6.1 and following.
	4. Report 2 – section 6.4, Table 38.	Bottom counterweights (concrete), manual dismantling and landfill, are difficult to process. --- Material recovery e.g. for building industry should be possible.	Potential recycling of concrete is possible (e.g. for construction of roads). However it is not fully established (also due to the low value of this fraction). In some case recyclers separate bottom counterweights in order to avoid contamination of other recyclable fractions or to avoid problems for small shredding plants. However no precise figures are available and data from IEC/TR 62635 have been adopted.
	5. Report 2. Section 6.4.1.2 /3 Table 39/40	Reference/ details for RCR / RVR are taken from IEC 62635. Data is based on current or recent situation – a projection of the future is missing. --- Mention the range of years which the data is based on, mention the need for actualization of the data and/or IEC 62635	(Mentioned in section 6.2)
	6. Report 2 – Section 6.4.2.1	Several assumptions about the manufacturing and use phase: Several assumptions about the use phase: Data taken from a 2005 study. Should be updated with 2012 data. Assumptions about the manufacturing phase are producer specific. Assumptions about the use phase should be in line with EU energy label.	The cited study was provided by the CECED itself and qualified as representative of the current scenario. --- It has been highlighted (section .4.2.1) that a lower consumption during the use-phase will increase the relevance of other life-cycle stages (including EoL).
	7. Report 2 – Section 6.5	Bottom counterweights (cast-iron), landfill. --- Change landfill to recycling.	(Corrected)
	8. report 2 –Section 6.6	Resource efficiency requirements on design have to be balanced with other design aspects. New requirements, for example on the design to potentially facilitate manual disassembly, should take into account the overall life cycle performance of a product. The potential environmental benefit of new requirements needs to be weighed against possible design constraints affecting other regulated areas, for example environmental performance already within the existing requirements, such as for energy and water. Other factors to be considered are safety and restricted substances. There must be much more research carried out to assess the impact of new requirements such as disassembly on other dimensions like performance. Requirements on disassembly and associated declarations to be made by manufacturers must be realistic, measureable, comparable and verifiable taking into account the state-of-the-art. This will require the development of standards to set a common basis. For requirements to be effectively measured, the methodologies must be based on a recognised standard, preferably established at international level.	Life-cycle impacts of requirements have been considered as far as possible with data and resources available. According to a qualitative analysis from references, the design for disassembly of PCBs would require minor efforts to be implemented and this should not interfere with the performance of the WMs (including environmental performance) --- The need of standards for the verification has been underlined in the report (including the new annex 4 of report 2).

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2. CECED (European Committee of Domestic Equipment Manufacturers)	9. report 2 –Section 6.6.1	The WEEE Directive already imposes that PCBs are separated. However, this is done in different ways. The WEEE Directive does not ask for intact PCBs to be separated but only that PCBs should be separated. Thus some recyclers first shred and then manually or with technical means sort the PCB fragments. Requirements on design for disassembly of PCBs must be measureable, comparable and verifiable. This will require the development of standards to set a common basis. The development of standard should be proposed to the competent bodies – CEN/CENELEC. If a standard is used it will need to keep up with technology development. Timings cannot be seen as 'one size fits all' – requirement for washing machines must be adapted to suit other products – each product would require a separate standard for disassembly. Setting quantitative targets in seconds need to refer to a standard procedure and tools. With several different requirements on one product (for motor, LCD, PCB), all requirements should be in one and same disassembly standard, for example for a washing machine. However, the measurement uncertainty associated with different people in different laboratories carrying out disassembly may be high. Design for disassembly generally does not exist, and is today not a part of product development.	Recent scientific publications (e.g. [Chancerel et al, 2009]) show that pre-shredding followed by manual sorting has lower yields than full manual extraction (Report n° 3 – page 35). The need of standards for disassemblability has been underlined in the text (including also the definition of the tools to be used and experience of disassemblers). --- Some procedural key points for the disassemblability have been illustrated in the new Annex 4. Further research on the topic will be performed in next phases of the research
	10. report 2 –Section 6.6.2	Requirements on design for disassembly of LCD must be measureable, comparable and verifiable. This will require the development of standards to set a common basis. For requirements to be effectively measured, the methodologies must be based on a recognized standard.	(The need for a standardized procedure has been underlined in section 6.6.2)
	11. report 2 –Section 6.6.3	Requirements on design for disassembly of motors must be measureable, comparable and verifiable. This will require the development of standards to set a common basis. For requirements to be effectively measured, the methodologies must be based on a recognised standard.	(The need for a standardized procedure has been underlined in section 6.6.3)
	12. report 2 –Section 6.6.4.1	Requirements on manufacturers to declare the content of rare earth in WMs motors must be measureable, comparable and verifiable. This will require the development of standards to set a common basis. Requirements on declaration of content must be matched by the ability of market enforcement to test products to verify or falsify any declaration. Perhaps it would be better to try and incorporate any rare earth declaration within the structure already in place for REACH.	(The need for a standardized procedure has been underlined in section 6.6.4.1 The possibility to use the structure in place for REACH will be investigated will be investigated in next phases of the project)
	13. report 2 –Section 6.6.4.4	Requirements on manufacturers to declare the recyclability benefit rate must be measureable, comparable and verifiable. This will require the development of standards to set a common basis. The WEEE Directive already requires that a certain level of recycling is met by manufacturers. Today's WEEE recycling technology allows for the recovery of up to 95% of the base materials. It should be assessed if setting recyclability requirement in product legislation will really bring additional benefits than those already being experienced under the WEEE Directive. When the WEEE Directive was created a target on recycling was set rather than on recyclability as it would immediately bring results as it was applicable to waste coming back rather than a future requirement on the recyclability of products being put on the market.	The WEEE Directive refers to the recycling rates while the methodology here introduced relates to the recyclability as potential. The objective of setting potential requirements on recyclability is to improve the potential of products to be recycled and, therefore, to increase the amount and also the "quality" of the recycled materials. The setting of requirements on the recyclability benefits is, however, related to the development of specific databases for the calculation.
	14. report 2 –Section 6.7	Industry supports the concept of a circular economy for materials and welcomes the return to market of materials that are used in the products we produce. There is a concern however that some of the results from the study seem to be based on political rather than environmental motives. It is perfectly valid for countries and continents to secure resources that are needed for the economy of those states or unions but we would raise the issue that there needs to be a clear link to the benefits for environment and resource recovery rather than financial incentives that have no environmental benefit.	The study is based on scientific results, and all the evaluations are based the environmental life-cycle approach (including resource depletion indicators). The definition of critical materials is out of the scope of the study

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2. CECED (European Committee of Domestic Equipment Manufacturers)	15. report 2 –Section 6.7	There must be much more research and development carried out for new requirements on disassembly of PCBs, motors and LCD screens. Benefit analysis is critical to ensure the potential improvements in recyclability and associated benefits are not outweighed by increased resource use at other stages, including production, use phase (with energy efficiency) or new components. For most appliances covered (and regulated) by the Eco Design Directive today, energy consumption in the use phase is by far the overriding environmental aspect according to the preparatory studies carried out under the Directive. Any future action on resource efficiency must therefore fully acknowledge these findings, demonstrate significant potential for improvement without entailing excessive costs from a life cycle perspective and must not lead to isolated resource efficiency measures that would undermine energy efficiency or other relevant product characteristics. Requirements on design for facilitating manual disassembly will not ensure that manual disassembly really takes place. There is nothing to prevent the recycler to just shred the waste products - products that manufacturers would have designed for manual disassembly. The time lag between legislation and its effect has to be considered: Legislative acts implemented today will start to significantly affect the reality of recycling activities in 10 to 15 years. Recyclers like any other industry, continuously work to improve efficiency. This usually means eliminating labour cost such as manual disassembly. It is hard to see this change, so we can expect a continued push for shredding – or other means of mechanical disassembly - replacing manual disassembly. The concern for the recyclers is not manual or mechanical. The recycler is trying to optimise the balance of treatment cost-output value. Different actors find the balance slightly different - saving on treatment will give lower income from the output material, while maximising output value will increase treatment cost. The main interest for the recycler is to have products and materials that are easy to separate, so maybe "separability" - with whatever means, manual or mechanical - rather than "disassemblability" should be the requirement. Instead of going straight for design for disassembly we should also consider stricter requirements on EOL treatment. For instance mercury in lamps (could be any other example). It is not important if this is done manually, it is important that the mercury is removed. As such we should focus on the EOL treatment standards for these waste streams. If recyclers need to improve their processes to meet the new targets these costs will come back to producers anyway. Producers can then decide if it makes more sense to change their design or to accept the higher treatment cost. The end result will be the same as the treatment requirement must be met.	New research will be performed on the topic including the development of standard to allow measurement and verification. Concerning impacts of products, the relevance of some life-cycle stages is related to the selected impact categories. For example, manufacturing and EoL are more relevant than the use phase in terms of resource depletion. Concerning the term “disassemblability” it has been introduced because more general (for example including also reversible disassembly necessary for requirements on durability). However the use of new terms as “separability” or “dismantlability” will be considered. The requirement on disassemblability of components is not extended to all the product but only some components that currently are disassembled before processing because this optimize the performance of the recycling process (both in terms of resource efficiency and economic profits). Products designed to be disassembled/dismantled could also be shredded: this has been taken into account in the study, by introducing the shredding based scenario in the evaluation of potential benefits.
	16. Report 3 – executive summary	The methodologies for the RRR have been largely revised, aligning them as far as possible to the IEC/TR 62635. The data collected for the preparing of the methodologies in the IEC Technical Report (TR) should be verified to ensure it fully representative of the EU situation. Additionally, the time lag between legislation and its effect has to be considered. Legislative acts implemented today will start to significantly affect the reality in recycling in 10 to 15 years. As the database of IEC/TR 62635 is based on current (or recent) situation data need to be coming from a projection 10-15 years into the future. Further research is recommended. Technical Report (TR) cannot itself be used to determine compliance and so further work would be needed to convert this to a European standard once the legislative requirements (if any) are known.	Further research will we performed, including the revision of recycling rates. The methodology developed in the study is however used as a tool to analyze the product and to identify product’s “hot spots”
	17. Report 3 – executive summary	Recycled content is not a criterion that should be considered within product legislation. Enforcement and verification of recycled content may be difficult. Manufacturers cannot assure that suppliers of components they use have correctly declared recycled content. Market enforcement cannot test on the product to confirm or challenge conformity with requirement. Thus a stewardship approach may be more appropriate than legislative requirements.	Verification possibilities will have to be carefully considered depending on the different product policies such criteria could be applied under. The requirements on recycled content can be more suitable for some product’s policies (e.g. voluntary labelling) rather then others (e.g. mandatory policies).

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2. CECED (European Committee of Domestic Equipment Manufacturers)	18. Report 3 – executive summary	Durability - it needs to be appreciated that some large household appliances may have an average lifespan of 15 years. In most cases it does not make sense to extend the life of a product if the replacement new product is meeting higher energy efficiency, safety and restrictions of hazardous substances requirements. Durability criteria may be better suited to products that have a shorter lifetime and low recycling rate (based on experience, the amount of scrapped WMs being recycled should be close to 100%). We appreciate the insight given by the JRC on their thinking towards durability and value the general direction that this research has taken. However current findings need further assessment of all the environmental factors before decisions can be taken on investing in extending the life of a product over the benefits of a new product, especially the example given on washing machines. Environmental considerations need to take into account areas such as energy, hazardous materials, material content and functionality to give a clearer picture for this equation. We would welcome future dialogue on this research to aid the decision making process.	The need of durable products is a very sensitive issues raised by several stakeholders. The method developed is useful to answer to some key questions on durability such as whether it make send to seek to extend lifetime of a product from a LCA perspective or not. The answer to this question will be fundamental to consider further whether to explore lifetime extension strategies for a particular product. Indeed there are other additional factors that also need to be considered in addition to applying the methodology developed by the study (as e.g. functionality, change in the legislations, user's behaviours). Such additional factors have not been addressed in this study. Cooperation with manufacturers to refine and test the methodology is welcome.
	19. Report 3 – section 1.4.1	Calculations should be supported by technical documentation, including Bill of Material of the product (evidencing parts/components that are potentially reusable). However, there is no proposal of how a Bill of Material should be communicated or transferred between producers and recyclers.	Conditions for the reusability of parts have been established by the IEC/TR 62635. It is not necessary to provide a full bill of materials, but the mass detail of parts reusable. --- The text has been clarified
	20. Report 3 - Section 4.2.2	Since the WEEE Directive came into force in 2003, the industry has been responsible for ensuring appropriate recycling and treatment of WEEE. This has mainly been done through the establishment and/or funding of treatment via a network of WEEE compliance schemes across the European Union. The industry currently recycles more than 3 million tonnes of WEEE annually. Proper recycling at the end-of-life is one of the key element of the resource efficiency, however it is estimated that 2/3 of WEEE escapes official treatment channels and is handled by operators different than producers. Those operators, not under the obligation of the WEEE Directive, are not required to treat WEEE in accordance with treatment requirements. As seen from this, the biggest potential for increasing and improving recycling is by ensuring all and any WEEE is covered by the same treatment and recovery requirement.	We agree that a proper collection of WEEE is a key issue. However, this is out of the scope of the project. Easy and economically viable dismantlability of products is also a key feature and this has been the subject of this study.
	21. Report 3 – section 4.2.6, Table 9	Table 9 - Example of data format to provide information to recyclers about hazardous substances in the product (modified from draft [IEC/TR 62635, 2012]) --- Label has to be harmonised with WEEE Marking and F-gas label.	(A note was added to the text mentioning that the provision of information should be also aligned to requirements from the legislation in force as, for example, the Directive 2012/19/EU (WEEE) and the Regulation (EC) No 842/2006 on fluorinated greenhouse gases)
3. CEFIC	1. Reports 2 and 3 - General	As a general statement, resource efficiency should be upgraded through feasible, practical and cost-effective pathways; impact of the proposed changes on competitiveness (no unilateral cost for the EU economy) should be analysed. The whole value chain has to be considered including consumers' role.	Competitiveness and profitability are important issues. This project focused mostly on methodologies and their application, more than the general assessment of resource efficiency.
	2. Reports 2 and 3 - General	Recycling, recovery and re-use should be based on the most resource-efficient measures taking into account systems in place. Profitability is an important element to consider. Such systems are not uniformly available within the EU and should be as well developed or promoted at the same time as EU policies like eco-design are adapted.	
	3. Reports 2 and 3 - General	Chemicals should only be considered when the risk during any of the life-cycle step is not acceptable and when they do represent a hotspot in the life-cycle approach. Data available from REACH dossiers should be used as preferred reference.	Management of chemicals is indeed covered by various EU policies. Being the study focused on waste management criteria, hazardous substances have been considered relevant when representing an issue for EoL treatments. Other potentially relevant aspects hazardous substances (including their toxicity or their threshold in products) were out of the scope.

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3. CEFIC	4. Reports 2 and 3 - General	Cefic would have preferred to get more time to be able to comment on the criteria as they are now covering chemical aspects. Science-based criteria and complete life-cycle approach should be used; hotspots should be clearly identified. Measurements of compliance should be strong enough to avoid soft implementation or cheating as well as discrepancies among interpretation.	-
4. Centre for Remanufacturing and Reuse	1. General	Re-usability is only considered at a component level in the case studies. However the reusing of whole products is not considered. This is likely to be environmentally preferable to reuse of components and should be both considered within the study and preferred --- Consider reuse of whole product	The RRR and RRRBenefits only cover the re-use of components. Some of the key issues of reuse have been considered in the "Durability" assessment (presented in Report No1, which was not part of the stakeholder consultation).
	2. General	Generally the discussion of reuse is superficial compared to the discussion of material recycling. It does not address many of the key issues around optimisation of environmental impact through product or component reuse such as the trade-off between rate of efficiency improvement and product life extension. --- Incorporate discussion of trade off between product longevity, rate of increase of energy efficiency over time and potential for product upgradeability through design	Indices on re-usability were not discussed for the two case studies, because considered EoL scenarios did not allow to do so. Other case studies with EoL scenarios considering re-use of components would allow this discussion. These aspects are however addressed in the Report No1 on Durability that has been published after the stakeholder consultation.
	3. General	The washing machine case study only considers reuse of components. Repair and remanufacture of washing machines at end of life is likely to be environmentally beneficial than use of components (although this calculation can be complex). It is clearly taking place commercially also, and the study should acknowledge this. The key assumption is stated on p89 in a footnote: "66 Note that the reuse of products includes several different activities e.g. the partial or full reuse of a product, the remanufacturing, and the refurbishment for the production of second-hand products or for humanitarian purposes. However, here is only considered the partial or full reuse of products by the company itself that manufactured the product. For further details, see EP1 – Reports n° 1 and 2." The highlighted assumption shows a lack of understanding of how the remanufacturing and reuse markets work. Washing machine manufacturers do not use used components in primary manufacture at present, and it is difficult to conceive of this practice becoming widespread in the short term. But washing machines are fully refurbished and remanufactured by other organisations, or are disassembled for components which are used for repair or in refurbishment. The reality of these operations is not acknowledged in the case study, nor their environmental benefit. This false assumption is also extended to LCD screens. The study needs to consider the wider use of components and products by organisations other than the company that manufactured the product. It is possible for manufacturing companies to participate in systems that engage in or encourage reuse of products or components, even if they do not carry out remanufacturing or use salvaged components themselves, these operations being carried out by third party independent or contracted organisations. --- Re-run case studies incorporating more realistic scenarios for reuse and remanufacture. Remove restriction that components must be reused by the original manufacturing company	Same answer as above. The note 66 has been revised.
	4. General	It is a pity that the case study on imaging equipment only considers recycled content. Consideration of reuse in this product class would have been highly relevant, particularly as reuse of components by manufacturers does take place (for example with the well known example of Xerox and photocopiers), as well as remanufacture of the complete product (for example by Oce, a division of Canon, and by Minolta, as well as by a much larger group of independent remanufacturers). The same criticism identified in (3) also applies to this product group. ---- Select a new case study in imaging in which reuse of components and product is considered	Indeed some imaging equipment case-studies can be relevant for reuse. However this analysis was a simplified case-study, based only on data from the literature (preparatory study) and specifically focused to recycled content due to time and resource constraint for the project.

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
4. Centre for Remanufacturing and Reuse	5. General	Overall, the lack of incorporation of reuse and remanufacturing processes in an operationally relevant way, and an assumption that the manufacturing company is the sole possible processor of components or products (an assumption that is not extended to the recycling of materials) creates the possibility of perverse environmental outcomes. The case studies should consider the wider reuse and remanufacturing system that these products reside in at present and that could be both extended and deepened to give greater environmental benefits. --- Consideration of the wider reuse and remanufacturing system,	Same answer as above
5. Digital Europe	1. Case-study LCD-TV	New requirements in product policy are not the only way to improve resource efficiency, or maybe not even the key ones. There are improvements that should be made to end of life legislation that would enhance levels of recycling and recoverability. If new requirements are proposed, for example on the design to potentially facilitate manual disassembly, these should take into account the overall life cycle performance of a product. The potential environmental benefit of new requirements needs to be weighed against possible design constraints affecting other environmental performance particularly performance already within the existing requirements, such as for energy and water. There must be much more research and development carried out to assess the feasibility of new requirements such as disassembly. Requirements on disassembly and associated declarations to be made by manufacturers must be measureable, comparable and verifiable. This will require the development of standards to set a common basis. For requirements to be effectively measured, the methodologies must be based on a recognised standard, preferably established at international level. It is worth considering that requirements on design for facilitating manual disassembly will not ensure that manual disassembly really takes place. There is nothing to prevent the recycler to just shred the waste products - products that manufacturers would have designed for manual disassembly. The concern for the recyclers is not manual or mechanical. The main interest for the recycler is to have products and materials that are easy to separate, so maybe "separability" - with whatever means, manual or mechanical - rather than "disassemblability" should be the requirement. The case study on TV was conducted based on a lot of assumptions and information whose sources are not clearly indicated or verified. Therefore, it is hard to judge whether the recommendations it is making are robust enough.	Overall life-cycle performances of the product are considered in the methodology. Design constraints for new requirements have been qualitatively estimated. New research will be performed on the topic including the development of standard to allow measurement and verification. Concerning the term “disassemblability” it has been introduced because more general (for example including also reversible disassembly necessary for requirements on durability). However the use of new terms as “separability” or “dismantlability” will be considered in the next phases of the project.. The data used for the analysis were always presented transparently with references. The bill of materials of the TV has been derived by direct measurement (in a recycling plant). The details of the studied product (including the brand) were not disclosed for confidential reasons.
	2. Case-study LCD-TV	The TV study has been based upon a single, 20” CCFL back-lit model and is not representative of the current and future situation which will consist of larger screen, LED-backlit TVs. Therefore the conclusions drawn are fundamentally flawed, for example: - CCFL back light technology is becoming obsolete, so the conclusions drawn from the difficulties in recycling mercury and its necessary separation process will have little if no impact for future eco-design requirements. - The report states that more than 1.5kg of PMMA material is used in the panel guide light of the TV sample. Whilst this figure may have been correct for this (assumed to be old) 20” CCFL model, where the guide light may have been 12mm or so thick, a modern 20” TV with more efficient LED backlights would contain less than 500g. Therefore the emphasis upon PMMA throughout the report has been exaggerated. - As LED back-lit TVs are significantly thinner than CCFL types they use much less plastic material in the enclosures than has been reported. - A large part of the plastic recyclability potential assumed that the large plastic parts (rear-cover, bezel etc.) did not contain flame retardants. However, in order to satisfy today’s safety standards, we must use flame retardants so this would change the recommendations considerably. - The use phase of the TV is greatly exaggerated. It is claimed its on-mode power is 65W, which for a 20” TV would equate to an “G” energy grade, which is outside of today’s minimum requirements. Using an “A” grade power of 20W would decrease the in-use phase to a third.	The analysis was based on available data on the case-study product and its technical characteristics. DE was invited to provide data. If different products and technologies would be considered, a new analysis should be performed. Some requirements (as those about mercury) could be no relevant anymore but other potential requirements could raise (e.g. related to critical raw materials contained in LED). --- It has been highlighted (section 7.4.2.1) that reducing the impact during the use phase will increase significantly the relevance of other phases, including the management of the End-of-Life of the product.

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
5. Digital Europe	3. Case-study LCD-TV	It is difficult to follow the connection between the equations for RRR and the findings from the TV analysis. As an example Indium was highlighted as an outcome for the TV research but this does not seem to be based on the RRR equation and there is no existing technology to extract the metal.	The Recyclability is a potential and therefore also based of possible changes in recycling rates and how these could affect the considered indexes. The relevance of indium in the LCD has been evidenced by the analysis of the recyclability product (LCD currently not recycled also due to low information on their composition). The suggested potential requirement on declaration has been evidenced by recyclers as a possible way to promote the development of technologies for recycling LCD. --- Clarified in section 7.6.2.
	4. Case-study LCD-TV	Some of the recommendations are already applied in practice such as the plastics marking with the majority of TV makers in DIGITALEUROPE following the ISO-1043 series.	Indeed several plastic parts are marked but, as evidenced by recyclers, this is sometimes not effective (not clear marking). --- It is clarified that an improved marking (e.g. more visible and accessible) related to relevant plastic parts (section 7.6.3).
	5. Case-study LCD-TV	The report assumes that all LCD TVs are manually dismantled and all conclusions are more or less based on this assumption. Instead of going straight for design for disassembly we should also consider stricter requirements on EoL treatment, for instance mercury in lamps. It is not important if this is done manually, it is important that the mercury is removed. As such we should focus on the EOL treatment standards for these waste streams.	Based on communications from recyclers and associations of recyclers, manual dismantling of the LCD-TV is by far the most used treatment. Some automatic plants have been developed but these are only at the experimental level, and affected by various problems for the removal of mercury from residuals (see e.g. [EMPA,2011] cited in the section 7.5)
	6. Case-study LCD-TV	Requiring calculations of recycling rates based on weight is not useful. Improving the recycling rate of a product is easy, simply replace all plastics by steel and you are done. However, lifecycle impact of the product will increase. Also, recycling rates based on weights are not accurate as it forces the recycling industry to focus on heavy materials instead of environmentally important materials (for instance the mercury or rare earths). Instead, we need to think about the critical/hazardous materials in the products and push for improvements in their recovery	This is the reason why an environmentally based index (RRRBenefits) has been developed as part of this project. The recyclability by mass is however useful to some target as reducing the overall amount of generated waste or to improve the recyclability of some specific materials/parts (e.g. LCD, plastics).
	7. Case-study LCD-TV	It should be noted that it is very difficult and often impossible for makers to obtain the detailed breakdown of materials used and other similar information required by the study from their component suppliers due to confidentiality concerns. There is no legal obligation for component suppliers to share this information today (example, REACH obliges the declaration of only >0.1% threshold). Furthermore we question the added value of having the chemical content in detail. Will recyclers really have a look at it in detail as their processes are based on big volumes and generic values? These generic values are well known (they are used as basis for the JRC study)	It is not requested to declare all the substances but some relevant substances (e.g. Critical Raw Materials in certain key components). It is also highlighted that similar requirements have been introduced for some hazardous substances (e.g. mercury in the lamps)
	8. Report 3 – page 85	*Reuse: Operation by which a product, or a part thereof, having reached the end of one use-stage is used again for the same purpose for which it was conceived*. Please note this does not make sense and needs further clarity.	The definition is derived from the cited international standard (draft IEC/TR 62635)
	9. Report 3 – page 85	*Reusable part: Part of the product that has been specifically designed to be potentially reused.* This is a very vague definition, please clarify with examples, would RAM memory be an example of this?	The index on reusability considers only post-consumer waste parts that are designed to be reused for the remanufacturing of new products. --- Definition has been clarified in page 85 and section 1.3.1.
	10. Report 3 – page 85	*Reusability: Ability of a waste product to be reused.* This needs clarification over what is waste 'broken or non functioning' and what is no longer wanted but still functions and then becomes waste. These definitions need further clarification for a manufacturer to undertake the verification.	(Definition of ISO 22628, 2002 has been inserted in the text).

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
5. Digital Europe	11. Report 3 – page 85	*Bill of material of the product (evidencing components that are reusable)* How does the Bill of Materials provide evidence that the component is reusable? Industry is concerned with the provision of Bill of Materials to market surveillance authorities. Bill of materials are the core of intellectual property for businesses and the potential leaking or sharing of this information could cause serious damage to a company. This is especially significant with a company's latest products as patents may be pending. Industry would be interested to know what levels of safeguards would be put in place to ensure sensitive information is protected and if there are alternatives that could be put forward to minimise these risks to a company's confidential information being shared.	It is not requested to companies to provide a full Bill of materials of product. This guidance is how to calculate the reusability index. It is possible to state if a part is reusable based on the supporting technical documentation (also according to IEC/TR 62635). --- The text has been clarified.
	12. Report 3 – page 85	*- (in cases where the product is not reusable as whole) Disassembly information, proving that binding systems are reversible and the reusable component can be accessed and disassembled by a technician.* Please note this is a subjective requirement, the equipment may be reusable if repaired but there may be no market	Reuse of product as whole (e.g. for second-hand market) is not considered by this study. The index refers only to reuse of parts for remanufacturing of new products. --- The text has been clarified.
	13. Report 3 – page 85	*Provision of evidences that a commercial reuse and refurbishment system has been established. This can take the form of contracts with commercial partners, availability of refurbished parts in the marketplace, or other evidence that there is an established system.* Is this the responsibility of the Manufacturer, please clarify who you expect undertakes the assessment, do you propose that these methods are undertaken by a third party?	The report n° 3 does not refer to requirements but to methodologies. The section here illustrates what documentation can be used to establish if a part is reusable. The sentence refers to the IEC/TR 62635.
	14. Report 3 – page 86	Please note that a manufacturer would not be able to undertake this task without guidance from the waste industry	The methodology is based on IEC/TR 62635. The implementation of the methodology would require databases. IEC/TR 62635 currently provides only some partial databases.
	15. Report 3 – page 87	There is an assumption that a recycler would be able to make technical decisions over recyclability of components from the bill of materials of a product; the bill of materials does not provide location or interconnectivity between the parts. Most bills of materials will go to part level and not the composition of the parts	We agree that Bill of Materials alone is not sufficient. For this reason it is written that the Bill of Materials should be coupled with other information (e.g. disassembly information of parts for selective treatments, selective recycling, difficult to process and parts for material separation). The procedure is derived from IEC/TR 62635
	16. Report 3 – page 71 onwards	As regards durability, the findings need further refining of all the environmental factors before decisions can be taken over investing in extending the life of a product over the benefits of a new product especially the example given on washing machines. Environmental considerations need to take into account areas such as energy, hazardous materials, material content and functionality to give a clearer picture for this equation. We would welcome future dialogue on this research to aid the decision making process. It should also be noted that in many cases we can foresee the problem that a TV that has been repaired could not be returned to the market as it may not be able to meet, for example EMC, ErP etc requirements introduced after it was originally placed on the market.	Durability is a complex concept (as underlined in Report 1 and 3). However, in order to support the environmental assessment, the analysis has been restricted to some assumptions. In particular the scope was to establish if the potential extension of the life of a product can produce benefits. How this extension could be achieved and if it makes sense from other points of view (e.g. fashion issues) is instead broader topic. Further research on the topic and cooperation with association is welcome.
6. European Aluminium Association and Eurofer	1. General	The metal industry welcomes the initiative of the European commission to integrate resource efficiency and waste management criteria in European product policies. Since decades, metals are being recycled in a profitable way without losses of quality. Metals keep their original performance properties, even after multiple recycling loops, because metallic bonds are restored through melting. This allows them to be recycled into similar applications.	-

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
6. European Aluminium Association and Eurofer	2. Recyclability definition	Recyclability should integrate profitability The profitability of the waste treatment is definitely a pre-requisite of a realistic end of life in which the cost of the recycling operations has to be balanced by the economic benefits related to the avoided landfilling as well as by the economic value of the secondary materials which are generated. If the balance of the costs is negative, the end of life stage is not profitable and will not take place. In that case, only a specific waste product policy, e.g. like the "green dot" scheme for packaging material or incentives to promote a market for secondary materials, could secure the recycling or treatment of these products. ---- Metal product or metal components at the end of their life, i.e. metal scrap, are profitably used to produce new metal products. The collection and the preparatory operations like sorting and shredding are ensured by the economic convenience of using metals scrap (i.e. economic value of scrap). Hence, from a practical approach, it appears essential to associate the economic dimension of recycling to the "recyclability" term, i.e. taking into account the "profitability" of the recycling operations. If this connection is not done, the terminology of the "recyclability" does not make sense.	Profitability is already part of the method.. The economic viability of recycling processes is an essential pre-requisite for the setting of the EoL scenario, as basis for any further calculation.
	3. Recyclability should integrate the environmental relevance of recycling	The recyclability of metals is quite obvious because the environmental benefits linked to their recycling are significant. However, the term "recyclable" is currently used by many products or materials without any reference to the environmental relevance of the end of life recycling. Hence, the metal industry recommends introducing the notion of "environmental soundness" to the recyclability of materials or products.	This has been done by the project by developing environmental based indexes (e.g. the Recyclability benefit index)
	4. Alternative definition for "recyclability"	The metal industry proposes then the following alternative definition for "recyclability" (yellow parts are added compared to the original proposal) --- Recyclability: ability of a waste product to be recycled on a profitable and environmentally sound basis under actual practices and market.	The definition is based on standard IEC/TR 65635 and therefore it has been not changed. --- Suggested changes have been inserted as additional consideration in a note (page 13).

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
6. European Aluminium Association and Eurofer	5. Recyclability Benefit rate	The metal industry welcomes the idea to address not only the end of life stage from a quantitative dimension but also on a qualitative dimension. However, the proposed concept and equation appear complex, difficult to apply into the practice and technically not persuasive. In addition, the metal industry considers that the "Recyclability Benefit rate" should be evaluated independently from its use phase: the current equation applied to 2 similar products, i.e. similar design and similar bill of material, but having two different energy efficiencies during the use phase, will give a higher result for the less energy intensive product. Hence, the metal industry strongly recommends removing the use phase from the equation. Moreover, it is also quite strange that the current equation can lead to rates exceeding 100% for several LCA impact indicators. --- Simplified equation proposal (formula 15, page 42) The simplified equation reported in Formula 15 appears much more applicable while still addressing the objective of this indicator, i.e. prioritising the recycling operations towards materials where recycling presents environmental advantages. Considering that the impact of the recycling operations is quite difficult to assess, it is proposed to neglect the impact of recycling operations as already done in Formula 14 in page 41. The loss of quality (k) could be kept in the equation in order to reflect a possible down-cycling impeding a substitution of primary material by secondary materials. Hence, the metal industry would propose the following alternative equation to equation 15: $$R'_{cyc,n} = \frac{\sum_{j=1}^{P}\sum_{i=1}^{N} m_{recy,j,i} \cdot RCR_{i,j} \cdot k_i \cdot V_{n,i,j}}{\sum_{j=1}^{P}\sum_{i=1}^{N} m_{i,j} \cdot V_{n,i,j}}$$ This equation directly reflects the need to maximise the end of life recycling rate of materials presenting a high environmental impact for their virgin production. It solves the issue of data availability for most materials (R: impact category for the recycling of the material; D: impact category for the disposal of the material; M: impact category for the manufacturing of the material; U: impact category for the use of the product) and focuses on some of the key aspects addressed by the Resource Efficiency Roadmap: reuse of waste, limitation of landfilling and promotion of circular economy. Moreover, in no case, this rate can exceed 100%. This last aspect is not of secondary importance; in fact, in an ideal scenario, all materials would be recycled with an end of life recycling rate of 100% without any losses and quality degradation. In such ideal case, the recycling benefits are equal to the environmental impact of the production of the various materials and the "recyclability benefits rate" would be equal to 100%. However, in reality, the end of life recycling rate of the various materials are not equal to 100% and some material degradation may take place. The loss of material and the quality degradation through recycling are then considered in the proposed equation according to their environmental relevance. A similar equation can be developed also for the "reusability benefit rate", including then also the impact of the product manufacturing and not only the virgin material production.	The initial methods proposed in project EP1 have been refined here to include also the use phase, according also to some comments received. The objective of the method is, in fact, to estimate the benefits of some ecodesign requirements in a life-cycle perspective. Therefore, a full life-cycle is necessary, also as established by the Ecodesign Directive. This is also in line with recommendations of ISO/TR 14062 for the setting of ecodesign requirements (cited in Report 3 – introduction). It is not clear how the formula can have results higher than 100% (being the numerator built on similar values of the denominator, multiplied by factors <1). No values higher than 100% have been detected in the case-studies. The additional formulas proposed represent a set of possible alternatives (according to the scope of the analysis) and these have been presented and discussed. We still consider that the formula 12 is the most general and comprehensive and therefore the most suitable for product's policies. The terms of the formula are not complex (in line with terms normally in use in LCA studies). However simplifications can be applied in case-studies due to data availability. Finally in some cases it is necessary also to consider downcycling effects and also what the recycled materials is going to replace (not necessarily the original function of the material.
	6. Materials suitable for recycled content requirements (see 3.2.2 page 53)	The metal industry welcomes the recommendations that recycled content (RC) requirements should be restricted to plastics and/or technical glass. RC is an indicator which is inappropriate for metal products. Hence, the metal industry recommends adding the following statement at the top of the page 94 and 95: "May make sense only to recycling markets which are not profitable nor mature"	(The comment has been added in notes)

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
7. European Environmental Bureau (EEB)	1. General	EEB welcomes and supports the approach adopted by JRC to investigate how to better integrate resources use requirements in Ecodesign policy. EEB believes this work could be a crucial step to grasp the opportunities for product design optimization for resources use and end of life management, particularly for ICT products.	-
	2. General	EEB acknowledges the efforts performed by the JRC team to align their methodological proposals with Ecodesign policy (aims, constraints and procedures), despite the need for improving further consistency between the specific Ecodesign methodology (MEErP) and the assessment tools used in this report (referring more to EC LCA handbook impact categories). EEB also welcomes the efforts to align with (draft) international standard IEC/TR62635 to deploy the methodologies, potentially paving the way for increased ownership by worldwide manufacturers.	-
	3. General	As regard the environmental dimensions investigated in this report, EEB is glad that a focus has been made on abiotic material use, as this is at the crossroad of different EU initiatives (Resources Efficiency Roadmap, Raw Material Initiative, Greening ICT …). However, EEB considers that the first R (= reusability) has been neglected compared to the 2 other R's (= recyclability and recoverability), and that hazardous contents considerations have been weakened in comparison to Phase 1 of this work. EEB also thinks that more needs to be done on durability dimension (*but the limits were clearly expressed by JRC team which had not time yet to fully investigate this last dimension*).	The RRR and RRRBenefits only cover the re-use of components. However, selected case-studies were not relevant for reuse. Some of the key issues of reuse have been considered in the "Durability" assessment (presented in Report No1, which was not part of the stakeholder consultation). Although the developments of EP1 remain valid, hazardous substances were considered only for the EoL phase since it was judged that only this phase could be more synergetic with and avoid duplication with existing legislation (e.g. ROHS, REACH, WEEE). Relationships with these pieces of legislation and product policies will have however to be investigated in the future.
	4. General	As regards, proposed potential requirements, EEB deems relevant to address "*disassemblability*" of products, as product disassembling is a cornerstone for potential reusability & recoverability of products, as well as their decontamination and extended duration (reparability, upgradability). *(In addition disassembly can take place at local level, creating potential local jobs)*. However, the possible adaptation of the suggested disassembly requirements to "soft" shredding, or other mechanical material separation processes, should be explored soon, in order to integrate this emerging technology, enabling to separate materials without undermining their recoverability. EEB also appreciates that plastic recyclability has been considered. In fact, both critical material recovery - made possible through proper disassembly- and plastic recyclability are not really addressed by any other EU regulatory or incentives instrument so far (even though some Ecolabel criteria could be very close). In that perspective, EEB strongly supports the suggested information requirements, such as providing product BOM and disassembly scheme as well as the marking of plastics. While the verification of recycled content proposals seem more challenging for a proper enforcement, the potential benefit of recycled content requirements for saving embedded energy and GHG emissions, linked with manufacturing stage, represent an interesting aspect to link energy and resources policy. EEB is convinced that enforceability could be eased by referring to standard or certification scheme (such as the Californian standard mentioned by the JRC team, or the new EUCertplast certification scheme proposed by some plastic recyclers at EU level, or the EPEAT dimension for post consumer plastic use in product.).	We generally agree on these comments from EEB. Concerning the soft (slow) shredding, it has been investigated in the study although differently mentioned as "pre-shredding", being this generally a pre-treatment before fine shredding of the product. Performances of pre-shredding have been analyzed especially in relation to losses of precious metals. --- Pre-shredding/slow shredding clarified in a note to section 6.2.2.
7. European Environmental Bureau (EEB)	5. General	As a consequence, EEB considers it's now time to start implementing some of the requirements suggested by JRC team, using the nowadays opportunities, mainly the definition of implementing measures - or VA's - for ICT products within Ecodesign implementation framework. This should happen by prioritizing the more mature requirements suggested by JRC, and possibly by adopting a two step approach: asking first some standard information (*information requirements*) to have the manufacturers get used to the methodologies and measurement methods, then setting specific requirements for resources use performances.	-

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
7. European Environmental Bureau (EEB)	6. General	A very important point according to EEB is to ensure the proper resources dedication for complementing Ecodesign implementation measures with resources use requirements. The adequate resources should be allocated during the preparatory study stage – or preparatory revision stage; the adequate resources should also be allocated during the definition of regulations to make sure additional policy options investigations and requirements setting do not slow down the overall implementation of the Ecodesign Directive.	-
	7. Overall methodology (report N°3)	For EEB, the JRC proposals are compatible with Ecodesign aims and procedures. JRC have clearly integrated the need for verification/enforcement by market surveillance authority (MSA), by proposing for each potential requirements some verification documents and process.	-
	8. Overall methodology (report N°3)	For 3R's performances requirements, standard "calculations" tables are introduced which could support both the measurement by industry and the verification by MSA. While these tables are new, they do not seem more complicated than formulas elaborated in some implementation measures for calculating the energy efficiency (EE) requirements (see for example the ongoing vacuum cleaner case). In line with the setting of measurement method in implementation measures for EE, effort has been made to take into account existing standard. The JRC has aligned the core of its 3R's methodology on the draft international standards IEC/TR62635. As the use of priority resources and the use of hazardous substances are also declined according to the draft standard, at least these dimensions can be captured using a same calculation base. However, EEB thinks that the standard does not really address the reusability potential of product, as focusing on today's potential for parts reuse, not future potential for whole appliance reuse or remanufacturing. In addition, the JRC does not really explore the possibility of setting reusability requirements, for example by requiring a certain rate of reusable parts (as it's done for recyclability). In addition, the definition of recyclability is not made clear enough. EEB would suggest that recyclability is understood as going to "selective recycling", rather than being potentially mixed in different EoL scenario categories (selective treatment, selective recycling, other parts). In fact that would not prevent recycling innovation, but would help clarify that recyclability, as a potential, qualifies material that can go directly to an identified recycling process, available and with no need for pre-treatment and de-pollution (those latter being addressed in IEC/TR62635 as "selective treatment").	JRC tried as far as possible to align its work with IEC/TR 62635. However, it was decided to propose a re-usability index (not proposed in IEC/TR 62635) in order to address re-usability aspects. Reuse of products as whole have been not considered but could be parts of future research. No requirements on reusability have been proposed, because the selected case-studies (WM and LCD-TV) were not found relevant for this criterion, at least for the EoL scenarios considered. Different results could be obtained in the future with different case-studies and different EoL scenarios.
	9. Overall methodology (report N°3)	Whereas the standard tables associated to the methodology can help setting requirements on hazardous contents removal at the end of life, this environmental dimension has been largely water downed when compared to first stage of this work. For sure, JRC tried to avoid overlaps with existing regulations such as RoHS and REACH, but the focus on end of life management for hazardous contents does not really help to set requirements on individual product contents. EEB is convinced that additional requirements could have been explored at product level. In fact RoHS is rather a horizontal approach to hazardous in EEE and REACH deals with substances. Hazardous contents requirements for products would have had a "vertical" dimension per product category. E.g: Maximum mercury content in CFL, possible "0" mercury content in TV.	Hazardous substances were considered only for the EoL phase since it was judged that only this phase could produce relevant product requirements. It was moreover considered that other life cycle phases could have created potential overlaps with other EU legislations (e.g. REACh, RoHS). Relationships with these pieces of legislation and product policies will have however to be investigated in the future.
	10. Overall methodology (report N°3)	The methodology for verifying the self-declared recycled content is more challenging, as recycled content, targeting plastic material, requires supply chain management, which may be harder to verify once the product is put on the market. However, the JRC refers to a Californian standard, SCS2012, which could help enforcement. EEB thinks that the verification of recycled content could also build on the new EU certification scheme used by some plastic recyclers, the EUCertPlast. Complementarily, alignment with EPEAT standard (bronze, silver, gold levels requirements for post consumer plastic contents) could be investigated. The compliance with such certification schemes could be a first guarantee for MSA. If need be, it may be considered some additional testing, able to differentiate a virgin plastic from a recycled one.	New strategies and documentation for the verification of requirements in recycled content will be investigated in future phases of the research.

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7. European Environmental Bureau (EEB)	11. Overall methodology (report N°3)	As regard durability, some more work needs to be performed, maybe with a focus on critical component replacement possibility (identification and spare parts availability). While EEB appreciates the efforts to balance extended duration with energy consumption of product (amongst other environmental dimensions), EEB is not convinced that we can really base calculation of durability on comparing existing appliance with a potential new purchase by end user. In fact, there is no certainty about what will be the next purchase. E.g: replacement of a simple washing machine by an integrated washing/drying appliance. With such uncertainty, the durability calculation seems a very theoretical exercise. Particularly for quick turn over/high innovation rate ICT products, a focus on critical component for life time or for upgradable functionality of appliance could be useful (for these products, the electricity consumption during use stage is less predominant).	The analysis of durability is only at its initial stage. The methodology developed intends to answer to some initial questions (e.g. it is worth to extend the useful life of some product groups? How relevant could be the benefits). The analysis is based on initial assumptions. Uncertainties are modelled by different scenarios to be set. However the durability concept is wider and it implies other issues (including functionality, user behaviour and fashion), which haven't been implemented in the proposed method. --- Additional clarifications introduced in the new Report n°1
	12. Overall methodology (report N°3)	For EEB, it is important to investigate further the consistency between the MEErP and the environmental impact assessment methodology proposed by JRC. But it is to be noted that such a consistency is required for assessing the "significance" (= the environmental impact or the "hot spots") of the product/materials, and decide if there is a need for setting requirements for material use and EoL, but not for defining the requirements *per se*. As regard the identification of a base case for setting a reference product, the MEErP approach seems relevant and has been largely integrated by JRC. As regard the environmental impact, the MEErP has so far systematically underestimated the production stage impact, noticeably of ICT products. This is now confirmed by several studies on TV's and laptops[30]. The MEErP needs to be refined accordingly, or its deployment to assess the relative environmental impacts of the different life stages needs to be made more accurate. In that perspective, the Abiotic Depletion (ADP fossil/elements) impact category, suggested by JRC, could be integrated in the Ecoreport tool, as a way to evaluate more specifically resources use impact. More generally speaking, impact categories need to be aligned between the MEErP and JRC proposals, but for EEB there is no fundamental incompatibility between the two approaches.	LCA methodology in addition to the Ecoreport tool of the MEErP methodology was used in order to capture resource (including CRM and ADP) efficiency performances of products.
	13. Test cases (report N°2). *Imaging equipment*	For imaging equipment (IE), the JRC approach built on the Ecodesign preparatory study for identifying the base case and deploying the methodologies. Only recycled content dimension, not any 3R's, was targeted for IE by JRC. For EEB, there might be a missed opportunity not to have targeted "reusability" of product and components, as in the IE industry, there is already a certain tradition for reusing/remanufacturing appliances (noticeably for B2B). As regard recycled content requirements, the verification is a challenge. As mentioned above, it could be made more workable by referring to standards and certification schemes. It is to be noted that in its VA (to be endorsed soon), the IE sector has integrated compliance with EPEAT standard. EPEAT standard for IE encompasses post consumer plastic use and set a 3 levels requirement: bronze, silver and gold. For silver and gold a minimum level of post consumer recycled plastic has to be demonstrated. A simple way of deploying this requirement within the IE industry would be to monitor the VA and ensure that it moves progressively towards the silver, then gold levels of EPEAT for recycled plastic content. *(Taking into account the fact that, at a certain point of time, Ecodesign and EPEAT do not target the same market proportion, an adaptation could be performed, similarly to the way Ecodesign is referring to Energy star scheme).*	Imaging equipment case-study was developed as an additional simplified case-study to the other two complete case-studies (WM and LCD-TV), to test recycled content. Reusability for imaging equipment could be indeed relevant, but this assessment was out of the scope of the project. Experiences of the VA of the IE sector for the implementation of recycled content requirements will indeed be investigated in the future.

[30] On ICT in general, see *"Life cycle assessments of consumer electronics — are they consistent?"* Anders S. G. Andrae & Otto Andersen -2010 ; on laptop, see for example the article *"Product Carbon Footprint (PCF) Assessment of Dell Laptop – Results and Recommendations"* Scott O'Connell, Markus Stutz -2010; on LCD TV, a paper is to be published by Rikke Dorothea Huulgaard-Aalborg University- *"Ecodesign requirements for televisions - is energy consumption in the use phase the only relevant requirement?"*

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7. European Environmental Bureau (EEB)	14. Test cases (report N°2). Washing machines	For washing machines (WM), the JRC decided to investigate two different types of WM (basic and higher end). The focus was on 3R's and durability. Some requirements are suggested on maximum disassembly time of critical components (LCD panel, PCB, motor) in order to enable recovery of critical materials. As already discussed, the setting of manual disassembly time requirements could be challenged by the emergence of automated technology enabling material separation without diluting the scarce critical materials. In that perspective, some alternative – not necessarily substituting- requirements could be set to ensure this proper material separation in the future. For example, the requirement for no glue or for homogeneous fixing methods (screws, quick fix systems), compatible with the targeted scarce material to recover, could be explored. In any cases, the information requirements suggested by JRC should be supported to help producers getting used to methodology, before setting specific requirements. In the report, JRC suggests to set a requirement on "Declaration and/or thresholds for the RRR and RRR benefit rates" (p128-129 report N°2). For EEB, there may be no need for such a requirement, as this is more about assessing the environmental impacts of materials, not about respecting specific or information requirements. If producers have to get used to the methodology, use of 3R's tables could be suggested as information requirements. *(To express it with an analogy, Ecodesign does not ask that each producer uses the Eco-report tool of MEErP).* As far as durability is concerned, EEB repeats that more work is to be done, with potentially a focus on possible replacement of critical components for life time extension. At this stage, information requirements on those critical components, on spare parts availability (& affordability?), on reusability could be relevant for WM. (The producer liability in case of repair of an appliance is also to be addressed in case life time extension relies on third party repair, not in contract with OEM)	Potential requirements for assembly (e.g. avoiding use of glue, use of quick fix systems) have been explored (especially in the phase 1 of the project). However, setting requirements on their use could limit too much the design solutions. It is here preferred to refer to the time for dismantling as the best proxy for disassemblability. It is left to manufacturer to select the best design alternative to meet this requirement. Indeed the methods have been defined for the assessment of the product. However, the possibility of some requirements based on their application has been assessed. This could be relevant for some specific cases and indicators (e.g. for plastics and/or critical raw materials). Replacement of key parts is one of the conclusions of our study. Additional research will be performed.

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
7. European Environmental Bureau (EEB)	15. Test cases (report N°2). Washing machines	*For LCD TV, JRC relied on Ecodesign preparatory study performed with data from 2005-2007. For EEB, there is a need to update the reference baseline. Mainstream new LCD screens do not content CCFL anymore (but rather LED technology), so the focus on removing mercury back lit lamps may not be relevant, while the environmental benefit of a proper LED back lit lamp recovery is still to be investigated. Additionally, new studies tend to show that LCD screens production stage has a significant impact for GER (global energy requirements) and GHG emissions, an impact which was clearly underestimated by the Ecodesign preparatory study.* Nonetheless, EEB supports the JRC suggestion of setting possible specific disassembly requirements for critical parts, as well as plastic recyclability requirements. EEB also supports the associated information requirements proposed by JRC. As regard disassembly, as for WM, adaptation to requirements could be done in view of "soft" mechanical technology for material separation. As regard, recyclability of plastic, JRC assumes that no flame retardants would be embedded in ABS or PMMA, (two important plastic materials). That's why a high recyclability rate can be achieved. As mentioned in the comments regarding the overall methodology, EEB would prefer a clear recyclability definition and a simple alignment with "going to selective recycling" in the different EoL possibilities listed by the IEC/TR62635. With such a definition, setting recyclability requirements would encompass no need for pre-treatment and/or de-pollution and would not account for recyclable the product parts going to "selective treatment" or "other parts". This would align with JRC statement p145 of report N°2: "However, if ABS would contain flame retardants and/or fillers, its recyclability would be 0% (as suggested by the IEC/TR 62635). For example, assuming that frames contain flame retardants, the plastic Recyclability rate of the LCD-TV would become 44%." For LCD Tv's, EEB regrets that "recycled contents" requirements were not explored, as for LCD displays, as for other ICT products, the manufacturing stage is significant for energy consumption (GER) and CO2e emissions. Potential benefits could have been assessed. Not considering "recycled contents" may be a consequence of the reference to Ecodesign preparatory study, neglecting manufacturing stage impacts, as already mentioned. Durability would also be a key dimension to investigate for LCD screens which tend to be replaced ever quicker compared to last 10 years. <u>For EEB, it is important not to miss the ongoing revision for defining future Ecodesign requirements for TV's. EEB repeats that a two step approach could be relevant (a first Tier for information requirements, the succeeding ones for specifying requirements).</u>	No primary data from manufacturers have been available for the study. The analysis was based on data from literature, plus additional data from references (including preparatory study). Different results could be obtained with different case-study (especially if other technologies are considered, including e.g. LED). Soft-shredding for LCD-TV has been not observed, being the majority of devices (around 95%) currently dismantled. Automated treatments are still at developing/research stage. We used the definition of recyclability as in the IEC/TR62635. Recycling rates of materials/parts derives from the process that they undergo in the EoL (e.g. pre-treatment, sorting, shredding and downstream treatments) Concerning flame retardants, no primary data on the product were available (including missing or incomplete labelling). For this reason, some assumptions have been set. Concerning the analysis recycled content, low information on plastics in the TV case-study limited the study. For this reason a new product was selected specifically for this analysis. Some of these issues could be addressed in future phases of the research.

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
7. European Environmental Bureau (EEB)	16. General	A selection of some mature requirements with regard resources use and end of life management could be integrated in Ecodesign implementation measures. EEB thinks the information requirements suggested by JRC (BOM, disassembly scheme, marking of plastic, use of 3R's tables…) are ready to use and could be deployed "horizontally" across all relevant product categories. As regard specific requirements, the disassembly requirements could be adapted to possible automated process, but they are clear and enforceable. The same goes for recyclability of plastics, providing recyclability is understood as "going to selective recycling". On recycled content, a focused discussion on enforcement possibilities should take place. To start with, information requirements could be set. Eventually a bonus/malus scheme could be explored, balancing the embedded energy with the energy in use stage in order to provide incentives for integrating recycled plastic. Reusability would deserve more practical suggestions by JRC and durability require further documentation. In terms of opportunities to integrate such requirements, the revision of the implementation measures for TV and all the ICT product categories seem real opportunities (critical material contents and increased plastic use). For those ICT products, the manufacturing stage is clearly a significant stage with regard environmental impact and overall energy use, recycled content is thus also an important dimension. The VA's to be endorsed or discussed in coming months offer an opportunity not to be missed (IE, CSTB…game consoles?). In addition and beyond the strict scope of the JRC study, EEB insists on 3 additional points: - The need for a proper resources allocation to Ecodesign policy, made even more crucial with the setting of potential new requirements. - The need for an increased consistency between the different product policy instruments at EU level (Ecodesign, GPP, Ecolabel): when a measurement method is defined, it would be relevant to use the same methodology for all instruments, just changing the threshold levels. This should not prevent that GPP or Ecolabel have additional criteria to investigate, but at least a common set of "basic" criteria should be deployed. That would potentially save some enforcement resources at national level. - The need to enter a learning process should not be delayed. If eventual complementary studies are to be launched (*by DG Enterprise as it's been mentioned during the 10/09/2012 meeting*?), they should really enable to push the investigations further and not be used as a pretext not to start anything in the meantime.	-
8. EERA (European Electronics Recyclers Organisation)	1. Report 2 – page 64.	*Technology: the assumption that is made in paragraph 3.2.2. is that plastics will be disassembled and that "micro-" or "macro-sorting" will be enough to create a clean and usable plastic. The reality is that most recycling of E-Waste in Europe is based upon a process of shredding, whereby after the separation of the metals, the plastic fraction is concentrated in the shredder residues. This shredder residue typically contains plastics in a concentration of some 80 – 85% whereby the remainder consists of contaminants such rubber, wood, fibres, foam, glass traces etc. These contaminants are often difficult to handle, but these need to be removed to create plastics that can be recycled into PCR content for EEE. We want to point out that plastics recycling is not just about separating different plastic types – plastic recycling from shredder residues is a complex process. Although "active disassembly" might be a theoretical option, the reality will be that recycling will continue be performed on a complex mix of equipment types and that it will be unrealistic that such systems would be impacting the actual recycling practice at least in the foreseeable future.*	Treatment of shredding residues is indeed a key issue, especially concerning plastics. The objective of the research was to identify/assess potential requirements at the design stage that could contribute to an improved recycling. Requirements on plastics (including e.g. labelling, recyclability of plastics, easy dismantling) could contribute to improve some dismantling based plants, although it was highlighted that not all the recycling plant would benefits about this.

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8. EERA (European Electronics Recyclers Organisation)	2. Report 2 –page 83	*LCA recycled plastics from E-Waste – paragraph 5.5.1 of your paper states that no LCA data are available for ABS and HIPS. EMPA is close to finalizing a complete LCA to compare E-Waste Plastics recycling to the production of virgin plastics and with municipal waste incineration and the CO2 emissions savings of recycling E-Waste plastics are even better than their earlier paper that was presented in the IERC conference in Salzburg in January 2009 (in this presentation it was reported that some 3000 kg CO2 emissions are saved by recycling producing 1000 kg of PCR plastics from E-Waste). We can provide you with a copy as soon as the paper is available, but the results can unfortunately not be presented yet; the paper is planned to be completed in November coming – but I do attach the presentation of EMPA that was made at the IERC conference in Salzburg 2010 (see global warming potential slide 17).*	We are aware that recycled plastics generally have impacts much lower than virgin plastics. However few data are public available on LCA of recycled plastics. Results of the study can be refined once more precise information will be available.
	3. Report 2. flame retardants in plastic parts	*Flame retardants. Throughout the entire paper reference is made to the group of brominated flame retardants without distinguishing between the restricted BFR's – PBB's which cannot be found anymore in WEEE and PBDE's particularly c-octa-BDE - and the non-restricted BFR's. We would suggest that this distinction is made, as the paper could be interpreted that all brominated flame retardants are restricted substances, with as a consequence that there is even more pressure to replace these with other flame retardant substances, such as phosphor based flame retardants, which can only be used in PC-ABS with unknown consequences (and doubts) to the recyclability of E-Waste plastics – see also point 4. As background information we add a paper that we prepared for the EU waste shipment regulation correspondents in 2009 (WEEE applications BFR presence).*	(The distinction has been clarified, including also the suggested reference.)
	3. Report 2 - POP-substances Stockholm Convention octa-/penta-BDE	POP-PBDE's. The Stockholm convention has defined two commercial PBDE's (octa- and penta-BDE) as "new-POPs". Only octa-BDE is relevant to E-Waste, but as this substance in practice has been phased out it the 90-ies it is an ever decreasing issue. The technologies exist to reliably reduce the threshold levels of PBDE's as described in REACH and RoHS. Although the Stockholm convention as allowed for an exemption for recycling plastics with the remote risk of these octa-BDE's, the EU has not notified their interest for this exemption to the Stockholm convention (yet) and commissioned a "Study on waste related issues of newly listed POPs and candidate POPs" (No ENV.G.4/FRA/2007/0066) – see pages 773, 799 and 800 of *http://ec.europa.eu/environment/waste/studies/pdf/POP_Waste_2011.pdf*. This study proposes to reduce the low POP content level threshold (LPCL) to as low as 10 ppm per PBDE congener. If this accepted to become the basis for future EU legislation, it has the risk of stopping the newly developing industry of recycling E-Waste plastics. The E-Waste plastics recycling industry is perfectly able to produce RoHS and REACH compliant plastics, but it cannot fully eliminate any legacy substances and as this kind of thresholds cannot be measured reliably, the use of PCR plastics from E-Waste to EEE products risks come to a halt if thresholds of these POP-BDE's would be reduced substantially. The Stockholm convention generally allows for unintentional trace contaminants of 0,1%, which is perfectly do-able at the current recycling practices.	Thank you for the very precise comment. We do not know how to consider these aspects in the report since this is related to non-product policies.
	4. Report 2 –page 173-174	*Marking of plastics and its' limitations. The paper refers and suggests to add requirements for labelling and marking in various parts of the paper. The plastic recycling industry has noted that in many cases the marking of the type of plastics or even the additional marks such as FR for flame retardant compounds are not correct in practice. If certain polymers change in price, the moulders of EEE housings (often companies in the Far East) don't take the effort to change the imprint markers in the mould. As different countries might have different requirements regarding flame retardants, the same takes place for the "FR" markings. The markers therefore are not a reliable method to separate plastics. Furthermore, as in Europe the actual practice of recycling is mainly by shredding processes, the plastics markings get lost anyway. We are not arguing that marking does not have any positive impact, but we have to emphasize that the impact should not be overestimated.*	We know that not all recyclers would take advantage of marking of plastics. This has been considered in the analysis of the requirements, based on some scenarios. --- Uncertainties of the estimation have been underlined in Report 2 – section .7.6.3

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
8. EERA (European Electronics Recyclers Organisation)	5. Report 2 – page 144 - 145	*Flat Screen housings and the new Cenelec Standard to add flame retardants to flat screen housings. EERA and the plastics recycling community were completely surprized when the Cenelec announced the new standard for flame retardancy is (flat) screen TV's. EERA understands perfectly why a standard for flame retardancy may be required for the housing of Cathode Ray Tubes (CRT screens) as these screens have internal heat sources. Apart from the business objectives of the flame retardant industry – who have chaired the committee for this standard – we fail to see why Flat Displays Panel screens (FDP screens) - that do not have internal heat sources - require flame retarded housing, particularly as this will prevent the recycling of these WEEE plastics for re-use into high tech applications. This standard will thus have an impact on the recycling targets of the WEEE Directive. The current estimation of the end-of-life treatment of CRT and FDP screens is shown in the graph below (source UNO university/Step initiative): (attached figure)* *By 2020 it is estimated that the EU end-of-life treatment of Flat Display Panel screens will amount to close to 1400 thousand MT's and this will involve over 250 thousand MT's of plastics annually (see graph above).* *Although the flame retardant industry have started an initiative to start research into the recyclability of plastics with flame retardants (after this standard was implemented), it is practically certain that these plastics cannot be recycled for re-use (Cradle-to-Cradle) in new electronic appliances. It is highly questionable that closed-loop recycling of these flame retarded plastics will be possible at all, particularly as many OEM's change over to phosphorous based flame retardants under the pressures from NGO's and changing legislations such as RoHS. These plastics are less recyclable according to recycling studies and even statements from the additive suppliers themselves. Furthermore, most plastics from CRT recycling with (brominated) flame retardants are mainly traded and exported to countries where treatment in line with the Annex II of the WEEE Directive cannot be proven because they contain the FR additives. If flat panel displays did not require FR additives they would more likely be recycled in a compliant manner. Perhaps, most importantly, this standard will drive manufacturers to using much more expensive and complicated materials (PC-ABS with phosphorous based FR additives). This is against the growing trend towards "green chemistry" and other standards such as Blue Angel, EPEAT, TCO, Green Screen, etc. that encourage the use of simpler, less toxic and more recyclable materials such as standard HB FR grade ABS and HIPS, which is used in flat panel displays in most other parts of the world. Forcing manufacturers in Europe to use these FR additives will make them less green and less competitive.* *Have the environmental and safety trade-offs between the likelihood of candles igniting a flat screen display versus the certain use of these more complicated chemicals been assessed? For example, the recycling industry was never consulted before releasing this standard. And are there similar standards for wood furniture, window coverings, lamps and other objects even more likely to come into contact with candle flames?* This is a huge loss of potential raw materials for the electronics industry and EERA is of the opinion that the business and safety aspects of this CENELEC standard are in no relation with environmental damage that will be the consequence of these plastics not being recycled and the use of plastics requiring a complicated additive, which must also be manufactured and disposed of at end-of-life. But as far as your paper is concerned, this standard will certainly have an impact on the assumptions that you have formulated in paragraph 7.4.1.3 (page 144/145).	According to our analysis, the content flame retardant in plastic parts in LCD-TV largely decreases the recyclability of such products. However safety issues, as those raised in the comment, are out of the scope of the analysis. Analysis was based on recyclability figures currently available. We are ready to revise the results once detailed data will be provided, both by manufactures and recyclers.

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9. EFRA (European Flame Retardant Association)	1. Report 2 – page 1	Recycle rates need to be put in context of the WEEEE streams where they are appearing combined with the local situation and available processes. In Europe a mix of manual sorting and shredding takes place with each time a different recycle rate. Therefore recycle rate need to be put in context with the used scenario.	The considered EoL scenarios differ product by product. For the considered case-study products, we considered representative European EoL scenario based on both manual dismantling + pre-shredding and shredding. In the future, the possibility to have spatially-based EoL scenarios could be explored.
	2. Report 2- page 47	Ecolabel criteria are not always science-based. In Europe REACH provides the real hazard and risk phrases.	(Sentences revises and notes removed)
	3. Report 2- page 47	Hazardous substances in electronics are fully covered and addressed in EU legislation such as REACH and the recently recast RoHS directive	
	4. Report 2- page 48	The use of flame retardants in electronics is regulated and already addressed in relevant EU legislation such as the recently recast RoHS Directive. The statement according to which flame retardants are not yet regulated is therefore misleading. We suggest deleting it.	
	5. Report 2 – section 3.2.3	Flame retardants, as any other commercial chemical substance in Europe, are subject to REACH. As such, most flame retardants are not C&L. Relevant C&L and or banned FRs are already regulated via REACH.	The table refers to potential ecodesign requirements for products, including thresholds and declarations of substances that can interfere with EoL treatments (including recycling). Requirements are derived by the survey in the scientific literature.
	6. Report 2- section 5.3.	The composition is strongly depending on the category of waste stream: for example in LCDs HIPS and PC/ABS are the dominant ones, where for LED it is PMMA and PC/ABS.	The composition refers to an average “”base-case” Ink-jet multi function device. All the data refer to the Ecodesign preparatory on imaging equipment.
	7. Report 2 – section 6.2	Landfilling is only one of the end of life options available for plastics containing flame retardants. Such streams can also be recycled or incinerated for energy recovery. Often, the choice depends on the EU Member States (e.g. incineration is more common in some MS than in others).	(Modified)
	8. Report 2 – section 6.2.2	According the WEEE plastics with brominated flame retardants need to have a separate treatment (which is always the case if plastics re cycling into individual plastics need to be made) and no additional hazardous waste stream is produced. Plastics with FRs are able to be recycled except some FRs which are regulated and not allowed to put back on the market through recycled plastics.	According to data from IEC/TR 62635 and publication on the scientific literature, landfill and energy recovery are the most common treatments for plastic parts with flame retardant, especially for shredding residues. Further information on performances of sorting and recycling processes for plastics with FR could be considered in the future.--- (Section 6.2.2 has been revised, additional references provided.)
	9. Report 2 – section 6.2.2	Landfilling is only one of the end of life options available for plastics containing flame retardants. Such streams can also be recycled or incinerated for energy recovery. (s. comments above regarding different situation in MS) Today density separation is not sufficient to separate the complex mix of plastics and a combination with high-tech techniques are used. Examples of plastics with FR suitable for re cycling do exist.	
	10. Report 2 – Table 32	Today due to the complex mix of plastics density separation is not sufficient to separate all plastics and XRF is needed in combination with density including NIR and other techniques.	The suggested techniques have been mentioned, However, there are not data about their representativeness and performances for treating EU WEEE. For the analysis, data from IEC/TR 62635 and performances given by representative recyclers have been used.
	11. Report 2 – section 6.2.2	It is common practice to separate brominated flame retardants is via XRF. Via further sorting these plastics can be recycled or the energy to be recovered.	
	12. Report 2 - Section 6.2.3	The table used in this report is one example from France and not validated. It is mentioned in the table as example only and not linked to a certain scenario.	According to IEC/TR 62635, data reported are related to “European scenario for large household appliances, small household appliances, IT and telecommunications equipment, consumer equipment”.
	13. Report 2 - Section 6.3.1.4	Antimony present in WEEE fractions going to precious smelters like Umicore in Belgium are able to recover 70% of the Sb present in the feed (J. Brusselaers, F.E. Mark, L.Tange, Using Metal-Rich WEEE Plastics as Feedstock/Fuel Substitute for an Integrated Metals Smelter, Plastics Europe, Umicore and EFRA, 2006). Also in mechanical recycling the Sb is recycled.	(Citation has been added. However there are not data about the representativeness of the treatments in EU and on achieved the recovery rates)
	14. report 2 – Table 40	The used recovery rates are only as example as no scenario and composition WEEE stream is defined. They can not be used as technical data.	According to IEC/TR 62635, data reported are related to “European scenario for large household appliances , small household appliances, IT and telecommunications equipment, consumer equipment”. This data is the only data currently available

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9. EFRA (European Flame Retardant Association)	15. Report 2 – Section 6.5.2.3	The energy of thermosets can be recovered in smelters where the plastics is functioning as chemical reducing agent (J. Brusselaers, F.E. Mark, L.Tange, Using Metal-Rich WEEE Plastics as Feedstock/Fuel Substitute for an Integrated Metals Smelter, Plastics Europe, Umicore and EFRA, 2006).	The section refers to recycling not to the energy recovery.
	16. Report 2 – section 7.2	There is a trend of shredding in closed rooms where the mercury is captured and the plastics are sorted afterward.	New technologies have been mentioned (Section 7.5). However, according to associations of recyclers and recyclers, their current representativeness in the EU is low. If these technologies prove to be promising for the future, their performances will be considered if they are properly documented.
	17. Report 2 – section 7.2	In 2012 in Belgium and the Netherlands the main fraction is shredded.	
	18. Report 2 – section 7.2	Landfilling is only one of the end of life options available for plastics containing flame retardants. Such streams can also be recycled or incinerated for energy recovery. Examples exist (s. above).	(Modified)
	19. Report 2. section 7.2.2	Plastics with brominated flame retardants need to be separated where after the can recycled or going for energy recovery or landfilled	-
	20. Report 2. section 7.2.3	An EFRA recycle study shows that 20% of the back covers are HIPS/Brominated flame retardants (not C&L → but ATO which is needed as synergist would be C&L (R40)) containing and the dominant fraction is PC/ABS with PFRs and HIPS/PPE with PFRs. Only small amounts of ABS without Brominated flame retardants.	Due to lack of any other data, the analysis was based on a product dismantled at the recycling plant. Details of plastics are derived from plastic marking. The EFRA study could be used in the future in a subsequent case study.
	21. Report 2. section 7.3.1	Recycling of plastics containing Brominated flame retardants (BFRs) is possible and delivers satisfactory results, demonstrating superior recyclability, stability and compatibility with different plastics (Boerrigter, H., "Implementation of thermal processes for feedstock recycling of bromine and antimony, with energy recovery, from plastics waste of electrical and electronic Equipment, Phase 1", Netherlands Energy Research Foundation (ECN), July 2000). This is particularly important due to increasing demand for resource efficiency. In Europe, the recycling of bromine from plastic waste is feasible and is taking place today, as demonstrated for example by Axion Recycling (http://www.axionrecycling.com/). Such activity represents a key opportunity to create jobs in the recycling sector and push industry towards increased sustainability, in line with EU objectives for green growth. When recycling is not possible, there is a range of eco-efficient waste management options such as energy recovery available for the end-of-life of materials containing flame retardants.	If data on performances of representative recycling routes for BFRs polymers is made available, they will e considered in the future. --- Some notes have been added in Chapters 6 and 7 concerning the effort into developing technologies for the recycling of plastics containing flame retardants.
	22. Report 2 – section7.4	The Flame Retardant system used for in LCDs are published by EFRA (s. EFRA E&E brochure). Mainly HIPS with a Brominated flame retardants (not C&L) plus PC/ABS and HIPS/PPE with PFRs-RDP and BDP.	The analysis was based on a product dismantled at the recycling plant. Details of plastics have been derived from plastic marking.
	23. Report 2 – section 7.4.1.3 and section 7.6	EFRA would like to underline that Acrylonitrile - Butadiene - Styrene plastics containing brominated flame retardants (BEO's not C&L) have proven to be most suited for mechanical recycling. Tested plastic materials containing brominated flame retardants have shown superior recycling properties compared to tested halogen-free plastic grades as they were able to retain important properties such as colour and fire safety rating. The statement about 0% recyclability is wrong and should be deleted.	Figures (in IEC/TR 62635) about recycling rates in EU of plastics with flame retardants indicate a recyclability rate of "0".
	24. Report 2 – section 7.4.1.3	From July 2012 TVs housings have to be fire safe (maybe quote the standard)In case plastics are used they will contain Flame Retardants.	(Cited)
	25. Report 2 – section 7.5.	PC-ABS always contain PFRs which will be the case in the future for all used plastics in housings	(Modified)

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9. EFRA (European Flame Retardant Association)	26. Report 2 – section 7.5. and 7.6.3	In Europe, the recycling of all the bromine from plastic waste is feasible and is taking place today, as demonstrated by Axion Recycling (http://www.axionrecycling.com/) for example. (s. comment about wording above) In addition, the flame retardant industry is taking responsibility to address flame retardants in electrical and electronic waste by investing in research on recycling solutions for a more sustainable use of resources and the potential of recycling plastics containing flame retardants. For example, last year the industry in partnership with the members of the European Electronic Recyclers Association, the WEEE Forum, plastic producers and OEMs initiated a project looking into how to improve the recycling of plastics from post-consumer flat panel displays. The project will be completed in October 2012. Such activity represents a key opportunity to create jobs in the recycling sector and push industry towards increased sustainability, in line with EU objectives for green growth. A large study for LCD's with plastics recycling is running to identify the composition of the LCDs plus the recyclability in cooperation with 4 large plastics manufacturers.	We based the analysis on figures of IEC/TR 62635 that currently are the most representative data available at the European level. Further information on performances of representative sorting and recycling processes for plastics with FR could be considered in the future.
	27. Report 2 – section 7.6.3	This statement is relevant for all black plastics and not only for FR containing ones. Current testing is going on as LCDs are only coming up in waste streams recently. For any plastics re cycling separation is needed.	The sentence was based on communications from recyclers. Indeed other problems with other plastic characteristics (e.g. colour) can interfere with recycling --- Highlighted in the text
	28. Report 2 – section 7.6.3	In LCDs ABS is only a smaller fraction, where HIPS w/o Brominated flame retardants and PC/ABS plus HIPS/PPE with PFRs are the dominant plastic types.	The analysis was based on a product dismantled at the recycling plant. Details of plastics were derived from plastic marking. It would be possible to consider HIPS and PC/ABS instead of ABS and the results would not change dramatically.
	29. Report 2 – section 7.7	The recyclability index still needs to be defined for specific scenarios like manual dismantling and or combined with shredding. Information of the plastics composition including the used FRs are present via EFRA	The analysis has been based on the current most representative scenario (manual dismantling based) and on the analysis of future scenarios (shredding based). --- Uncertainties of the analysis have been underlined. Other potential EoL scenarios are potentially possible, but data concerning their representativeness and yields should be made available.
	30. Report 2 – section 7.7	PMMA is possible to be separated from other plastics using a combination of density plus sensor based/ NIR sensor techniques.	Analysis based on communication of some recyclers plus IEC/TR 62635. Results could be updated once more data on innovative representative process are available
	31. Report 2 – section 7.7	See above. In the back cover already a marking is present for type of plastics combined with pre knowledge it is possible to understand the composition. This information is available on the EFRA website (http://www.cefic-efra.com/) and EFRA is available to provide a more detailed explanation	Marking of plastic parts is not generalized in TV. The EFRA information will be used in future study.
	32. Report 2 – conclusion	Marking is now inside the back cover of the LCD, and it could be very useful if marked outside.	(suggestion cited in a note)
	33. Report 3 – section 4.3.1	Studies and analysis showed that no Brominated flame retardants with risk phrases are used	(Modified)
	34. Report 2 – section 6.3.1.1	In PCBs now TBBA is present higher than 50 ppm as all TBBA is reacted into an epoxy resin	The table refers to one of the few studies with a detailed disaggregated picture of main constituent materials. The analysis could be revised once more updated figures would be available,

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10. EUROFER – The European Steel Association	1. Report 2- 1.3.4 / Table 12 and Annex 2	In table 12 it has been reported a high human toxicity value for the iron that is in contrast with the Chemical Safety Report used for the REACH Iron Registration. The high value reported in the table 12 probably derives from the set of data assumed in the table A2.1: BUWAL (1996) reference for steel should be substituted with a more up-to-date reference. Life Cycle Impact assessments related to toxicity has been found to have a number of failings and should properly be re-examined. --- The ELCD database or the LCI database from worldsteel should be used for the iron, at least.	Indeed the high figures can be related to the selected data sources. ELCD data were not adopted because needed to distinguish between primary/secondary production processes, while ELCD provides only aggregated data. However, the analysis in Report 2 –Table 2 was aimed to the selection of case-studies and not intends to provide general assessment on materials. --- Uncertainties of data and assumptions have been underlined
11. EUROMETAX – European association of metals	1. General	Eurometaux welcomes the objective of the JRC technical report which aims to define criteria to reflect recyclability, reusability and recoverability in eco-design implementing measures. Eco-design can be a powerful tool to promote resource efficiency and recycling provided the criteria are set on a sound basis. Eurometaux is aware of the technical dimension of the report but would like to highlight some more political and market realities which should in our view be considered so as to avoid that the measures recommended are disconnected from reality and are at the end counter-productive.	-
	2. General - Promoting recycling : the market context	Europe has a leading, large-scale recycling industry, enabling complex materials to be efficiently recycled while respecting high environmental standards. More quality recycling can be done in Europe provided the following challenges are among others addressed : ▪ Access to secondary raw materials, notably through improved collection of scrap and end-of-life products. ▪ Proper pre-treatment including optimal recovery of materials for recycling. ▪ Illegal exports of scrap and end-of-life products leading to a loss of valuable raw materials in the EU. ▪ Lack of a level playing field worldwide which means that secondary materials exported legally or illegally are in many cases treated in poor environmental, health and efficiency conditions. ▪ Lack of ambitious waste stream specific recycling targets in different member states. ▪ Lack of a clear definition of the recycling value chain. In the absence of such clear definition confusion is created between collection, pre-treatment and recycling The ultimate objective must be to ensure that the material/end-of-life products collected are recycled properly (and not only collected and possibly shipped to badly performing recycling processes which are in some cases located outside the EU). Eurometaux therefore strongly believes that the definition of criteria for consideration of recyclability in eco-design is a good step towards ensuring that more material can be recovered and recycled but it needs to be implemented alongside other measures addressing the above challenges, including a recycling certification scheme.	-
	3. General - Who is the recycler	The recycling process can be broken down into three separate, but highly interdependent, steps: collection, pre-treatment and recycling. All steps are indispensable to recycling, but collection or pre-treatment does not automatically lead to recovery of the material at the end of the chain. Recycling is now multi-metallic by nature and requires a much more complex operation in order to maximize recovery yields as well as protect the local environment and worker's health. The JRC study designates the pre-processors as "recyclers" and has not consulted recycling facilities which is a pity as the latter could have brought an interesting perspective to the study. The right denomination should at least be used in the study so as to avoid confusion which could lead to inadequate or incomplete policy measures.	The study considers all the 3 steps mentioned. This study has been mostly based on data from pre-treatment facilities. However some data from final recyclers have been collected directly or indirectly (thanks to information on the final treatments of materials from pre-treatments facilities or association of recyclers, thanks to data coming from IEC standard). Missing information concerning losses along the whole chain has been complemented by references from the scientific literature. --- Clarified in the text of Report 2. (executive summary and case-studies)
	4. Metals are the driver for recycling	In many cases, metals thanks to their high value and the fact that they do not lose their properties through recycling are a key driver for recycling end-of-life products. It should be noted that metals are recycled to high rates but that minor metals or metals in very complex products might require different approaches compared to the traditional markets of the main metals.	(The sentence has been added)

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11. EUROMETAX – European association of metals	5. Durability and Reusability	While durability and reusability are important criteria, it does not preclude the recycling of the material/product at end-of-life. It is essential that the *optimal* use of materials is promoted rather than the minimal use of materials as simply limiting material inputs, without considering realised costs and benefits in the use phase, is inefficient. Re-use should take place provided that the global environmental footprint is not disproportionate in comparison to recycling the materials product and replacing it by a more efficient one. Very often, re-use is also linked to exports of products to third countries, meaning that recycling after the re-use phase becomes difficult, as an adequate infrastructure is very often lacking. In this case, the total environmental footprint might be even larger than direct recycling. Non-ferrous metals are intrinsically durable, but like recycled content, the focus on a single criterion – durability – may be misleading. A more integrated approach is needed for products which are often complex.	Reusability of components for remanufacturing has been considered in the research. The reusability benefit index has been set to assess the potential benefit of reusing some components compared to the whole life-cycle impacts. Re-use of the product as whole has been not considered (including how this would effect the performance in the use phase). Durability in the study has been only considered at the product level (durability of single materials has been not part of the analysis).
	6. Hazardous substances	REACH is a complex and ambitious piece of legislation with very clear procedures and objectives. The consideration of hazardousness as a criterion for eco-design should not neglect the fact that REACH aims at regulating the safe use of substances. REACH will define the management measures or substitution process is relevant and appropriate - no unnecessary interference should take place with this process.	In order to overall with current legislation on hazardous substances, the research focused only on product's parts with hazardous substances relevant for EoL treatment.
	7. Recommended measures	Eurometaux supports the analysis according to which more manual dismantling should take place to allow for more efficient material recovery and recycling. However, it wishes to highlight the market context and call for integrated measures so as to avoid that the increased cost of manual dismantling leads to more exports of end-of-life products to non-OECD countries where the material may or may not be dismantled and recycled optimally.	This study only deals with product policies, not with waste policies. In addition, Ecodesign on dismantling/disassembly time not forcing manual disassembly on recyclers, merely making it more economically attractive to the to choose such option.
12. European Trade Union Confederation	1. Report n°2 (p90)	It is not clear how the dismantling time that is mentioned has been calculated. We think that this kind of estimation should take into account health and safety of workers and: - ensure that appropriate protections are taken to avoid workers' exposure to hazardous substances and products; - avoid an excessive workload, as it is known to lead to musculoskeletal disorders and to generate a psychosocial burden for the worker --- Delete the quantitative estimation and mention the need for further work to include health and safety requirements in the calculation of assumptions for dismantling time.	We think that the proposition of some indicative time could be useful. However in the report it is mentioned that the requirement is only indicative of current practises observed in some recycling plants. --- The revised text of requirements includes a note about health and safety issues to be considered (e.g. page 120).
13. FEAD (European Federation of Waste Management and Environmental Services)	1. General	FEAD and its members support the development of product policies which promote material resource efficiency, and we suggest that a combination of measures to achieve this should be explored by the Commission, including eco-design requirements for reparability, recyclability, and recoverability; eco-labelling to inform consumers of the material resource efficiency of products, and their recycled content; and measures to support green public procurement. FEAD members, who are the private sector waste and resource management companies, can play a major role in bringing valuable material resources back into productive use, provided the right economic and regulatory framework is in place.	-

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13. FEAD (European Federation of Waste Management and Environmental Services)	2. Report 2 - General	The 3 scenarios described may not be representative of treatment scenarios, as they describe only manual treatment or shredding treatment. Although the methodology seems relevant and well- thought through, products that would be designed according to the prescriptions coming from this study will be recycled in minimum 5 to 10 years time from now on. In that perspective, existing technologies used for product dismantling and recycling that have not been studied here may well be the standard in the recycling industry. The results may then be different and not lead to the same conclusions, especially conclusions on "required time for disassemblability". To reinforce this comment, it seems that in the near future increased volumes of WEEE coming to the recycling plants and more stringent rules on health and safety may encourage the use of mechanical treatment. A lot of new recycling technologies are developed now. --- It is necessary to have scenarios describing best available technologies and developing technologies based on the entire spectrum of existing technologies in order to ensure a level playing field. A state of the art of recycling technologies based on a wider panel of visits may be relevant.	The setting of EoL scenarios is indeed very important for the proposed methods. The analysis of case-study has been based on communications from recyclers (pre-treatment facilities and final recyclers) and associations of recyclers. The scenarios included both dismantling + pre-shredding and shredding treatments, and included some innovative representative (already deployed and economically viable) technologies. According to information collected these scenarios are the most representative of the current situation and also of the next future. Technologies for the EoL treatments have been not developed as expected in the last decades, and still there are no evidences of quick changes in the use of technologies in the next future. In some cases, as for example for the LCD-TV some changes could occur concerning the EoL scenarios. For this reason, a dynamic analysis of EoL scenarios has been considered, based on different scenarios and assumption. These scenarios could be revised only once more precise performances data about innovative representative processes will be available.
	3. Report 2 – section 7.2	Recycling of LCD TV. A lot of new processes are developed nowadays besides the manual dismantling (semi-manual etc.). --- The conclusions should be reviewed in light of upcoming technologies	The presence of innovative technologies for the treatments of LCD-TV has been underlined in the text. However these plants are mainly at the testing/developing stage, and no public data about their yields are available. Furthermore, their representativeness for the EU context is still very limited (based on communications from association of recyclers)
	4. Report 2 – section 7.2	Technologies are or will be available soon in different countries in plastic sorting to sort brominated flame retardant plastics. Therefore the scenario must be reviewed based on those technologies. --- Same comment as previous	Although some technologies about recycling of plastics with flame retardants are under development, still their representativeness and diffusion in the EU is limited. The study was based on the most update information available from the scientific/technical literature. Further information on performances of representative sorting and recycling processes for plastics with FR could be considered in the future.
	5. Report 2 – section 7.7	The conclusion on labelling of plastic parts by producers has been proven very difficult to implement by producers (problem of reliability) and therefore to use in the recycling business. A false labelling can damage the production of an entire batch of recycled materials. --- Detection techniques and automated sorting of plastic categories and content will be more reliable and efficient in the near future.	Marking of plastics has been mentioned by some recyclers as an interesting ecodesign option to facilitate EoL recovery. --- The problem related to reliability of plastic marking has been inserted in section 7.6.3. Automated sorting systems have been mentioned (e.g. in section 7.6.3).
	6. Report 3 - General	It is important to encourage and impose standards on producers or feedstock suppliers for EEE production to reuse and integrate in their production recycled materials. If the collection/treatment and recycling of WEEE is to be encouraged by the legislation as it is and the recycling industry is lead to produce more and more reusable materials, it needs to be able to find stable market outlets to sell its recyclable materials. --- Encourage coordination between recyclers and producers on design and create a market to reuse recycled materials in "closed loops" for instance. Impose the use of a certain percentage of material coming from the recycling industry in the production of EEE is one solution.	The analysis focused on the reuse of some parts by manufacturers for remanufacturing of products. We recognize that reuse implies other issues (including the fostering of a stable market) but this is out of the scope of the research.

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14. Federal Institute for Materials Research and Testing, and Federal Environment Agency (Germany)	1. General	We welcome the project and strongly support efforts to develop appropriate parameters and measures in order to address resource efficiency and waste prevention aspects in product policy. Especially for the Ecodesign Directive but also for the development of Ecolabel criteria respective tools are missing. While the revised Methodology for Ecodesign of Energy-related Products (MEErP) with the new parameters “Critical raw materials indicator” and “recycmax”is already one step forward, it does not yet sufficiently include parameters for resource efficiency. We therefore welcome the announcement of the Commission, that a new study on the further development of the MEErP will be launched where this issue shall be addressed in more detail. The results of the project “Integration of resource efficiency and waste management criteria in European product policies on hand” provide from our point of view an excellent basis which should be used. Especially in the case studies this project demonstrated how the developed parameters can be used to deduce operational requirements. Some of the proposed Ecodesign requirements should be considered in the coming preparatory studies.	-
	2. Indicators - Methods	The developed parameters Reusability Rate, Recoverability Rate, Recyclability Rate – RRR; Recycled Content; Durability and Use of Hazardous Substances seem to be very useful indicators. It is especially important, that the environmental benefit ratio of the parameters is calculated, as only this can demonstrate the environmental effects. In a further development it would be helpful to combine these parameters with the critical raw materials indicator, e.g. recyclability of critical raw materials or recycled content of critical raw materials.	We agree with this comment and this could be part of future research activities
	3. Durability	While the parameter durability caused the most discussion in the stakeholder consultation, it is a parameter which is of high importance for waste prevention policies and it has a high public attention, at least in German media. The declaration of use time or other aspects of durability also formed a key issue in the commission consultation on the sustainable consumption and production action plan. We agree with the conclusion of the stakeholder consultation, that the effect of durability is very much product group dependent. In case of energy related products it will have especial importance for products where the impacts of the use phase are declining (relative high energy efficiency) and which cause considerable impacts in the production (e.g. high content of materials with high environmental burden like high-purity chemicals or some critical raw materials). One example for such a case are notebooks. Other critical issues are if a product has a short lifespan or if it has a low recyclability. Furthermore with regard to consumer protection it will become more and more important to develop standards for the measurement respectively declaration of use time of products (e.g. burning hours of lamps) or in case of products where this is not feasible (e.g. the use time of a refrigerator is problematic to measure) ways should be developed to measure and respectively declare the use time of critical components (e.g. motor, condensator, charging cycles of accumulator).	We agree that the durability is a complex issue that requires additional research (including on how to define some key parameters). The method developed allows, however, to analyze the considered case-study product and to estimate impacts of products with declining impact during the use phase. Standards to define the durability of products (e.g. average lifespan) are very product dependant. Their development is crucial but it was out of the scope of the project.

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14. Federal Institute for Materials Research and Testing, and Federal Environment Agency (Germany)	4. Indicators – Application	The case studies demonstrated that the developed indicators are suitable to derive appropriate requirements for product policy instruments. To allow for an easy application in preparatory studies for the Ecodesign Directive it would be desirable to integrate such information into the Ecoreport Tool of the MEErP. The stakeholder consultation revealed, that there are some methodological differences in the applied impact categories and may be also data between the JRC study and the MEErP, however it seems that these issues can be solved. The developed indicators are in any case of high value for preparatory studies of product policy instruments in order to derive operational requirements. We would very much acknowledge, if the parameter would be used for the preparatory studies of the EU Ecolabel and if applicable as well for the Ecodesign Directive. Further research and experience seems to be necessary in order to assess, if a binding declaration of the parameters to the consumers is useful respectively in which context it makes sense. The case studies illustrated that only on the basis of the benefit ratio an appropriate assessment of the impact of the indicators is possible. For consumers this seems to be too complicated at present. The case study on washing machines showed that the recyclability rate was favourable for WM2, while the benefit ratio showed better results for WM1. Furthermore the two types of washing machines used different technologies. It could be the case that the difference of a washing machine of type 1 from producer A to a product from producer B is negligible. However first experiences could be made e.g. by an integration in voluntary Environmental Product Declarations, as these declare anyway the environmental impacts of the product on the basis of LCA impact categories.	Integration with MEErP is potentially technically possible but it requires further work (including the use of common data and indicators).
	5. Requirements in Product Policy instruments	The study and the discussion of the stakeholder consultation revealed that specific requirements for easy disassembly/dismantlability of certain components are of importance for the increase in material recycling and especially the quality of recycling material and by that the economic feasibility. While it seems that separation technologies of plastics and mass metals improved considerably, still the pre-treatment of devices in order to separate components which contain hazardous substances or a considerable amount of critical raw materials is important and will become even more important in future. Time-based indexes for the recycling were one of the most promising examples in terms of practicability. From our point of view, such requirements principally could already be applied in future implementing Ecodesign measures.	-
	6. Requirements in Product Policy instruments	The case study on imaging equipment demonstrated the significant effect of recycled content, in this case of plastic material. We share the opinion of the commission, that in a first step requirements on recycled content of plastics are appropriate for voluntary instruments like Ecolabels. Appropriate means of proof are important. Especially a minimum requirement of recycled content of priority resources (e.g. critical raw materials) could deliver a valuable contribution to a resource efficient Europe. However major practical constraints need to be considered and further investigated. The long-time availability of recycled material needs to be taken into account in order to avoid market distortion. Furthermore it seems to be difficult to verify a recycled content by a product test (especially in case of metals) rather certificates of the supply chain would be necessary. As the project revealed only for plastics at least a standard for prove exists. Certificates are not yet in place, however in future developments could be expected.	We highlighted that recycled content of metals has been not considered among the requirements, focusing only on plastics. Common metals are in fact already largely recycled. Verification of recycled content should be based on documental verification and, although the availability of some standardized approaches, verification still represents a challenging issue especially in the context of mandatory policies.
	7.Requirements in Product Policy instruments	A marking of plastic parts will contribute to an improved recycling only if a manual disassembly and separation will take place. The discussion of the stakeholder consultation however revealed that especially the plastic parts are in most cases treated by shredder technologies and a following separation. Such requirements should therefore only be set if a significant share of the products is treated by manual dismantling and/or if a relevant environmental benefit ratio can be gained like e.g. in the case of the PMMA sheets of LCD TVs.	We agree that not all the pre-treatment facilities would benefit of such requirement. However, still several stakeholders and recyclers underlined this as a potential relevant requirement. We considered this limitation by assuming some alternative EoL scenarios. However, we can revise figures once more representative data would be available.

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15. Glass for Europe	1. Report 3- section 2. Revision of the methodology for the calculation of the use of priority resources'	Even if an analysis of the Priority Products and Materials is done in point 1.2.3.1 of the Report 2, a definition and what materials are to be considered as "priority resources" should be included in point 2 (revision of the methodology for the calculation of the 'use of priority resources') of Report 3 --- Include a definition and what materials are to be considered as "priority resources" in point 2 of Report 3	The analysis of the prioritization of the resources was part of the analysis during the Phase 1 of the project (EP1 - Report 2). It is recognized that the identification of a list of "priority resources" could be a policy issues going beyond the scope of the project. The analysis was therefore only focused to the environmental impacts of materials and products in order to assess and improve resource efficiency of product's EoL. --- Clarified in the report 3 – section 2.1.
	2. Report 3. section 3.2.2 Materials suitable for recycled content requirements	The typologies of waste input included in the scope of the recycled content, should be consistent and harmonized in its diverse applications. Acceptable materials to be considered should be consistent with what is prescribed in the ISO 14021 (clause 7.8.1.1). Pre-consumer materials, fulfilling the definition of the ISO 14021, should be allowed, which would otherwise create discrepancies with what is required in this ISO standard. As a concrete example, in sustainable buildings certifications, such as LEED[1] and BRE[2] certifications, the calculation of recycled content of products, uses the ISO 14021 as reference, and therefore encompasses both pre-consumer and post-consumer recycled content. [1]*LEED - Leadership in Energy and Environmental Design* [2]*BREEAM - BRE Environmental Assessment Method BRE - Building Research Establishment* ---- The calculation of recycled content should take equally account of pre-consumer and post-consumer materials.	The cited standards and tools refer to both 'pre' and 'post' consumer waste. However the objective of the project was the identification of potential criteria to improve resources efficiency of product. It is noticed that pre-consumer waste are generally already minimized by manufacturers. Recycling of post-consumer waste needs, instead, to be encouraged because post-comers materials are those affected by a lager downcycling when recycled. The ecodesign phase 1 project already defined both typologies of indices. However, in this phase it was decided to focus exclusively on the "post-consumer" recycled content being this more suitable for Ecodesign purposes.
	3. Report 3 – section 4.3.1 Methodology for assessment of components using hazardous substances	The "definition of the set of substances to be considered" (as dangerous substances) should be limited to substances covered by a legislative framework, in particular by REACH and CLP regulations. Considering substances included in voluntary agreements and other initiatives would represent an additional burden to applicants, without clear and precise boundaries of all sources that would require to be checked and with most likely an overlap with compulsory legislation. --- The "definition of the set of substances to be considered" (as dangerous substances) should be limited to substances covered by a legislative framework, in particular by REACH and CLP regulations. Substances not regulated should not be included.	We agree that, if a requirement is set based on the method, this requirement should refer to regulated substances. However in a life perspective, other hazardous substances could be potentially relevant. For such reason the method has been defined more generic (potentially including both regulated and not regulated substances). Please, note that in the case-study analysis (Report 2) the research focused only on regulated substances. --- A clarifying note has been added
16.IEC TC 111	1. Report 3 - general	We believe that product information assessments and disclosure are a key factor to support a resource efficiency policy, in particular RRR index , recycled content and possibly durability. This requires clear methodologies are set and kept simple for practicability and user result easy interpretations. We recommend to not considering binding requirements unless the appropriate methodology has been clarified, implemented and check for practicability and reliability. Then recyclability rates and recycled contend that are basically by TR 62635 seem to be the most appropriate for early implementation. This is conditioned by the development of the related data bases as appropriate. We recommend that durability be considered and treated within environmental product declaration frames and the appropriate PCR's that define time spans aspects --- To emphasis these considerations in the executive summary and conclusion.	Recyclability rate as in the IEC/TR 62635 is the most developed indicator. However, other indexes (Recyclability benefits or durability) have also been developed to identify relevant key components to which apply other potential ecodesign requirements which would benefit from further future development.

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16.IEC TC 111	2. Report 3 - general	*EC/TR 626352, draft technical report* : This document was approved by IEC on June 2012 and its content is completely set. One shall consider it is no longer a draft. (publication within a few weeks at most) --- Delete “draft” in all places in the document	(Deleted)
	3. Report 3 – page 6	- *Definition of recycling/recovery rates for each product’s parts* : the manufacturer does not really defines the recyclability rate. It shall instead use the values as reported from recycling industry --- Identification of recycling/recovery rates for each product’s parts for the selected scenario	(Modified)
	4. Report 3 – section 1.2.1.3, Table 1 & 1.3.1	*reusable components are included in the calculation of the Recyclability/Recoverability rates17 (while in the EP1 project these have been considered separately for the Reusability index).* In our opinion, when considering a product with regard to resource efficiency, reuse parts should be included in the recycling ratio. Actually, there is no difference between re-use of product part or reuse of material when assessing how much new raw material is needed for a new product manufacturing. The benefit of reuse part essentially rests on economical and down grading aspects. Thus, this is why it has been included in the recyclability rate. On the other hand, assessment of part re-used may present some interest if one want to evaluate the second hand market of a given product or component, but this is not relevant for the purpose of TR 62635 and recyclability rate assessment. --- To include reused part in the recyclability rate calculation	As showed in section 1.3 different indexes have been developed for recoverability, including reusability, recyclability and energy recoverability. This is the major deviation of the proposed method compared to I*EC/TR 626352*.
	5. Report 3 – Page 18	*The IEC methodology, how established now, is instead less suitable for binding requirements (e.g. minimum thresholds to be achieved) due to site-specific information that the manufacturer :* This assessment is only partially correct : manufacturers are invited to use any scenario that is made available, such as the one propose in the TR, as long as the scenario is identified with its recycling rates. --- *Unless a specific public scenario is specified, The IEC methodology, how established now, is instead less suitable for binding requirements (e.g. minimum thresholds to be achieved) due to site-specific information that the manufacturer may collect.*	(Modified)
	6. Report 3 – sections 1.2.2 and 4.3.1.2	The disassembly time is indeed a key element, but it cannot be used as an independent criterion to define “easy to dismantle”. The real parameter is economic and depends on time but also labour cost and the benefit gained with dismantling instead of shredding. This latter depends then on recycled material quality and market prices. In addition, this parameter cannot be measured during the design phase when recyclability rate should be calculated for eco design consideration. It is then too complex and only barely under manufacturer responsibility. In addition, even with tables, product information concerning part joints is hardly available. --- These criteria should be left apart, and not considered for binding requirements.	Although not precise, time for dismantling is used as proxy for “easy to disassembly” of parts. This is not systematically used for all parts but for some “key parts” that are worth to be disassembled. The threshold for the time for disassembly in a requirement should take into consideration the economic issues. --- A standard for measuring the time for disassembly should be developed to support the verification of the requirement (clarified in Report 2 – Annex 4).
	7. Report 3 – section 2.3.1	The concept of benefit per environmental impact with LC thinking is interesting in principle , but calculation is getting quite complex and difficult to implement by industry Above all it requires additional data which are not yet available as mentioned page 40. --- To add after 2.5 a conclusion saying that : It should be kept for scientific approach for further studies. To postpone it for consideration till feasibility is demonstrated	The methodology is not yet intended to be directly used for requirements (as also pointed out in the Report 2 – section 6.6.4.2) but it is useful for the analysis of products and identification of product’s ‘hot spots’ (key components and/or product parameters that are relevant in terms of relevant life-cycle impacts and/or improvement potential). --- Clarified in the end of Section 2.3.1
	8. Report 3 – section 2.3.2	Same comment	
	9. Report 3 – section 2.3.3	Same comment	

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16.IEC TC 111	10. Report 3 – section 3.4	*records that demonstrate an active business relationship with each supplier of recycled material*; Manufacturer , especially OEM, may have no access to material suppliers up-stream and generic data should be accessible when available --- Reference to recycled data content bases or demonstration of active business	The sentence refers to a standard (SCS, 2011). However, verification of Recycled content is a key issue, and its application or not is dependant on the type of EU product's policies considered.. --- Limits and difficulties of the verification have been underlined in Report 3 – Section 3.2.
	11. Report 3 – section 4	The hazardous substance aspect is well documented and impacts on recycling operations seem to be covered by legislations. Including the set of substance to be considered. Its direct impact on resource efficiency appears weak and other specific resource efficiency requirements are not relevant. --- To state it in the text body	The potential overlapping with other EU policies has been considered. This is the reason why the study only focused on the EoL treatments of components containing hazardous substances and potential product-related strategies to improve their treatments (including e.g. provision of information). This is also in line with recommendations of IEC/TR 62635 stating that ""*Manufacturers should provide information which identifies the sources of potential hazards to recycling or recovery personnel*"
	12. Report 3 – section 5.3.1	We would suggest to consider LCA standards and ISO 14025 standards where typical life time and product time are covered in PCR . In our opinion, this latter address the point and should be use for durability assessment, when relevant and considering these 2 cases : Case 1 : product life > typical life time (e.g. obsolescence due to market.) Durability is not relevant Case 2 : product life < typical life time . LCA is calculated talking into account replacement	The methodology here proposed is in line with ISO standards on LCA. Concerning the assessment of the average "useful life" parameter this is not discussed in the report but it could refer to similar assessment performed in other methodologies (e.g. the MEErP [VhK, 2011]). --- The concept of obsolescence and its interaction with durability has been partially discussed in Report n°1.
	13. Report 3 – conclusions	*The draft IEC/TR 62635 does not consider a procedure for the verification of the indices, which is instead proposed in the report based on some provided calculation data sheets.* This is no accurate, as the TR requires that declaration shall explicitly in clause 7.4 that product reference, scenario and related information shall be made available. Data sheets are not requested as all elements are to be found in the above mentioned documents. --- *IEC/TR 62635 procedure for the verification of the indices is based on the availability of Product and recycling process scenario description. In the report , it is instead based on some provided calculation data sheets*	(Modified)
17. Oekopol GmbH - Institut fuer Oekologie und Politik	1. Report 3 – Chapter 4.	[it has been provided a commented version of the chapter]	We thank the stakeholder for the fruitful / constructive comments and the suggestions. These have been largely adopted in the revised Chapter 4 (Report n° 3). Among the comments the Oekopol highlighted that the „Green Screen is given a very pronounced position in this paper-2. We mentioned that this is one of the methodologies available and has been illustrated as exemplary, also following feedback received for the first phase of the project. However the section has been revised and shortened, in order to not unbalance its importance. --- Revision of Chapter 4 of Report 3

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
18. Orgalime	1. General	Orgalime thanks you for consulting us on the above mentioned draft methodology, currently under development by the Joint Research Centre and DG Environment. Following the stakeholder meeting on 10 September 2012, our industries wish to confirm once again their general commitment to the objectives of the EU Resource Efficiency Roadmap, the Ecodesign and Energy Labelling Directives and EU waste management legislation. On the other hand, we regret to have to confirm to you our general concern and reservation on the draft methodology and its application to our industry sector, in particular for the following reasons:	-
	2. General	- We originally supported the Ecodesign (EuP) Directive as this was the result of lengthy discussions with regulators to set up a single and holistic framework for dealing with the environmental impact of the products of our industry. For our companies it is indeed essential, when designing a product, to know well in advance what are the factors they need to take into account for the design of their products.	-
	3. General	- The draft JRC methodology does in our view not sufficiently take into account the criteria of the Ecodesign Directive, and more particularly the life cycle approach of the Directive and its requirement of demonstrating "a significant potential for improvement in terms of its environmental impacts without entailing excessive costs" (art.15 Ecodesign Directive).	The proposed methodology concerns several product policies, including those in the scope of the EcoDesign Directive. Methods developed in the Project Phase II are based on a life-cycle approach, thus in line with the Ecodesign Directive. The proposed methods allow to identify potential requirements based on a life-cycle assessment. Case studies show that it is possible to assess the benefits of the potential requirements, and hence their significance. Requirements can also be compared to benefits related to Implementing measures already adopted under Ecodesign. The relevance of requirements is related to selected impact categories. Potential costs have been qualitatively assessed, according to the objectives of the project, more oriented on the development and testing of methods and identification of potential requirements. The project was not meant to carry out a full Impact Assessment of the potential requirement identified.
	4. General	- The draft JRC methodology also in our view continues to insufficiently recognises the existing MEErP methodology that has been established and reviewed for the implementation of the extended Ecodesign Directive according to article 21 of the Directive.	The MEERP methodology and Ecoreport tool has been used when possible (e.g. as for recycled content benefits). In addition to MEErP and the Ecoreport tool in it, LCA methodology have been further used in order to appropriately capture some material efficiency aspects. The proposed methods are complementary to the MEERP and potentially suitable for integration into this methodology.
	5. General	- In application of this existing MEErP methodology, the recent tender ENER/C3/2012-418 on 12 product groups targeted by the Ecodesign Directive already foresees an analysis of the most significant non-energy related environmental aspects of relevance to these product groups as well as analysis of the feasibility of introducing requirements on reusability, easy dismantling and recyclability. Therefore, the draft JRC methodology would lead to an unnecessarily duplication of resource efficiency implementation studies and potential implementation activities in our sector. This would once again lead to adopting a more complex and, also an incoherent and costly approach for the same products, while today the stated policy of the European Commission is that it seeks a simplification of the regulatory framework.	The methodology has been developed in order to further enhance the analysis of the most significant non-energy related environmental aspects as well as analysis of the feasibility and associated benefits of introducing requirements on reusability, easy dismantling and recyclability.

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18. Orgalime	6. General	- The development and application of a parallel methodology that singles out resource efficiency or waste management parameters from the products' wider environmental, economic, social and functionality parameters risks leading to misleading and conflicting results, including from an environmental point of view. It especially risks leading to a negative impact on the ongoing Ecodesign implementation on energy efficiency, which represents a priority topic under the Resource Efficiency Roadmap in itself.	Identification of potential product policy requirements on material efficiency in that case studies of this project is not in conflict with other energy-efficiency requirements.. The potential requirements are complimentary. In addition, should any potential requirements on material efficiency identified be applied to any EU product policy in future, they will need to be in line with all the relevant provisions (e.g. on functionality, life cycle cost and life cycle environmental assessment) specified in the EU product policy they are considered for application (e.g. Ecolabel, Ecodesign, etc).
	7. General	- The proposed methodology on "durability" of products particularly conflicts with the ongoing implementation of the Ecodesign Directive on energy efficiency in our sector, as the energy efficiency performance of a product continuously improves from one generation to the next.	The developed method (see also application to a case study in Report n°1) proved that under some conditions, the prolongation of the operating life of a product can lead to overall environmental (including energy) benefits. Further to this, and in line with any other potential requirements considered under EU product policy, policy makers can exercise judgement as to the timing of potential requirements in order to eliminate/minimise trade offs, if any.
	8. General	- The suggested ecodesign requirement that manufacturers should ensure that a given product can be manually dismantled within a certain time period (e.g.: 40/50 seconds) would impose costs and burden on manufacturers of these products, while it does not mean that manual dismantling would indeed take place during the end of life recycling process of the product, as manual dismantling is very costly. This has been explicitly confirmed by stakeholders representing the recycling industry sector during the stakeholder meeting of 10 September. Therefore, the application of the draft methodology is likely to result in proposals for ecodesign requirements that would not lead to environmental improvements in reality, while - imposing cost as well as administrative burden on product manufacturers, - jeopardising unnecessarily the competitiveness of European manufacturers, and - increasing costs for consumers and reducing the affordability of products.	We recognized that not all the recyclers would take benefits of the improved disassemblability of some key parts. This has been considered in the assessment of the requirement (considering several scenarios, including the EoL shredding-based scenario). Design for Disassembly supports dismantling-based scenarios (with higher yields) and does not hinder shredding-based scenarios (with lower yields). Non Design for Disassembly hinders dismantling-based scenarios and does not support shredding-based scenarios. The assessments carried out in the project proved that the requirement is relevant for some impact category. Concerning the costs, the qualitative analysis (based on publication on the literature) indicated that costs for design for disassembly/dismantling are generally very low/ negligible compared to other costs and could also reduce costs for assembly. Furthermore we underline that design for disassembly can be a benefit for users, allowing for substitution of key parts, prolonging the useful life of products and translating into a reduction of costs (See report No1 on Durability) Furthermore, we highlight that according to the comments received by various stakeholders, including some recyclers, (here attached) dismantlability of key parts is a key issue in resource efficiency.
	9. General	- The suggested ecodesign parameter of "recycled content" raises our concern as it is impossible to trace the use of recycled materials while producers remain liable for any product default. Choosing the material content for products is determined by many factors, all of which would need to be taken into account.	Verification possibilities will have to be carefully considered depending on the different product policies such criteria could be applied under.. The requirements on recycled content can be more suitable for some product's policies (e.g. voluntary labelling) rather then others (e.g. mandatory policies). The use of post-consumer recycled materials is seen as one of the essential lever to push the recycling of some materials.

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18. Orgalime	10. General	- The suggested lead indicator of Domestic Material Consumption (DMC) will give an indication of the material efficiency of the society/country, however, it would not reflect the quality of recycling processes. This is also because DMC is mainly a measurement in tons/quantity, not of quality. The lead indicator therefore shows in our view considerable weaknesses in terms of its capacity to reflect all aspects of Resource Efficiency in an appropriate and reliable manner.	Analysis of DMC and other economic indicator was out of the scope of the project
	11. General	- It is suggested that the indicators for turning waste into a resource be based on municipal waste, generation, recycling and landfilling. This will, in our view, not provide a reflection of how the industry progressed in producing less and less waste, in increasing recycling of industrial waste, within its own production and between different industries.	The project only concentrated on product-related aspects, not on the production.
	12. General	In annex to this letter, Orgalime submits a copy of its position paper of 16 January 2012 on the draft JRC methodology, as we consider that most of these comments unfortunately still remain to be taken into account. Orgalime's position paper of 16.01.2012 on the Commission's Resource Efficiency Roadmap itself, which includes our concrete recommendations for implementation, can be found here: http://www.orgalime.org/Pdf/PP_Resource_efficiency_Jan12.pdf	The methods developed in this study and their application as demonstrated by the case study are in line with Art 15 of the Ecodesign directive and recognise the existence of the MEErP methodology. Should any of the suggested potential product requirements be considered for future Ecodesign Implementing Measures further discussion with stakeholders will take place in the context of the usual process set out by the Ecodesign Directive
19. Plastics Europe	1. General – Report 2 and 3	We recognize the technical value an the contribution of these documents but we deeply regret to be given such a little time to make comments, impeding going in the details enough and proceeding to a collect of comments from our members. --- We suggest EU commission and JRC to arrange longer period for consultation. We suggest JRC to warn stakeholders in advance that a consultation is going to take place, for example by reactivating a short periodic newsletter.	Stakeholder consultation was announced via available channels (JRC website and mainlining lists of Ecodesign Working groups) in July 2012. Consultation was held from 17th August to 21st September 2012. We are sorry that the available time was not enough and/or that the announcement did not reach the stakeholder in time. Comments and suggestions are welcome (also outside of the stakeholder consultation). Any new comments will be not taken on board in the present project but potentially in the next phases of the research.
	2. General – Report 2 and 3	As explained in the JRC-IES website the project intends to contribute to the developments of methodologies for the measurement and validation of SOME eco-design parameters for resource efficiency: RRR, recycled content, use of priority resources, use of hazardous substances. We welcome that these methodologies are based on LCA approach and, regarding dangerous substances, are based on regulation and on product stewardship approaches It should be reminded in report 2 and 3 that the panel of parameters considered, when implemented in the eco-design of products, should be considered with the broader picture of the LCA of products, including the use phase and any other relevant stages, as recommended by the ISO TR14062 "Integrating environmental aspects into product design and development". Indeed for chemical and material industries the use phase is an important mine of improvement and source of motivation for eco-design. --- Report 2, page 11, after "…to assess their potential benefits." We suggest adding "These should be considered in perspective of a whole life cycle approach of the product considered, including use phase and relevant other phases, in order to minimize trade-off and optimize global environmental benefits" Report 3, we suggest a phrase with a similar message in the introduction, possibly at the end of page 11	(Sentences added, including reference to ISO/TR 14062).

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
19. Plastics Europe	3.Report 2 - Section 1.3.2, bottom of page 34	"Among plastics, PA, PUR, PC, and PVC have generally larger impacts". The criteria which underpin this statement are not obvious, debatable, and there are too much uncertainties (see the next comment.). In addition this statement does not bring any value to the report but contradict the strong warning of the last phrase of page 35: "However, these values should be not used as basis for general 'judgments' on the materials, being the use of such materials into products not considered here. Results should also only be used within the scope of this study." ---- Remove "Among plastics, PA, PUR, PC, and PVC have generally larger impacts" in section 1.3.2 and also in section 1.4 (conclusion)	(Removed)
	4. Report 2 - Table 10 and table 13 and linked table A.2.2	In PlasticsEurope EPD we do not calculate toxicological and ec-toxicological impact yet because we consider it is not robust enough. Despite recent recommendation from JRC-IES ILCD handbooks based on a scientific rationale, it is a matter of fact that the LCA community lacks of experience, practice, cross checking ability, when calculating those indicators. Particularly they are very sensitive to the inventory of substances which are fare from being updated and validated in existing database. The entry-level compliance of PlasticsEurope data has been recently validated by the consultant Dekra who point out this issue with our old eco-profile calculated by Boustead Consulting. He also pointed out that the eco-profile recently updated by PlasticsEurope like PET, PC was not yet updated in the ELCD. We would like to draw your attention on our updating programme underway: PS, PA6, PA66, should be published in a couple of months. Polyolefin's and PVC update are being launched with results expected in a delay of one year. ABS/SAN and EPS should be started soon. --- We suggest adding page 39 a statement about LCI of substances uncertainties in respect of (eco) toxicological indicators	(Added)
	5. Report 2 - Table 10 and table 13 and linked table A.2.2	We strongly doubt that PVC may be responsible for 25% of freshwater aquatic toxicity as figured in table 13. In table A.2.1 we can see a high value for 1,9 E+1 kg DCB-eq for PVC. The reference data is PVC ELCD 1998. Such a high value may come from old value of dioxine or mercury emission. These have much improved (decreased) in 2005 data. It may also come from any other substance to which the indicator would be very sensitive. To la lower extent the concern is the same with human toxicity. ---- This subject is very sensitive as it brings to the conclusion that PVC is highly relevant at the European level for some impact categories. Moreover, in the current background where PVC is permanently criticized this conclusion may easily be diverted out of the scope of this report. Therefore it is of the utmost importance that the calculation is verified, and we propose to work on it with our consultants and the JRC before the report is finalized.	(PVC has been excluded from the high level assessment due to low quality of data available to the project team. It has been clarified in a new footnote).

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20. RREUSE (Reuse and Recycling EU Social Enterprises network)	1. General - Reusability	Reuse centres often store parts recovered from second hand appliances, including washing machines, in order to be able to fix those appliances which have a high reuse potential. Reusability in this context is important, not for removing components of an appliance in order to use in the manufacture of a *new* machine, but in order to replace faulty components in another machine in order to prolong its lifespan as spare parts are expensive and often hard to come by. In the case of washing machines components that are often saved by reuse/repair centres for further use include motors, mechanical and electronic electronic steering mechanisms and pressure switches As questioned during the stakeholder meeting, components do have economic value as they become crucial when refurbishing a machine which has a faulty component where a replacement spare part does not exist anymore or is simply too expensive to make repair economically viable. Thus this should be considered within the methodology relating to reusability. RREUSE also agrees with the EEB that reusability should more reflect reparability and the potential for whole appliance reuse or remanufacturing rather than just the components in order to substitute those destined for new machine production.	We agree on the potential key role of reuse and its complexity. However, the objective of our research was to identify methods to identify and set ecodesign requirements to improve EoL of products. For this reason the analysis was limited to reuse for remanufacturing. Moreover, no re-use / remanufacturing scenario was considered in the case studies because they were not considered as representative from a flow perspective. Other case studies with EoL scenarios considering re-use of components could allow this discussion on re-usability indices. Reuse of products as whole or activities of reuse centres are very important but these activities are still difficult to be considered for potential ecodesign requirements for manufacturers. On the other hand, we are in line with considerations of RREUSE in the analysis of durability (report n°1 of the study). In fact we highlighted the need of design for disassembly of key parts (e.g. mechanical and electronic mechanisms) for their reparability/substitution. Such requirements could largely underpin activities of reuse centres (as those described by the stakeholder).
	2. General - Typical issues encountered with washing machines	Typical faults with washing machines related to product design which often leads to a shortening of its lifespan have been presented in the following video featuring R.U.S.Z, a member of the Austrian Reuse and Repair Network, Repanet (See minute 14:16) http://www.youtube.com/watch?v=vbMhbWEibxM&feature=plcp Currently, the large amount of increasingly cheaper mass produced washing machines available on the EU market are posing the following problems to consumers and reuse/repair centres: ▪ Lower quality shock absorbers cannot withstand 1600 rpm for a long time. In addition the ball bearings get pressed into plastic outer casing of the washing machines which wears out the bearing carrier/bearing seat quickly dramatically reducing its lifespan. In order to replace the ball bearings, not only these have to be replaced but also at least part of the casing. In many cases one has to purchase the complete casing including the drum which is very expensive, often leading to it being cheaper to buy a new appliance. Metal outer casings and better quality shock absorbers would improve durability. ▪ Problems with the pump fittings/sealants/washers which are made out of rubber degrade quite often or can easily become blocked ▪ Electronic steering components linked to the timer can fail, which is a problem as increasingly it is difficult to identify the problem with increased numbers of electrical components. Moving towards a more mechanical design would drastically improve reusability/durability. ▪ The membrane of pressure switches (pressostat) can degrade overtime which leads the washing machine over time to take on more water than it should and is designed to take on. Repair workshops often register degraded membranes which lead to more water and electricity consumption. ▪ Heaters can stop working prematurely, especially in regions with hard water (high lime content). Washing machines should be serviced at least once a year to prevent limescale which seriously reduce energy efficiency.	(We listed these typical component failure in the new Report n° 1 concerning key components for durability of WM).

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
20. RREUSE (Reuse and Recycling EU Social Enterprises network)	3. Data gaps regarding reusability	The JRC observed the activities from 5 recycling plants in order to create the case studies to test the 3R methodologies. None of these plants extracted any components for reuse. The lack of data regarding reusability is alarming and is reflected by the reusability rate being 0% (reuse of post-consumer waste parts not detected) in both the washing machine and LCD screen case studies. This clearly needs to be addressed. As members of the RREUSE network are involved in preparation for reuse (repair/refurbishment) of WEEE we strongly recommend the JRC to visit some of our reuse and repair centres in order to be able to have a true picture of reusability and durability issues in practice and fill in data gaps within their case studies.	As underlined, the study focused on reuse of components for remanufacturing. The current project is now concluded.. However we would be glad to visit RREUSE members and to analyse a typical re-use EoL scenario in the next phases of the project, as needed.
	4. Comments on durability	Whilst RREUSE understands that this work is in progress, without document 1 and the related case studies we cannot see the full application of the methodology in order to make a good evaluation. Regarding lifecycle assumptions of a product e.g. 11.1 years for a washing as quoted in the presentation, it is important that we start moving away simply from looking at the Carbon footprint of products when determining the lifespan of a product. For example a life cycle assessment relating to fridges commissioned by "Schweizerische Agentur für Energieeffizienz" and "Bundesamt für Energie" 2008 (http://www.esu-services.ch/fileadmin/download/steiner-2005-Kuehlschrank_Graue_Energie_1.0.pdf) comes to the conclusion that although the use-phase requires 80% of the primary energy consumption compared to 20% for the production - and distribution phase, by closer examination the production phase gains more importance due to severe environmental impacts during extraction and therefore has to be taken more into consideration. More indicators related to resource efficiency must thus be used to assess the replacement time of an appliance from an environmental perspective. In order to be able to efficiently repair/refurbish an appliance it should be designed for ease of disassembly without destroying the integrity of the casing which significantly affects reuse potential. As an aside, the website I-Fixit, often gives scores for electronics regarding their reparability and includes factors affecting this such as: * *Are components glued, fused, or screwed?* * *How difficult is it to open the device?* * *Are proprietary screws used? Etc.* Having a list of criteria like this could help at the design stage. Lastly, the Commission itself recently stated, "we must move away from a wasteful economy towards one based on durability and reparability of products which is likely to create job opportunities throughout the product lifecycle in terms of, maintenance, repair, upgrade, and reuse."2 We ask that the Commission can apply this thinking strongly within its work on reusability and durability. We await the JRC's report on durability in report number 1 with anticipation and we do hope the information provided will help with your work. We thank you for your efforts.	The research currently focused on the setting of a method to assess the potential environmental benefits in prolonging the operating time of an energy related product. Analysis of key parameter was not performed yet and the case-studies were based on assumptions from other studies (mainly preparatory studies) and other LCA. We agree on the key role of reparability and disassemblability (non destructive) as underlined in our reports. --- The proposed citation of the EC has been mentioned in the new report n° 1.
21. STENA	1. Report 2 page 97	The choice of PCB composition is tricky depending the different ages/models/manufacturer that exist on a market. A big part of the PCB can be compared to a low grade TV-circuit board.	No primary data from manufacturer were available. Data from references have been used.
	2. Report 2 page 124	In a TV there are more the 2 lamps. --- In backlighted TV it can be for instance 8, 16 or 20 CCFLs. The number is decided by the size of the TV.	The observed case study was a 20'' LCD-TV containing only 2 lamps. --- It has been clarified that the value refers to the particular case-study considered.
	3. Report 2 Chapter 7	Before discussing the details, one major factor is not at all discussed; the safety aspect. Manual dismantling exposes the dismantler to Hg-emissions since a significant amount of the lamps (discussed values between 10 and 70%) are broken during or before the dismantling. Mechanical treatment on the other hand guarantees that no workers are exposed to Hg, as long as the process is continuously monitored by Hg-measurement equipment.	It has been observed that dismantlers always use safety devices to reduce the risks of contamination. However, the full analysis of safety aspects was out of the scope of the research.

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21. STENA	4. Report 2 Chapter 7	The case study is based on full manual dismantling. As for most other products, mechanical treatment is also used for LCDs. Due to the historical low volumes; such mechanical treatments have been less common up until now. However, this is radically changing and mechanical treatment has to be taken into account	The study was based on the current technologies observed at the recycling plants. Future technologies have been considered in the dynamic analysis of future scenarios. However, it has been underlined that quantitative data about the efficiency of such automated recycling process are not public available.
	5. Report 2 page 132	"Is shredding insufficient do to the uncontrolled Hg emissions". We have had a number of audits from authorities and control organizations, producers on this process. --- Shredding of LCDs in a process tailored for LCDs does not lead to uncontrolled Hg emissions since the Hg is taken care of. To shred LCD-TV with CCFL where Hg emissions is not controlled is not an option.	(Innovative plants, including those developed by STENA, have been mentioned in Report 2 section 7.5).
	6. Report 2 page 134	"Little information on performances is still available on... [Mechanical treatment]" and such treatment "is therefore not included in the EOL scenario." The difficulty to get information should not exclude mechanical treatment.	According to association of recyclers, mechanical treatment of LCD-TV is still very minority in EU. Mechanical treatments of LCD-TV have been however considered in dynamic analysis of future scenarios. Data from other processes have been considered.
	7. Report 2 page 153	"These treatments might be more economically efficient than the current EoL scenario while generating higher losses of recyclable materials with consequent reduced environmental benefits." Not correct. Which underlying study with a comparison between manual and mechanical processes shows this? ---- Existing EoL scenarios must be studied more. We have customer demands today that only accepts a mechanical treatment as ours to make sure Hg is not released uncontrolled into the air.	This statement did not concern the release of hazardous substances but the yield of resource recovery. --- Sentence corrected to: "These treatments might be more economically efficient than the current EoL scenario while usually generating higher losses of recyclable materials with consequent reduced environmental benefits."
	8. Report 2 Table 67	The recycling rates in Table 67 are incorrect. For instance, we can achieve a recycling rate of close to 100% of PMMA. Point 4. There are other technologies then density.	The recycling rate of PMMA is based on values from IEC/TR 62635 concerning other plastics after shredding. This reflects the average EU situation. Current figures could be updated once performance of separation plants will be published.
	9. Report 2 page 177	The conclusion that manual dismantling allows for high recyclability is partly void. Economic factors will prevent all parts from being fully dismantled. In comparison, mechanical processes will fully separate all materials and may therefore yield a higher recycling ratio.	According to communication of recyclers, manual dismantling of LCD-TV is currently fully economically viable and allows higher recycling rates.
	10. Report 2. section 7.6.3	" *.. the presence of flame retardants/fillers, in plastic is not compatible with their separation via mechanical systems (sorting by density"*. This is not correct. We use in Sweden since 2007 density separation to sort out a ROHS compliant pre-concentrate of ABS, HIPS, PP from other plastics including FR containing ones. We do that from a shredded WEEE fraction that has been pretreated. Size that can be sorted is 7-50mm. We produce more then 10 000 tons annually including a fuel fraction. (then also cursive text on page 168 not correct. Can be sorted) --- The recyclability is also achieved via the mechanical route and density separation on plastics from LCD-TVs. Not only if manual dismantling takes place.	These figures have been derived from published data (both in IEC/TR 62635 and articles). We could refine these figures once quantitative data would be published. --- A note has been added in the section pointing out that, some plants are currently doing the separation.
	11. figure 8 and 9	The demand for recycled plastics of high quality is big. So the presented scenarios already exists and even at a higher recycled content --- In 5.6 write more clearly that plastic recycling takes place which confirms your results.	(Suggested sentence has been added)

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21. STENA	12. Report 3. Annex 1-4	Question to stakeholders: Which of the potential requirements suggested in each of the case studies seems more robust for early implementation in mandatory and voluntary product's policies and which one requires more work and why? In all of them the BOM is a part (direct or indirect) if the guideline. So implementation of IPC 1752 or/and IEC62472 is crucial for any requirement in the sense that benefits can be achieved. So any proposed requirement guidelines that concerns material declaration, like indium content or hazardous substance content, should be prioritized.	Results of the research and proposed potential product's requirements are in line with this comment.
	13. Report 3. section 1.3.1	In the text the definition of recycling is referred to IEC/TR 62635 that is do not include reprocessing to fuel or backfilling. Here is a problem in which process is accepted/allowed/agreed about within a definition --- Somewhere this problem should be addressed when evaluation the recycling /recovery rate.	Definitions have been derived by the standard. However, different sets of indexes have been developed to cope with different goals. The scope of each index is specified in the definition of their scope
	14. Report 2. page 140	About no figures in flame retardant content. This could be possible by checking the labeling and the check the standard translating it. After that contact European Flame Retardant Association http://www.cefic-efra.com/, they can then assist on more data.	Figures on flame retardants were generally missing. Further data will be collected in the next phases of the research.
	15. Report 2. Table 58	Definition of poor intermediate and very high too subjective --- Express it as a range instead.	These were the only figures available for the case-study product. A range has been not considered to avoid the multiplication of different scenarios. Primary data will be used, when available, in the next phases of the research.
	16. Report 2. Section 7.6.3	Potential requirements marking plastics. Not a good idea to colour the marking since it can interfere with the colour of the part. Also if the label is a sticker the sticker must be the same plastic as it is stuck to (if the part is of plastic) ---- Use the 25g limit as it is the already used standard in plastic labelling. And refer and develop existing standard	(Requirement has been modified. Concerning the setting of thresholds, further analysis is necessary)
	17. Report 2. Section 7.6.1.	Putting all the time requirements together you can interpret it as you have 14,5 minutes to manual dismantling it. This is way to long. --- Add a total maximum time also	Maximum thresholds was already set in the requirement (this has been clarified also in the text)
	18. Report 2. General	Question to stakeholders: Which of the potential requirements suggested in each of the case studies seems more robust for early implementation in mandatory and voluntary product's policies and which one requires more work and why? The disassembly requirement is a good idea but must be much more investigated before implemented. In discussion with producers we communicate module thinking meaning define and assembly a product in modules. Then also dismantling becomes easier.	The disassembly requirement will be further investigated through the development of a standard for the measurement of disassembly time.
	18. Report 2. section 7.4.1.3	Plastic content over 50%, we find this level too high.	This is based on the studied case-study product. --- It has been specified in the text

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22. Suez Environment	1. Question	Which of the potential requirements suggested in each of the case studies seems more robust for early implementation in mandatory and voluntary product's policies and which one requires more work and why?) (1) Designing for disassembly would appear to be the most relevant requirement that also applies across product categories. As a general statement, products that are difficult to disassemble are more likely to be discarded in toto rather than recovered for repair or refurbishment, or recycled. The precise metric needs more careful consideration - time for disassembly is perhaps less important than the ability to separate out different parts and materials to the extent that subsequent processing is made cheaper and technically less challenging. (2) Recycled content threshold is another requirement that applies across product categories, if necessary on a material by material basis (for example to plastics content, and/or to rare earth content). This requirement would stimulate innovation in recycling and production technologies, and could potentially be supported by incentives in the form of recycling certificates, or credit for carbon reduction. (3) Less clearcut is a requirement on product durability. A product might be made to be more durable, but customer behaviour may negate this advantage by misusing the product, or replacing it with a more advanced model well before its design life. Other supporting mechanisms such as product take-back and product leasing need to be considered in tandem, in order to close the producer responsibility loop.	-
	2. Report 3 - section 1.2.1.1 and Table 1	Although Report No. 3 states that the IEC Technical Report (TR) definitions of recyclability and recoverability are "coherent" with the previous Phase 1 project output (EP1), there is in reality an important distinction and these two definitions are incompatible. The TR definitions are "based on actual practices" with rates estimated from "references and information from recyclers" (page 16), whereas the formulae presented in EP1 describe the "potential" for a particular component or material to be recovered or recycled. This implies that a value for recyclability or recoverability based on the TR definition could vary over time as "actual practices" improve with or without improvements in product design, whereas a value based on the EP1 definition would be a theoretical value varying with improvements in product design, but independent of downstream "actual practices". --- Agree on which option to adopt before the concept is applied to initiatives such as ecolabelling. This difference should be underlined on page 18 and table 1, page 20.	We consider the two set of definitions coherent. In particular for both the EP1 and IEC /TR, the recyclability is a potential/ability of a product. It is true that according to EP1 this ability can change over the time, and it is the reason because the analysis of different possible EoL scenarios has been considered (including when possible, the dynamic analysis of future scenarios). The analysis of alternative scenarios has not necessarily to be performed (according to the IEC/TR) while it is part of our method (as underlined in section 1.3.2.1). Furthermore the estimated recyclability of a product does not necessarily matches with the real processes that the product will undergo at the EoL. For this reason the recyclability is distinct from the effective recycling. --- This concept has been clarified in section 1.2.1.1 and in Table 1.

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22. Suez Environment	3. Report 3 – sections 1.2.1.1 and 2.3.3	The precise definition of recovery/recoverability used in Report No. 3 is not entirely clear. The TR appears to suggest that recovery is limited to energy recovery, whereas as page 45 of the Report acknowledges, Directive 2008/98/EC defines recovery far more broadly: Annex II lists 13 recovery operations, only one of which (R1) relates to direct energy recovery. Page 45 of the Report acknowledges recycling as a subset of recovery, as is "preparing for re-use". However, these are not the definitions which the Report uses in its interpretations of the various recycling and recovery indexes. --- Definition of recovery/recoverability should be consistent with definitions in EU waste legislation.	Definition on section l 1.2.1.1 about recovery has been corrected. According to IEC/TR 62635 reusable parts are considered as part of recyclability index. This is recognised as a discrepancy from EU legislation. For such purpose, different indexes have been defined including or excluding reusable components (as in sections 1.3.1 and 1.3.2.2) The definition of recoverability is referred to IEC/TR and it includes all recovery operations (reuse/recycling/ different energy recovery options), in line with EU definitions. The energy recoverability benefit index is build upon the definition of energy recovery by Ecodesign Directive, and it mainly focuses on energy recovery by incineration. Incineration is the most common option and that can be modelled in a general way, as performed by the index. However, as underlined in section 2.3.3, this index is potentially extensible to other energy recovery options (some examples have been provided in EP1 Report n° 2 – Section 3.4.2 and 3.4.3).
	4. Report 3 – section 1.2.1.2	Cooperation and information exchange between manufacturers and producers will be key to achieve higher improvement and close the loop of circular economy. Market demand for recycled materials will support the development of EU recycling potential and performance, and ensure that the eco-design improvements made by producers will effectively translate into better recycling if economically viable (cost of dismantling + market value of recycled content). - - - A clear and predicatable regulatory framework, securing long-term investments and rewarding sustainability efforts is needed to accompany the implementation of eco-design principles.	This project only focuses on requirements at the product level and it is unclear how the suggestion could be used at this level.
	5. Report 3 –section 1.2.1.3	The revised algorithms for recyclability and recoverability differ from the previous Phase 1 formulae in that the former relate to individual components, rather than to individual materials within individual components. We agree with this simplification, but question whether, in the case of component-based recyclability, a weight based algorithm is appropriate (see below). In relation to recoverability, if the meaning of the term is restricted to energy recovery, then we question the interpretation of Formula 2. If a component has intentionally been designed and made of non-combustible material such as metal or glass, then energy recovery by incineration (as noted on page 13) is not an option and the product could be perceived to be penalised for having a low or even zero recoverability rate. The example of liquid crystal displays on page 17 (RVR = 0) illustrates the point. --- Ensure that definitions of such terms and the manner in which they are used in the Report are consistent with definitions in EU waste legislation, and that communication of the RCR and RVR values (for example, in ecolabelling) does not oversimplify or obscure legitimate environmental or design arguments	Formulas have been aligned to IEC/TR also for data availability on the RCR/RVR. Still different sets of indices have been developed, with different scopes, in order to 'capture" different properties of the product/component. The product assessment should be performed on the basis of multi-criteria analysis, considering the different aspects. Considering the cited component (liquid crystal display), this is made by material not suitable for incineration (also for the potential content of heavy metals), nor the component is currently recyclable, leading to a recoverability of 0%.

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22. Suez Environment	6. Report 3 – sections 1.2.2 and 4.3.1.2	We are in agreement with the decision to set aside the index of disassembly developed in EP1. The index had methodological flaws, for example by setting the disassemblability index D to 100% for a product that can be used in toto without the need for dismantling or disassembly (for example, furniture). While there are many products (perhaps the majority) that require an element of dismantling and disassembly prior to reuse or recycling, many others do not, and the proposed methodology in EP1 did not allow for this possibility. Unfortunately the same problem applies to the methodology described in Section 4.3.1.2 of the present Report, which relies on a single parameter, the time for disassembly, to characterise disassemblability. See attached ACEA presentation on car dismantling. ---- Review the methodology described in Section 4.3.1.2, which should not rely on a single parameter, the time for disassembly, to characterize disassemblability.	The disassemblability was explicitly part of the indexes in EP1, while it is implicitly influencing the new indexes (by the definition of the EoL scenario and RCR/RVRs). Once the disassemblability of some components is recognized as critical for the product life-cycle, we investigated potential parameters influencing it. Time for disassembly, according to the literature and communication of recyclers, represents probably the best available proxy. Furthermore, it is potentially measureable and verifiable and, therefore, potential suitable for Ecodesign requirements. Time for disassemblability could be not relevant in the case of automated disassembly. According to our knowledge, this is, however, working only on few experimental cases and not representative of EU EoL scenarios.
	7. Report 3 – section 1.3.1	As with the previous revised formulae, we agree that Formula 3 (Reusability rate) is an acceptable simplification of Formula 1 in EP1 (i.e. removing the focus on materials within components). However, the Commission should consider whether weight is an appropriate unit of measurement in a component-based algorithm. The limitations of a mass-based approach have been well summarised in Section 2.2 of the Report, but a particular difficulty is its inclusion in Formula 3. By way of an example, if a product was made up of five components, four of which were of lightweight plastic and one of a heavy base metal, but only the latter was reusable, then a mass-based revised Formula 3 would skew the index heavily in favour of the mass of metal, despite the fact that in component terms only one-fifth of the product was reusable. --- Revise the measurement unit in formula 3.	We agree that mass based indexes could potentially misrepresent the LCA impact of a recycling a product.. For this reason, a set of environmental based indexes have been developed (Report 3 – Chapter 2)
	8. Report 3 – section 1.3.2.2	The terminology used to define an index integrating the various aspects of "the three Rs" is confusing. As noted above, the term "recovery" is defined in EU legislation as an all-encompassing terms that includes recycling, energy and materials recovery and "preparing for re-use". Formula 5 includes recyclability and ability to reuse (although it is not clear whether the Report is actually referring to "preparing for re-use" operations) in an index confusingly called "Extended Recyclability". Referring to our comment on a mass-based reusability rate (page 23), we accept that the use of different units in different algorithms will make it difficult if not impossible to aggregate individual indexes. However, we question the usefulness of an index such as the "Extended Recyclability Rate", given that reusability, recyclability and (energy) recovery are better defined and interpreted separately. --- All terminology should be consistent with definitions used in EU waste *acquis*.	The index is introduced by the IEC/TR 62635 that currently represents the most consolidated method for the calculation of the recyclability. However, this index is not in line with EU definitions of recycling. As previously explained, different sets of indexes have been developed to face this problem, including the cited Extended Recyclability Rate (including also the reusable parts).
	9. Report 3 – section 1.3.2.2	The Report refers to a revision to Formula 4, to include "certain materials or components", which we take to mean their presence in a global sense within a product (for example, the total plastic content or the total rare earths content of a product. We agree that such a revision would have its uses in focusing on the recovery of strategically important materials, but caution that the methodology should not revert back to the component-based Formulas 1-5 of EP1. --- The targeted index should be calculated on the basis of the mass of material recovered/recycled relative to the total mass of material present in the product – similar in approach to the methodology for the calculation of the recycled content described on page 55.	Critical Raw Materials have, generally, a small mass and, therefore, these are negligible compared to the whole product mass. A recyclability index referred only to the Critical Raw Materials would allow, instead, to measure what is the fraction of that critical material that is potentially recyclable. --- This concept has been clarified in a footnote in section 1.3.2.2

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22. Suez Environment	10. Report 3 – sections 2.3.1 *and guidance in annex 2 and 3*	We do not agree with the Report's definition of down-cycling as the ratio of the recycled material's "quality" relative to that of the virgin material. Although down-cycling involves converting waste materials into new materials or products of lesser quality and/or reduced functionality, its goal is nevertheless to prevent wasting potentially useful materials, and to reduce consumption of virgin raw materials and energy usage. The product under consideration is a discard, and therefore the issue is what operation should be applied to the discard – reuse, recycling, energy recovery or disposal. These are the options open to the waste manager, and we therefore question the use of Formulas 9 and 10 to characterise downcycling, which take as the baseline the manufacture of the product from virgin materials. --- While loss of quality is undesirable, the appropriate baseline scenario against which to assess whether a particular operation is down-cycling or upcycling is disposal (the lowest rung of the waste hierarchy) rather than virgin production of the same product. Against a disposal baseline, an up-cycle operation will demonstrate a higher environmental benefit than a down-cycle operation applied on the same discarded material. This is the conventional methodology for ranking operations within the waste hierarchy, which is the legal referential framework for these operations.	Downcycling is recognised as one of the most important methodological key issues in environmental indexes about recycling. Research is currently ongoing, and this s the reason while this parameter has been introduced but not practically used for the case-study. According to recycling process, sometimes the recycled materials are used for different purposes they were conceived. Although recycling is always desirable, environmental indexes should considered this depreciation. Downcycling of the material/part is therefore compared to its original function. Downcycling is however not used in the RRR indexes and this addresses your concern of underlying the prevention of wasting.
	11. Report 3 – sections 2.3.1 and 2.3.2	Formulas 8–17 appear to be representational statements of conventional LCA models, and as such do not acknowledge many methodological uncertainties within LCA that have yet to be resolved. For example, the summation across different impact categories in these formulas implicitly assumes that all impacts are of equal weight. Furthermore, V, D and R could have different units depending on what impact is assessed (global warming potential, land use, eutrophication, etc) and it is not clear how these can be summed. --- Underline that the LCA approach adopted by JRC in its formula is not binding. Practitioners should be directed to use established LCA platforms and impact assessment methodologies based on the ISO 14040 system of standards.	The index of recyclability benefit is calculated on a single indicator per time (summing contribution for the same impact categories related to different phases as V, D and R). Weighting and sum of different impact categories is not performed nor recommended. --- This has been clarified in a footnote to formula 12
	12. Report 3 – section 5.3.1 *and guidance in annex 4*	The example given in the report of durability assessment on indoor lighting systems (page 71) offers an alternative, and potentially more robust way of selecting an appropriate functional unit for a comparative LCA. In an LCA comparing the environmental benefits of three types of lighting (OSRAM and Siemens, *Life Cycle Assessment of Illuminants*, 2009) the functional unit was set at a lifetime of 25,000 hours, which was equivalent to the lifetime of 25 incandescent bulbs, 2.5 compact fluorescent lamps, or of one LED lamp. All three lamps had an equivalent service performance in terms light output during their lifetime. This allowed six impact categories to be assessed across five lifecycle stages: raw material production, manufacturing & assembly, transport, use, and end of life. The advantage of this approach over that proposed in the Report is that established LCA platforms can be used to undertake a comparative assessment. The methodology proposed in the Report, of factoring impact by the net extension in product lifetime, is not established LCA practice. Other considerations such as cost of manufacturing, maintenance aspects; recyclability; and service requirements can be built into the assessment and set against increased durability as appropriate.	Defining the function of a product is generally straightforward. Also for the case of lamps, lifetime is not exhaustive (also energy output – luminance – should be included in the comparison). See on such example, the EP1 Chapter 6. The methodology for durability developed in Report 3 intends to answer to typical ecodesign questions for Energy Related Products: - How large are the environmental benefits (if any) of extending the operating life of the considered product by a given additional time-frame? - How relevant are these environmental benefits (if any) compared to product's life cycle impacts? Examples of similar application among LCA practitioners have been illustrated in the state of art (new report n°1) Of course this is a first analysis, not including other key issues of the durability. However the results of the analysis are a first step to assess if durability is potentially relevant for a certain product group.

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22. Suez Environment	13. Report 3 –General	As volumes increase, and health and safety issues are better taken into consideration, recycling technologies are quickly developing eg. (i) to shift from manual to (semi-)automated dismantling process through slow / soft shredders for printed circuit board (PCB) ii) to separate sort brominated flame retardant plastics. These technologies might impact the conclusions of the study. --- Have scenarios describing the best available technologies and developing technologies in order to ensure a level playing field. Leave room for the evolution of EoL scenarios or introduce a revision periodicity to take into account upcoming technologies.	According to IEC/TR, the analysis has to be based on representative scenarios for the considered context. Analysis of alternative scenario, including dynamic analysis of potential new scenarios, has been introduced and discussed in Report 3 – section 1.3.2.1.
23. Swedish Energy Agency and Swedish Chemicals Agency	1. General	We in general welcome additional requirements on resource efficiency and waste management in Ecodesign	-
	2. Report 3 – Section 4	The analysis aims at identifying relevant materials (and product group that embed them) which contribute significantly to life-cycle impact categories at the European level. If this is the true aim, how can the analysis of hazardous substances, from the outset, be restricted to only consider the substances regulated by the RoHS directive? This topic is already covered by legislation and is from a regulatory point of view already fixed. The Ecodesign method gives one the impression that it consider hazardous substances but in fact there is no proper inventory of hazardous substances in products chosen out except already regulated substances. This is most remarkable and tends to undermine confidence in the Ecodesign method. --- All possible hazardous substances should be considered.	The methods discussed in Report 3 section 4.3.1 is applicable for all potential hazardous substances (regulated and not). It has been highlighted that the analysis of regulated substances is priority (also for data availability). However, in a life perspective, other hazardous substances can be potentially relevant, and should be investigated. ---- The text of the section has been clarified
24. WEEE Forum and Eco-systèmes	1. Report 2 - General	End-of-life scenarii: to what extent the scenarii established for the 3 case-studies can be considered as representative of the treatment schemes existing at a European level? Are the few visited treatment plants and operators relevant enough to build robust EoL scenarii? --- It might be more relevant to have the overall analysis based not only on an average treatment scenario, but taking into account different scenarii: average treatment, best available technologies or even developing technologies. A set of differentiated indices could then take into account the possible evolution of technologies which could be linked with the period of time between eco-conception and WEEE arising of the product. Besides, a broader consultation/ investigation could be recommended to complete the already carried out visits and literature review.	The analysis was based on observed recycling plants. The representativeness of their treatments and of the selected EoL scenarios has been set and checked with association of recyclers and recycling schemes. Also alternative scenarios and potential future scenarios have been considered. Innovative technologies, although in some cases already in use and/or under development, have still a limited diffusion and therefore not considered (due also to missing information on their performances). --- Clarified in the text (report 3 – section 1.3.2.1 and in the case-studies on report 2)
24. WEEE Forum and Eco-systèmes	2. Report 2 – section 6.2	WM EoL scenarii: new mechanical technologies already exist or are being developed, such as slow shredders. In France, this technology currently represents 1/3 of the treatment process for Large Household Appliances. Although there is no systematic manual dismantling for concrete counterweights with this technology, recycling and recovery ratios around 80% and 85% respectively, can be reached. ---- Proposed potential eco-design requirements such as improved disassemblability would therefore need to be analysed again through relevance check.	The slow shredding system has been considered in the study under the name of “pre-shredding” (clarified in the text). The improved disassemblability has been considered only for the PCBs. In fact, data from the literature proved the PCBs processed in shredders and soft-shredders are affected by large losses in terms of precious metals. Dismantling of concrete counterweights has been not considered in the average scenario (although performed by some companies). Recycling of concrete from washing machines is still limited (recycling rate from IEC/TR 62635 has been adopted). --- Pre-shredding / soft shredding clarified in a footnote to section 6.2.2

Author of comment	Item	Comments and suggestions (proposed changes)	Replies to received comments (what has been changed in the reports)
24. WEEE Forum and Eco-systèmes	3. Report 2 – section 7.2	LCD-TV EoL scenario: numerous R&D projects are led in the field of flat screens treatment process. Robots and semi-mechanical dismantling process can allow appropriate access to critical parts (hot spots) without entire manual dismantling. --- The complete manual dismantling scenario does not reflect some actual under development technologies which should be integrated to the analysis.	According to the consulted associations of recyclers and recycling schemes, the considered EoL scenario is representative of current EoL treatments. Innovative technologies have still a limited diffusion and therefore not considered (due also to missing information on their performances). --- New technologies for the treatment of LCD have been mentioned (section 7.5)
	4. Report 2 – section 7.2	Technologies exist in optical sorting of plastic parts, including sorting of brominated flame retardants charged plastics. In France, 2 treatment plants are currently operating on the basis of such technologies. A new consultation is about to be launched on optical sorting of plastics proceeding from all kinds of WEEE. --- To be taken into account when defining EoL scenarii.	Efficiency of separation of new technologies is generally not published. Once data are available, figures could be updated.
	5. Report 2 – section 7.7	Doubts can be raised on the reliability of marking/labelling plastic parts from suppliers. --- Encourage the development of more robust marking solutions.	The improved marking of plastics is a key issue suggested by some recyclers. The research raised this point in the proposed requirements, although more technical specifications are needed.
	6. Report 3 - General	The overall methodology aiming at analysing case-studies and providing potential eco-design requirements appears to be very relevant. As already noticed, the definition of representative EoL scenarii will have a key role in the analysis. A broader approach based on a complete and representative mapping of existing technologies could be more appropriate. --- Not remain with generic figures but integrate a broad image of existing technologies, covering the entire playing field.	We agree on such comments. Definition of the EoL scenario is a methodological key issue. However we based the analysis on data publicly available. Once data are available, figures could be updated (expected to be done in the next phases of the research).
	7. Report 3 - General	What will be the database used when calculating the recycling and recovery rates? Will the data stem from operators or be aggregated at a national level? Note: The WEEE Forum has designed software programmes and background data sources to allow its 41 producer compliance schemes in Europe and their treatment partners to determine in a transparent, traceable manner WEEE treatment results, including results over the entire treatment chain. This software allows them to classify and calculate the use of components and fractions in the final treatment processes. Furthermore, the WF_RepTool defines a structure for calculating the recycling and recovery rates achieved on the basis of the same data structure and an agreed classification of treatment technologies. --- Add a reference to WF_RepTool and WEEE Forum work on the matter. Add that this kind of harmonised data sets can be promoted across Europe in order to level the playing field in terms of reporting.	(Reference and details added)
25. WRAP	1. Report 2 – section 6.4.1.2	The washing machine study would benefit from sensitivity analysis. The assumption that concrete counterweights are sent to landfill means that the recyclability rate and the recyclability benefits results point to opposite findings for resource efficiency (measured by abiotic resource depletion). --- Add a sensitivity analysis. Make clear where the use of different methodologies leads to different recommendations for priorities.	The assumptions about recyclability of concrete from WMs is derived by IEC/TR 62635 and generally confirmed by contacted recycled. We know that some concrete is recycled, however representativeness of these treatments is not known. Counterweight can have indeed some relevance for mass based indexes, but negligible in terms of environmental impacts
	2. Report 2 – section 7.6.2	The recommendations do not relate to the methodologies being tested – the conclusions are drawn from other sources. Indium is responsible for up to 2% of environmental impacts associated LCD TVs and does not come through as a priority from the preceding analysis. --- Either make clear how the conclusion relates to the methodology or remove the conclusion. The validity of the recommendation does not appear to relate to the validity of the methods.	LCD has been recognised one of the key parts for the recyclability index (recycling rate: 0% [IEC/TR 62635, 2012]. According to recyclers, one of the reasons of not recycling LCD is the low availability of information about its content in relevant materials and, in particular, of Indium. --- Clarified in the text

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25. WRAP	3. Report 2 – sections 7.4.1.3 and 7.4.2.3	The two sections appear contradictory in that they recommend different priorities for improving recyclability and the recyclability benefit (general plastic recycling compared to Printed Circuit Boards). The recyclability methodology appears to add no value, as it only calculates the current recycling rate and yields no insight. --- In 7.5 compare the results and discuss how they should be used. Consider the suitability of using the recyclability metric at all in this context.	The two sections apply two different methods to the case-study, obtaining different results and identifying different priority parts for different purposes. According to our understanding, the two requirements are not contradictory. Mass based indexes, can be potentially relevant to maximize the recycling of some specific materials and parts.
	4. Report 3, Annex 1	Annex 1 defines reuse as including reuse of whole products. However, reuse of whole products has been excluded elsewhere. Ignoring reuse of products is reductive as it provides a potential incentive to move down the waste hierarchy, rewarding the disassembly of products but not repair and refurbishment. --- Make the definition consistent with what is being done, either by changing the definition or the scope of the methodology. We would recommend including reuse of products, allowing for repair and refurbishment to be considered.	Definition of reusability and scope of the method have been clarified. We agree that the reuse of the product as whole can be environmentally relevant. However, the scope of the project includes the analysis of design alternatives to improve reuse. Reuse/repair of products as whole is to some extent addressed in Report No1 "Durability" (outside of the consultation) Report No2 only focused on the reuse of components, specifically designed for that, that could be used for the manufacturing of new products. Unfortunately, no re-use / remanufacturing scenario was considered in the case studies because they were not considered as representative from a flow perspective. This could be however done in a subsequent study.
	5. Report 3- Annex 1	The reusability, recyclability and recoverability formula are being used to measure current levels of reuse, recycling and recovery. The methodologies cannot be used to predict the benefit of changes in design to allow for future improvements. --- Rename the methodology to reflect what it is actually being measured.	The names of the indexes are aligned to standard IEC/TR 62635. Their objective is to assess the potential for reuse/recycle/recovery of the product, according to the assumed EoL scenario (current or prospective).
	6.Reports 2 and 3	The methodologies and case studies do not recognise designing out problems (e.g. designing out hazardous materials). Instead, they focus on how to deal with them at end of life. --- Include discussion and examples of designing out problems to improve the various benefit indices.	Although the developments of EP1 on hazardous substances remain valid, hazardous substances were considered now only for the EoL phase since it was judged that only this phase could produce relevant product requirements. It was moreover considered that other life cycle phases could have created potential overlaps with other EU legislations (e.g. REACH, RoHS). Relationships with these pieces of legislation and product policies will have however to be investigated in the future.

European Commission
EUR EN – Joint Research Centre – Institute for Environment and Sustainability

Final Executive Summary. European Commission. Joint Research Centre. Institute for Environment and Sustainability. Final deliverable of the project “Integration of resource efficiency and waste management criteria in European product policies – Second phase”. September 2012

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Luxembourg: Publications Office of the European Union

2012 – 64 pp. – 21.0 x 29.7 cm

EUR 25654– Scientific and Technical Research series – ISSN 1831-9424

ISBN 978-92-79-27979-9

doi: 10.2788/72553

Abstract:
The report summarizes the main outcomes of the project (report n° 1, 2 and 3 of the project “Integration of resource efficiency and waste management criteria in European product policies – Second phase”. The report lists also in Annex 1 the feedback received during the stakeholder event (10th September 2012) and in Annex 2 the stakeholder consultation (17th August – 21st September 2012).

LB-NA- 25654-EN-N

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ISBN 978-92-79-27979-9

Publications Office