European Commission

JRC / DG GROW Project on the “Review of the Methodology for Ecodesign of Energy-related Products - MEErP”

2nd STAKEHOLDER MEETING

23/6/2022

Joint Research Centre

Housekeeping rules

- When joining the meeting, please identify yourself by your first and last name, and your organisation, e.g. *John Smith – JRC Seville*
- **Please keep your microphone muted and camera switched off when not speaking.**
- For a better audio experience, consider using a headset.
- To intervene during the Q&A sessions:

  1) *During the presentation you are invited type your questions in the meeting chat. You may then be asked to pose your question orally during the Q&A.*
  2) *Alternatively, ask for the floor by using the Raise Hand feature on Webex.*
  3) *Please wait for the chair to give you the floor. To speak, unmute your microphone.*
  4) *Please be concise in your interventions.*
  5) *After speaking, please mute your line again and lower your hand.*

- **Please note that the webinar will be recorded for internal use by the Commission services only.**

Agenda

Welcome and aim of the meeting

1. **Task 1** (Updating of the EcoReport tool):
   a. Presentation
   b. Q&A discussion
2. **Task 2** (more systematic inclusion of material efficiency aspects and of environmental footprint/ecological profile aspects in the design options and in the LLCC curve):
   a. Presentation

   --- Break ---

   b. Q&A discussion
3. **Tasks 4-5** (More refined evaluation of the economic impacts in task 7 of the MEErP; Other updates and integrations)
   a. Presentation
   b. Q&A discussion
4. **Next Steps and AOB**

European Commission

JRC / DG GROW Project on the "Review of the Methodology for Ecodesign of Energy-related Products - MEErP"

Development of Task 1: Updating of the EcoReport tool

Joint Research Centre

Content of the presentation

- **Subtask 1.a:** EF impact categories in the ERT**;**
- **Subtasks 1.d and 1.g:** End of Life modelling (recycled content and recyclability at EoL)
- **Subtasks 1.a and 1.b:** Datasets and further updates of the EcoReport Tool;
- **Subtask 1.d:** Material efficiency
- **Subtask 1.f**: Modelling of annual sales
- **Subtask 1.h:** Critical Raw Materials (novel approach);
- **Subtasks 1.c and 1.i:** Guidance on ERT and future updates
- **Subtask 1.e**: Ecological profile: to be investigated at a later stage
- **Subtask 1.j**: Ecological profile: to be investigated a

Subtask 1.a: Impact assessment

Update impact categories in ERT

- **Objective:** Update of the impact categories in the ERT

Implementation in the revised ERT:

- **16 EF** Impact categories + 1 additional technical information on **Primary Energy Consumption**
- Use of **robust indicators** aligned to prominent literature
- **Facilitated continuous updates** of characterisation factors
- **Alignment with** developments in **EF** and other **EU policies**
- **Easier interpretation**

Subtask 1.a: Impact assessment

Update impact categories in ERT

Added/improved compared to the 2021 consultation

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- **Easier interpretation**

ERTool

“NEW IMP_CAT” spreadsheet. List of Impact categories aligned with EF method.

	A	B	C	D
1		Impact categories and additional technical information	Unit of measure	Selection
2	Impact Category 1	Climate change, total	kg CO_2 eq	☑
3	Impact Category 2	Ozone depletion	kg CFC-11 eq	☑
4	Impact Category 3	Human toxicity, cancer	CTUh	☑
5	Impact Category 4	Human toxicity, non-cancer	CTUh	☑
6	Impact Category 5	Particulate matter	disease incidence	☑
7	Impact Category 6	Ionising radiation, human health	kBq U_{235} eq	☑
8	Impact Category 7	Photochemical ozone formation, human health	kg NMVOC eq	☑
9	Impact Category 8	Acidification	mol H+ eq	☑
10	Impact Category 9	Eutrophication, terrestrial	mol N eq	☑
11	Impact Category 10	Eutrophication, freshwater	kg P eq	☑
12	Impact Category 11	Eutrophication, marine	kg N eq	☑
13	Impact Category 12	Ecotoxicity, freshwater	CTUe	☑
14	Impact Category 13	Land use	UoM	☑
15	Impact Category 14	Water use	m^3 water eq. of deprived water	☑
16	Impact Category 15	Resource use, minerals and metals	kg Sb eq	☑
17	Impact Category 16	Resource use, fossils	MJ	☑
18	Additional technical information	Primary energy consumption	MJ	☑
19	Additional technical information			☐
20	Additional technical information			☐
21	Additional technical information			☐

16 EF impact categories + Primary Energy consumption

Subtask 1.d and 1.g: EoL modelling
(recycled content and recyclability at EoL)

- **Objective:** Revising the current approach. Granting consistency of modelling and allowing the implementation of different assumptions about the EoL modelling

Implementation in the revised ERT:

- Aligned to **EF** method by using the **Circular Footprint Formula (CFF)** – **simplified version**

$$(1 - R_1)E_V + R_1 \times \left(AE_{recycled} + (1 - A)E_V\right) + (1 - A)R_2 \times \left(E_{recycled} - E_V{}^*\right)$$

- Default data to the various parameters (i.e. **recycled content R1, recyclability R2 and allocation factor A**) as referring to the EF guidance documents (“**Annex C**”)
- it is possible (only for expert users) to **adjust these values** according to specific information available
- **Internal Consistency** within the ERT (datasets) and with external studies (EF results)

ERTool

“Inputs” spreadsheet. Example of introducing new inputs for the Bill of materials

	A	B	C	D	E	F	G	H
8		Pos	Bill of Materials	Category	Dataset on primary	Dataset on recycling	Amount	Unit of measure
9		nr	Description of component	Click &select	select Category first !	click & select		automatic, pls don't modify
10								
11		1	HDPE description	01-Plastics	6-HDPE production mix, at plant	25-High density polyethylene (HDPE), recycled	0.7	kg
12		2						
13		3						
14		4						

“Inputs” spreadsheet. Input box of CFF parameters for Bill of materials

	I	J	K	L	M	N	O	P	Q
8	Default R1?	R1, recycled content		Default R2?	R2, recyclability		Default A?	A coefficient	
9	Yes/No	default	custom	Yes/No	default	custom	Yes/No	default	custom
10			please insert			please insert			please insert
11	Yes	0%		Yes	0%		Yes	50%	
12									
13									
14									

Subtask 1.a and 1.b: Datasets

1.a Update of underlying datasets and 1.b introduction of additional materials

- **Objective:** Update the underlying datasets of ERT and include additional datasets on new materials also considering the possibility to provide regular updates in future

Implementation in the revised ERT:

- Replacement with **EF datasets (EF 3.0 DATASETS TO BE DELIVERED)**
- **Virgin and recycled materials** are covered
- **Consistency and robustness** across data (same rules)
- **Transparency**
- **Representativeness** at EU level
- Potential **interoperability** with LCA software
- Extension of the database to include **additional datasets by the user** on: materials (in particular electronics), energy, processes, direct emissions and transport

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ERTool

"Ecoreport tool_database" spreadsheet. **Values in the table are fictitious**. For each material both datasets on virgin and the correspondent on recycling need to be included

Database	Type	Category	id	Dataset name	Virgin/ Recycled	Reference flow	Unit	Climate change, total kg CO2 eq	Ozone depletion kg CFC-11 eq
EF3.0	Material	01-Plastics	1	Acrylonitrile butadiene styrene (ABS), fossil fuel-based	V	1 kg	kg	5.2E+00	9.0E-11
EF3.0	Material	01-Plastics	2	aramid fibre	V	1 kg	kg	6.4E+00	7.8E-11
EF3.0	Material	01-Plastics	3	Epoxy plastic, fossil fuel-based	V	1 kg	kg	6.52E+00	7.9E-11
EF3.0	Material	01-Plastics	4	EPS Beads from styrene polymerization and foaming production mix, at p	V	1 kg	kg	5.5E+00	8.9E-11
EF3.0	Material	01-Plastics	5	Ethylene propylene diene monomer (EPDM)	V	1 kg	kg	5.9E+00	7.5E-11
EF3.0	Material	01-Plastics	6	HDPE production mix, at plant	V	1 kg	kg	6.2E+00	6.9E-11
EF3.0	Material	01-Plastics	7	LDPE production mix, at plant	V	1 kg	kg	5.9E+00	6.0E-11
EF3.0	Material	01-Plastics	8	LLDPE granulates Polymerisation of ethylene production mix, at plant 0.	V	1 kg	kg	6.1E+00	7.7E-11
EF3.0	Material	01-Plastics	9	Nylon 6 fiber	V	1 kg	kg	7.5E+00	8.4E-11
EF3.0	Material	01-Plastics	10	PET production mix, at plant	V	1 kg	kg	6.7E+00	7.5E-11
EF3.0	Material	01-Plastics	11	Poly(methyl methacrylate) (PMMA) (acrylic), fossil fuel-based	V	1 kg	kg	8.1E+00	5.6E-11
EF3.0	Material	01-Plastics	12	Polycarbonate PC, production mix, at plant	V	1 kg	kg	7.7E+00	8.1E-11
EF3.0	Material	01-Plastics	13	Polyester resin	V	1 kg	kg	6.7E+00	9.1E-11
EF3.0	Material	01-Plastics	14	Polypropylene PP, production mix, at plant	V	1 kg	kg	5.3E+00	2.6E-10
EF3.0	Material	01-Plastics	15	Polystyrene PS, production mix, at plant	V	1 kg	kg	6.1E+00	6.7E-11
EF3.0	Material	01-Plastics	16	Polytetrafluoroethylene (PTFE) granulate	V	1 kg	kg	7.3E+00	8.6E-11
EF3.0	Material	01-Plastics	18	Polyurethane flexible foam	V	1 kg	kg	8.3E+00	8.5E-11
EF3.0	Material	01-Plastics	19	Polyurethane rigid foam	V	1 kg	kg	8.0E+00	7.5E-11
EF3.0	Material	01-Plastics	20	Polyvinyl chloride (PVC), production mix at plant, GLO	V	1 kg	kg	5.3E+00	7.4E-11
EF3.0	Material	01-Plastics	21	Polyvinyl fluoride	V	1 kg	kg	5.7E+00	7.6E-11
EF3.0	Material	01-Plastics	22	Polyvinylidenchloride granulate	V	1 kg	kg	7.2E+00	8.8E-11
EF3.0	Material	01-Plastics	23	Polyvinylidene fluoride (PVDF)	V	1 kg	kg	8.1E+00	6.3E-11

Subtask 1.a and 1.b: Datasets

1.a Update of underlying datasets and 1.b introduction of additional materials

- **Datasets inserted by the user:** new spreadsheet “New datasets_user”
  - Streamlined process to introduce new materials, energy sources and processes, and possibility to use these datasets in the different input sections of the ERT
  - For new materials and components introduced by the user, both virgin and recycling datasets are requested
  - The user shall:
    - Select type (i.e. material, process, energy, transport, boiler or direct emissions)
    - category for the dataset depending on the selected type, e,g, for material: plastics, metal, electronics
    - type name of the dataset, reference flow and unit of measurement
    - For each dataset, insert the LCIA values for both **virgin and recycled (in case of material)**

Subtask 1.a and 1.b: Datasets

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ERTool

“New Datasets_user” spreadsheet. The user can include new datasets by selecting type, category, name, unit of measure and impact assessment values of the dataset. Values shown in the table are fictitious.

Type	Category	nr	Dataset Name	Unit of measure	Virgin/ Recycled?	Climate change, total	Ozone depletion	Human toxicity, cancer
Please select	Please select the category	unit				kg CO2 eq	kg CFC-11 eq	CTUh
Material	02-Metals	300	Platinum_user	kg	V	6.12E-01	5.34E-09	1.85E-09
		301			R	4.10E-01	3.58E-09	1.24E-09
Process	01-Plastics	302	Injection moulding_user	kg		2.13E+00	2.24E-11	1.65E-08
Energy	05-Electricity	304	Elecriticity mix_user	kWh		3.74E-01	1.37E-10	6.12E-11
Transport	07-Transport	306	Lorry_user	tkm		1.05E-01	0.00E+00	2.17E-14
Material	03-Electronics	308	LCD screen_user	item	V	2.17E+00	-9.80E-15	2.84E-09
		309			R	8.68E-01	-3.92E-15	1.13E-09

Further improvements of the ERT

- **Objective:** Increase transparency and granularity level of the assessment in order to put emphasis on life cycle stages which can be more relevant for a specific product group

- Impacts of '**Packaging**', '**Distribution**' and **'Maintenance & Repair**' are modelled separately and consistently

- Possible to **model energy and materials** consumed during **each life cycle stage**.

- **Use phase** is kept with the **same format** (but allowing to select more datasets from the database)

- **Results** of resources use and emissions are reported by phase (similarly to what previously done, but aligned to the new impact categories and life cycle stages explored).

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Further improvements of the ERT

Manufacturing/Assembly phase & Distribution

ERTool

Pos nr	MANUFACTURING / ASSEMBLY Process description please insert	Manufacturing/ Energy/ Materials Click and select	additional materials/energy compared to the Bom above used in the manufacturing (e.g. materials ending in scraps; ancillary materials, etc.). Category click and select	Datasets click and select	Recycled material click and select	Amount please insert	Unit of measure
201	material1	Materials	02-Metals	19-Cast iron	52-Secondary steel slab		kg
202	electr	Energy	05-Electricity	80-Electricity grid mix (EU mix)			MJ
203	manuf	Manufacturing	Manufacturing	111-Forging of steel parts			kg
204							
205							

Pos nr	DISTRIBUTION	Description		Amount	unit
226	Transport mean 1	e.g. tranport to the regional storage	85-Articulated lorry transport, Euro 5, Total weight 28-32 t (without fuel)		kgkm
227	Distance 1				km
228	Transport mean 2	e.g. raw material transport	93-Freight train, electricity traction		kgkm
229	Distance 2				km
230	Transport mean 3	e.g. maintenance&repair	90-Barge		kgkm
231	Distance 3				km

Further improvements of the ERT

Packaging & Maintenance and Repair

ERTool

Pos nr	PACKAGING Description	Material/Energy Click and select	Category Click and select	Dataset click and select	Amount	Unit of measure automatic
218	Box	Material	04-Others	40-Corrugated board		kg
219						
220						
221						

Pos	MAINTENANCE and REPAIR	Select Yes/No	percentage (adjust)			Amount	Unit of measure
	Spare parts % of product materials	Yes	1%			4	g
nr	Alternatively, if relevant and more refined data are available,please include energy and materials consumed during this stage Description	Energy/Materials Click and select	Category Click and select	Dataset click and select	Recycled material click and select	Amount	Unit of measure automatic
269	Electricity consumption	Energy	05-Electricity	80-Electricity grid mix (EU mix)		10	MJ
270	Other materials	Material	04-Others	200-New_Other	201-New_Other	5	kg
271	Steel	Material	02-Metals	21-Steel cold rolled cc	52-Secondary steel slab	16	kg
272							
273							

Further improvements of the ERT

Results

ERTool

	Life Cycle phases --> Resources Use and Emissions		RAW MATERIALS (Bill of Material)	MANUFACTURING	DISTRIBUTION	PACKAGING	USE	MAINTENANCE & REPAIR	EOL Impacts	EOL Credits	TOTAL
	Materials	**unit**									
1	Plastics	g	0	0		0	0	0			**0**
2	Metals	g	0	0		0	0	0			**0**
3	Electronics	g	0	0		0	0	0			**0**
4	Others	g	0	0		0	0	0			**0**
5	**Total weight**	g	**0**	**0**		**0**	**0**	**0**			**0**
	PEF Impact categories	**unit**									
6	Climate change, total	kg CO2 eq	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
7	Ozone depletion	kg CFC-11 eq	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
8	Human toxicity, cancer	CTUh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
9	Human toxicity, non-cancer	CTUh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
10	Particulate matter	disease incidence	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
11	Ionising radiation, human health	kBq U235 eq	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
12	Photochemical ozone formation, human health	kg NMVOC eq	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
13	Acidification	mol H+ eq	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
14	Eutrophication, terrestrial	mol N eq	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
15	Eutrophication, freshwater	kg P eq	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
16	Eutrophication, marine	kg N eq	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
17	Ecotoxicity, freshwater	CTUe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
18	Land use	points	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
19	Water use	m3 world eq of deprived water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
20	Resource use, minerals and metals	kg Sb eq	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
21	Resource use, fossils	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
	Additional technical information										
22	Primary energy consumption	MJ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**

Subtask 1.d: Material efficiency

- **Objective:** Revising the current approach. Granting consistency of modelling and allowing the implementation of different assumptions about the recyclability

  - Material efficiency aspects are **modelled consistently** in various parts of the tool
  - **Recyclability and recycled content** are modelled as parameters of the newly introduced **CFF**
  - **Reparability** is modelled as a **separate section** of the tool and materials and energy inputs can be tailored by the user.
  - **Durability** is modelled through lifetime estimation and impacts normalised per year (Details in Task 2)

Subtask 1.f: Modelling of annual sales

- **Linked to subtask 1.d Material efficiency and Task 2:**
  - Modelling based on Weibull distributed lifetime
- **Estimation of annual sales inserted by prep-study user using:**
  - either real data;
  - or a model (e.g., constant rate of growth), and Weibull parameters
- **Model would allow for evolution and changes over time of:**
  - the stock model
  - the Weibull lifetime parameters (if required by the modelling)

Shape	**β**	2	14.2	**Average lifetime**
Scale	**η**	16	1246	**Stock**
Year	**Surv. factor**	**Sales**	**Surv.**	**Stock app.**
0	1.000	100.0	100.0	1185.8
-1	0.996	98.0	97.7	1162.5
-2	0.984	96.1	94.6	1139.8
-3	0.965	94.2	91.0	1117.4
-4	0.939	92.4	86.8	1095.5
-5	0.907	90.6	82.1	1074.0
-6	0.869	88.8	77.1	1053.0
-7	0.826	87.1	71.9	1032.3
-8	0.779	85.3	66.5	1012.1
-9	0.729	83.7	61.0	992.2
-10	0.677	82.0	55.5	972.8
…	…	…	…	
-39	0.003	46.2	0.1	
-40	0.002	45.3	0.1	

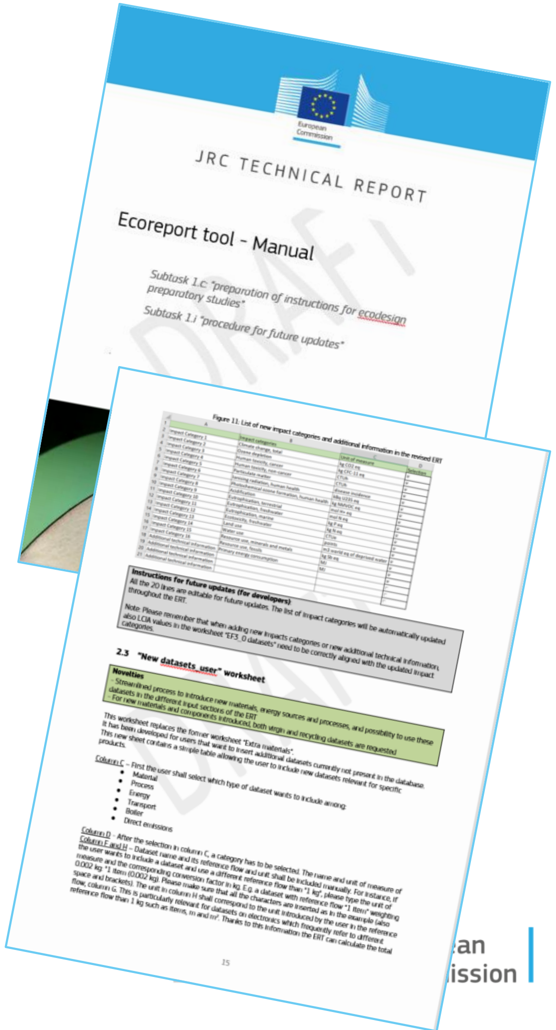
Subtask 1.h: Critical Raw Materials

- **Objective:** critically revising the current approach for Critical Raw Materials
  - CRM eq. index replaced by a new **step-by-step approach**
  - Provide guidance and streamline the analysis with **available information**
  - **Sequential screening of CRM** contained in the product under scrutiny
  - Based on the results of **Criticality Assessment 2020** (and future 3 yearly updates)
  - **Suggestions of strategies** supporting the mitigation of criticality

Subtask 1.c and 1.i: Guidance on ERT and future updates – ERT manual

Instruction on how to use the ERT and procedure on **future updates** are developed together in a **separate document**

- **ERT manual:**
  - The manual describes **each worksheet** of the revised ERT, in the order as they appear to the users. The user can find, at the beginning of each section, **reference cells to move within the tool**
- **Instructions for future updates of the ERT:**
  - of possible strategies for the future update of the ERT (especially to what concerns materials and energy datasets and default data used e.g. for the EoL modelling)
  - are included in the manual at the end of each section in dedicated boxes



Subtask 1.c and 1.i: Guidance on ERT and future updates – ERT manual

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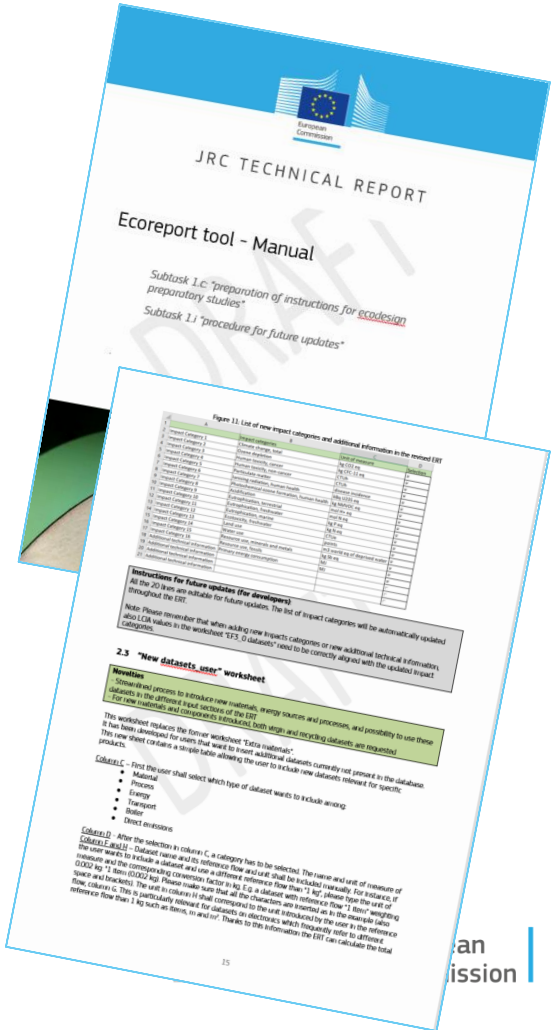

Subtask 1.e: Ecological profile

- **Inspired by the new Battery Regulation proposal:**
  - Declaration of the **Carbon Footprint** (based on **PEF method** and **PEFCR** to be developed)
  - **Performance classes:** future definition

- **A similar approach** could be followed in **future Ecodesign implementing measures**
  - Communication of information on **ecological profile of products**

- **A potential method** is currently being explored within the framework of the preparatory work for **Ecodesign and Energy Labelling requirements for PV modules**

Thank you for your attention

Task 1: Questions / Comments?

European Commission

JRC / DG GROW Project on the "Review of the Methodology for Ecodesign of Energy-related Products - MEErP"

Progress on Task 2:

"More systematic inclusion of material efficiency aspects and of environmental footprint/ecological profile aspects in the design options and in the LLCC curve"

Joint Research Centre

General principles for Task 2

a) Align as much as possible the nomenclature and modelling with the work done by CEN/CENELC JTC10 and the family of standards EN 4555X.

b) Align with the EoL modeling based on the Circular Footprint Formula (CFF), which as already been decided upon. Specifically, this means being able to inform the costume calculation of recyclability and other material efficiency parameters.

c) The calculation (estimation) of the lifetime is the cornerstone of Task 2. It will be used to normalize one-off quantities and allow for an equivalent annual to be determined.

Lifetime calculation

The lifetime of a product (durability under the nomenclature of EN 45552) will be calculated based on its initial lifetime expectation (reliability under the nomenclature of EN 45552) plus the lifetime increase due to repairability and upgradability. These calculations will be based on a scoring system with discrete steps. The discrete levels are dependent on the product’s design characteristics.

Reliability

Reliability		
Level	Design options	Average expected initial lifetime
1	Design options leading to best achievable initial lifetime in the market.	Lt_{01}
2	Design options leading to a good initial lifetime in relation to the market reference.	Lt_{02}
3	Design options leading to a not-so-good initial lifetime in relation to the market reference.	Lt_{03}
4	Design options leading to worst initial lifetime in the market.	Lt_{04}

The specific design options to take into account are not prescribed here, as the existing diversity among different product groups precludes such a prescriptive approach. This way, the Study-Team should have enough leeway to fully adapt the design options to be considered to the physical reality of the specific product-group under analysis. Design options and characteristics taken into consideration could be, *inter alia,* the following:

- Results of performance testes under specific standards;
- Improved product physical structure;
- More durable components (e.g. battery if not replaceable);
- Consumables availability;
- Provision of information about use and maintenance;
- Possibility of reuse.

Outline of method for lifetime calculations - I

a) According to standards EN 4555X, a number of critical components for repair and upgrade are identified.

b) These components will be treated as a series assembly, meaning that the failure of just one component will determine the failure of product as whole.

c) The initial lifetime of the product (reliability) is estimated - based on design characteristics – using the discrete steps scoring system previously presented.

Outline of method for lifetime calculations - II

d) The cost of repair and upgrade operations is estimated based on:

1. The labor (in hours) required to carry out the operation. This is dependent on the ease of the operation and, therefore, on the product's design characteristics. The discrete steps scoring system previously presented can be used for this task.
2. The cost of labor (per hour). This cost can vary substantially across Member States. However, a single value must be used in all situations. A method to approach this problem will be proposed further ahead.
3. The cost of required parts (required parts can be estimated from the Bill-of-Materials present in the EcoReport Tool and their cost – which are expected to be quite homogeneous across the EU - can be found through market research).

Outline of method for lifetime calculations - III

e) A cost analysis is performed (given the relative cost of repair or upgrade compared to the purchase price of a new item) to determine the minimum (critical) lifetime extension that is economically viable to be carried out.

1. This is a method to decide to either repair (or upgrade) or replace the item.
2. The important aspect is that a critical lifetime extension is calculated, i.e., if a repair (or upgrade) operation is expected to extend the product's lifetime by more than the critical lifetime extension, then the operation will be carried out. Otherwise, the product will be replaced.

Outline of method for lifetime calculations - IV

f) It is assumed that each product will at most undergo 1 repair or upgrade operation, i.e., the second failure (either due to repair or upgrade needs) will bring about the product's end of life.

g) Given the critical lifetime extension calculated before, a critical time of failure will be calculated, i.e., if the product fails for the first time before this critical time, then it will be repaired or upgraded, according to the case. If the first failure happens after this critical time, or if a second failure takes place, then the product will not be repaired or upgraded and will simply be replaced.

h) New lifetimes are calculated taking into account the described repair or upgrade scenarios.

i) Increased lifetimes (%) are calculated and used to fill in the scoring tables.

Reparability levels

Reparability	
Level	Design options
1	- Small disassembly depth (reduced number of steps required to disassemble) - Fasteners are reusable - Only basic tools, or no tools, needed - Repair can be performed in the use environment - Repair can be performed by a layman or generalist - Diagnosis support and interfaces are intuitive or coded with a public reference table - Spare parts and repair information are publicly available - Long-term availability of spare parts
2	- Medium disassembly depth (significant number of steps required to disassemble) - Fasteners are removable - Specific tools needed - Repair requires workshop environment - Repair must be performed by an expert - Diagnosis support and interfaces require publicly available hardware/software - Spare parts and repair information are available to independent service providers - Mid-term availability of spare parts

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Reparability levels

Reparability	
Level	Design options
3	- High disassembly depth (large number of steps required to disassemble) - Fasteners are neither removable nor reusable - Proprietary tools needed - Repair requires production-equivalent environment - Repair must be performed by the manufacturer or an authorized expert - Diagnosis support and interfaces are proprietary - Spare parts and repair information are only available to the manufacturer or authorized service providers - Short-term availability of spare parts (or no information)
4	The product cannot be repaired and must be replaced in case of failure (e.g., because parts are welded, product cannot be opened, spare parts are not available, etc.).

Reparability levels

Reparability		
Level	Total time to carry-out a typical repair activity [h]	Total cost of the repair [€]
1	t_{R1}	C_{R1}
2	t_{R2}	C_{R2}
3	t_{R3}	C_{R3}
4	-	-

$$\frac{C_{R/U}}{L_E} \leq \frac{C_{New}}{L_T}$$

$$L_E \geq L_{Cr} = L_T \frac{C_{R/U}}{C_{New}}$$

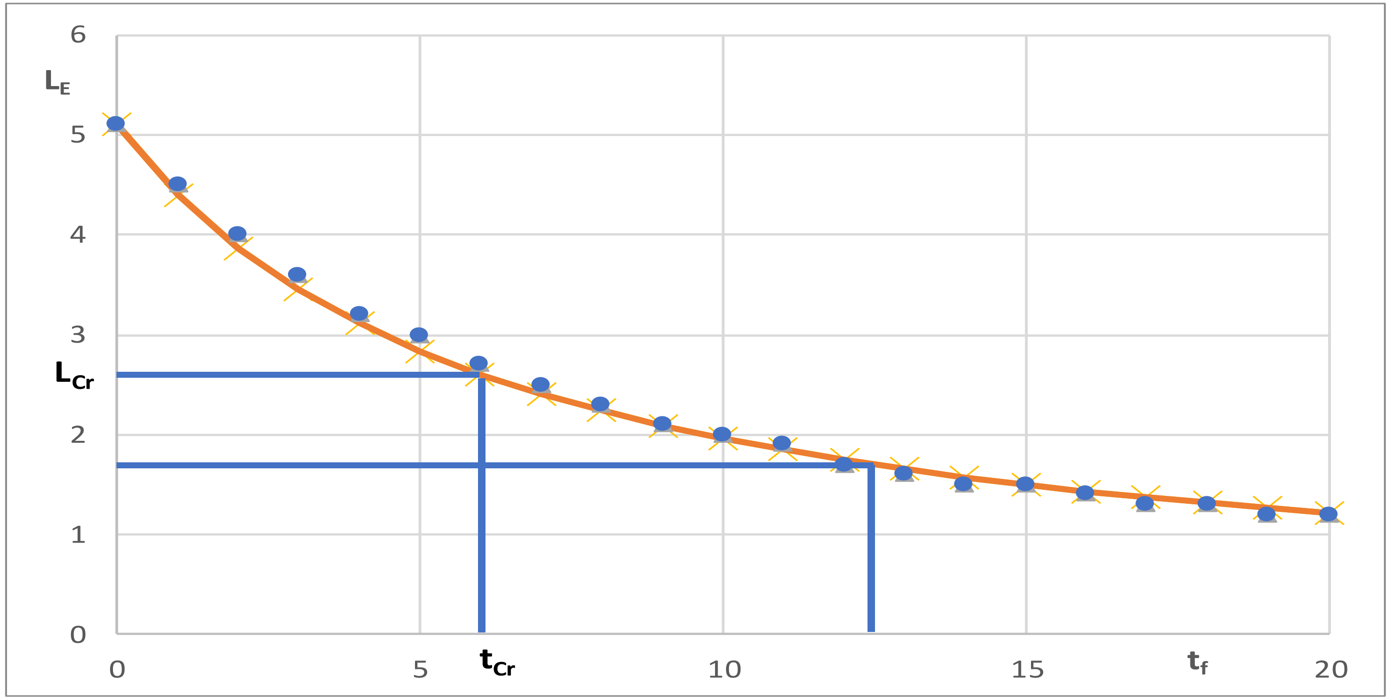


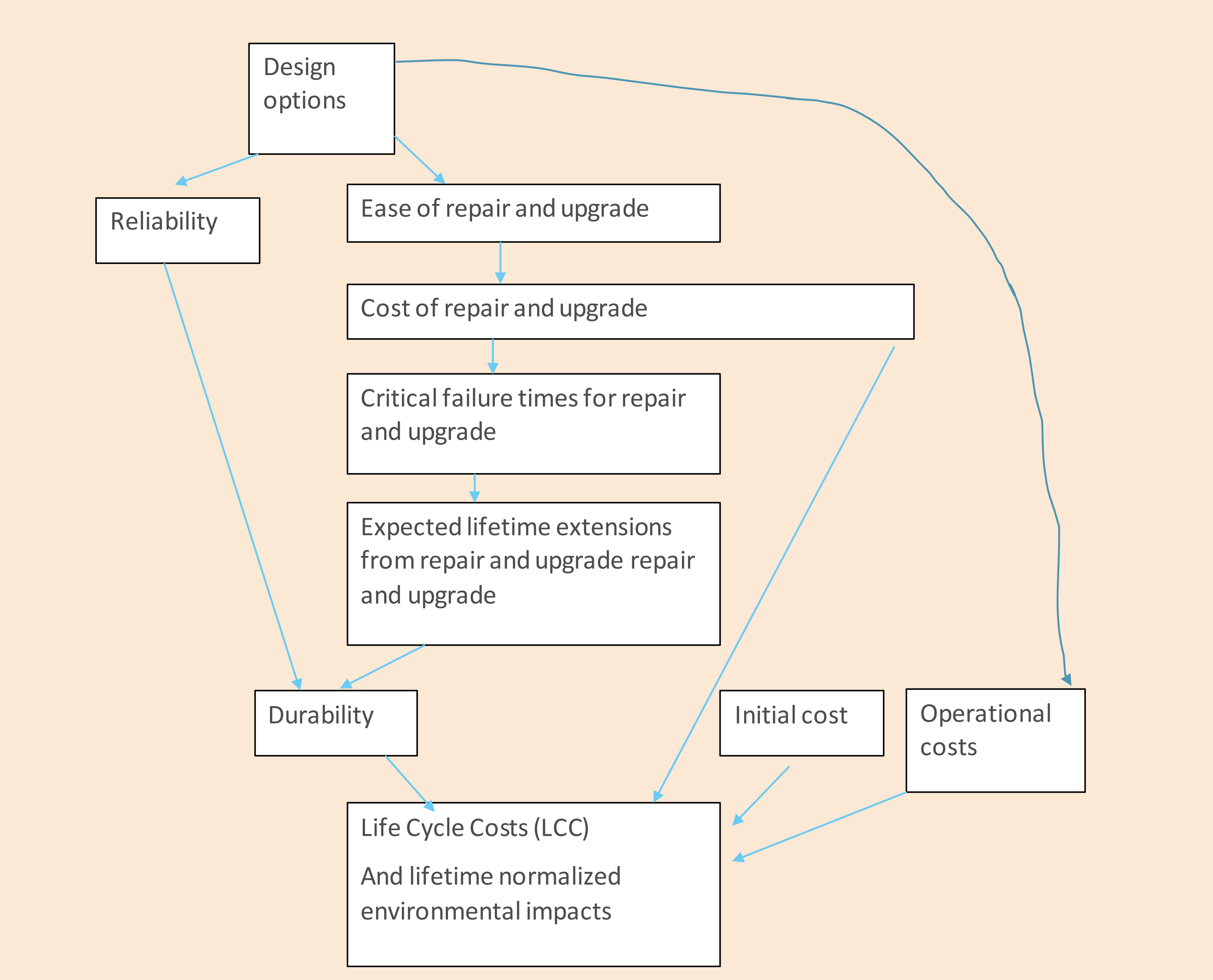
Illustration of the relationship between failure time and expected future lifetime.

Reparability and Upgradability increased lifetimes

Reparability	
Level	% increase in lifetime (ΔL_R)
1	ΔL_{R1}
2	ΔL_{R2}
3	ΔL_{R3}
4	0

Upgradability	
Level	% increase in lifetime (ΔL_U)
1	ΔL_{U1}
2	ΔL_{U2}
3	ΔL_{U3}
4	0%

Flowchart


Design options
Reliability
Ease of repair and upgrade
Cost of repair and upgrade
Critical failure times for repair and upgrade
Expected lifetime extensions from repair and upgrade repair and upgrade
Durability
Initial cost
Operational costs
Life Cycle Costs (LCC)
And lifetime normalized environmental impacts

An Example: laptop computer

As an illustration of the kind of results that can be possible to obtain, we present below an example of possible values for an hypothetical laptop computer (values are used for purely exemplification purposes).

Reliability		
Level	**Design options**	**Average expected initial lifetime**
1	Battery lifetime according to IEC EN 61960-3:2017: 90% capacity after 500 cycles Resistant to accidental drop according to IEC 60068 2-31: freefall procedure from 76 cm Resistant to shock according to IEC 60068 2-27: 40G pulse	5.9 yrs
2	Battery lifetime according to IEC EN 61960-3:2017: 90% capacity after 500 cycles Resistant to accidental drop according to IEC 60068 2-31: freefall procedure from 76 cm	5.5 yrs
3	Battery lifetime according to IEC EN 61960-3:2017: 90% capacity after 500 cycles	5.1 yrs
4	-	4.7 yrs

An Example: laptop computer

As an illustration of the kind of results that can be possible to obtain, we present below an example of possible values for an hypothetical laptop computer (values are used for purely exemplification purposes).

Reparability (laptops: assumed purchase price of 1000€)				
Level	Total time to carry-out a typical repair activity [h]	Total cost of the repair [€]	L_{Cr} [yrs]	t_{Cr} [yrs]
1	0.8	220	1.03	4.0
2	1.1	274	1.29	2.7
3	1.5	364	1.71	1.4
4	-	-	-	

Reparability	
Level	% increase in lifetime (ΔL_R)
1	20.8%
2	16.0%
3	9.4%
4	0%

Upgradability (laptops: assumed purchase price of 1000€)				
Level	Total time to carry-out a typical upgrade activity [h]	Total cost of the upgrade [€]	L_{Cr} [yrs]	t_{Cr} [yrs]
1	0.6	94	0.44	12.2
2	0.8	130	0.61	8.3
3	1.0	190	0.89	5.0
4	-	-	-	

Upgradability	
Level	% increase in lifetime (ΔL_U)
1	28.9%
2	28.0%
3	23.6%
4	0%

In the example above, you can see that the overall durability can float from a minimum of 4.7 years to a maximum of 9.2 years. Therefore a 96% increase in longevity (durability) is possible through an adequate choice of design options.

$$Lt_{min} = 4.7(1 + 0\%)(1 + 0\%) = 4.7\ yrs$$

$$Lt_{max} = 5.9(1 + 20.8\%)(1 + 28.9\%) = 9.2\ yrs$$

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An Example: laptop computer

As an illustration of the kind of results that can be possible to obtain, we present below an example of possible values for an hypothetical laptop computer (values are used for purely exemplification purposes).

Reliability	level	Average expected initial livetime [yrs]	Weibull location parameter (η)
	1	5.9	6.5
	2	5.5	6.1
	3	5.1	5.6
	4	4.7	5.2

Reparability	level	Total time to carry-out a typical repair activity [h]	Average rate of labour for repair [€/h]	Average cost of spair parts for repair [€]	total expected cost of the repair [€]	Lcr [yrs]	L'cr	z	t'cr	tcr [yrs]	% increase in lifetime (ΔL_R)
	1	0.8	96.00	139.00	220.00	1.03	0.20	0.85	0.77	4.0	20.8%
	2	1.1	120.00	139.00	274.00	1.29	0.25	0.65	0.52	2.7	16.0%
	3	1.5	150.00	139.00	364.00	1.71	0.33	0.45	0.27	1.4	9.4%
	4	-	-	-	-	-	-	-	-	-	0%

Upgradability	level	Total time to carry-out a typical repair activity [h]	Average rate of labour for repair [€/h]	Average cost of spair parts for repair [€]	total expected cost of the repair [€]	Lcr [yrs]	L'cr	z	t'cr	tcr [yrs]	% increase in lifetime (ΔL_U)
	1	0.6	96.00	40.00	94.00	0.44	0.08	2.09	2.35	12.2	28.9%
	2	0.8	120.00	40.00	130.00	0.61	0.12	1.50	1.60	8.3	28.0%
	3	1.0	150.00	40.00	190.00	0.89	0.17	1.00	0.96	5.0	23.6%
	4	-	-	-	-	-	-	-	-	-	0%

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Dealing with Costs that can vary significantly across the EU

a) Some costs - such as labor costs associated with repair operations - can vary significantly across the EU.

b) In such cases, we propose the following procedure:

   1) Estimate the cost of interest for a representative set of member states.

   2) Estimate the product's stock in place for that representative set of member states using the sales/stock model presented in task 1.f.

   3) Calculate the average of the cost under analysis using the stock in place previously calculated as a weighting factor.

Dealing with other material efficiency parameters (e.g., recyclability)

a) **In the cases where the recyclability default average (stated in the EcoReport Tool) value is not adequate, a more specific estimate can be estimated based on a discrete steps scoring system identical to the durability one.**

Recyclability	
Level	% recoverable mat. (rcycl%)
1	XX%
2	YY%
3	ZZ%
4	0%

b) **About recycled content, the values for this parameter will be principally implemented in the Bill-of-Materials of the EcoReport Tool.**

Coffee Break

European Commission

Thank you for your attention

Task 2: Questions / Comments?

Joint Research Centre

JRC / DG GROW Project on the "Review of the Methodology for Ecodesign of Energy-related Products - MEErP"

Progress on Task 3:

"More systematic inclusion of societal life cycle costs"

WORK IN PROGRESS – TO BE FINALISED

The current MEErP

a) The main focus of the MEErP analysis are the life cycle costs (LCC) for the user.

b) However, the existing MEErP allows, in theory, the inclusion of societal life cycle costs (total costs, including the externalities, associated with the life cycle of a product, covered by any actor in society), by associating a tabular 'MEErP equivalent' damage costs to a certain number of pollutants.

c) To date, this approach has not been systematically applied in Ecodesign preparatory studies. Moreover, the cost data need to be updated.

European Commission

The current MEErP

Table 35. Unitary external damage costs, their range and European totals
(main sources: CO_2 ETS trading price 1.1.2011, EEA 2011)

Air pollutant	[1] damage cost (EUR/kg)	[2] Range	[3] aggregated national emissions total (mln. kg)	[4] total damage cost (mln. EUR & %)	
CO_2 [5]	**0.014**	0.003-0.070	4.614.500	64.603	
subtotal greenhouse gases				*64.603*	21,3%
NH_3	**13.19**	1.3 - 27.2	3.862	50.926	
NO_x	**8.01**	0.6 - 13.9	9.631	77.137	
SO_2	**8.26**	1.4 - 12.8	5.044	41.669	
VOC	**0.76**	0.05 - 1.93	7.993	6.099	
PM2.5 equivalent [6]	**28.80**	4.6 - 29	2.041	58.775	
subtotal regional air pollutants				*234.606*	*77.4%*
Arsenic	**349.00**	30 - 530	0.19	66	
Cadmium	**29.00**	5.2 - 47	0.10	3	
Chromium	**38.00**	7.0–63	0.32	12	
Lead	**965.00**	90–1 480	2.08	2.010	
Mercury	**910.00**	80–1 360	0.08	68	
Nickel	**3.80**	0.7–6.3	1.00	4	
subtotal heavy metals				*2.163*	*0.7%*
Benzene	**0.08**	0.014-0.012	n.a.	n.a.	
PAH (BaP equivalent)	**1279.00**	120–1 960	1.46	1.871	
Dioxins and furans (POPs group)	**27 million**	1.5–37 million	0.000002	54	
subtotal organic micro-pollutants				*1.925*	*0.6%*
Total incl. CO_2 (external damages + gain on CO_2 abatement) **in mln. EUR**				**303 297**	
Total excl. CO_2 (external damages only), **in mln.EUR**				**218 090**	

[1] Unitary 'marginal damage cost' as assessed by the European Environmental Agency (EEA), Nov. 2011 (Revealing the cost of air pollution), except for CO_2 (see [5])

[2] The 'range' for CO_2 is the range of 'Societal Carbon Costs as indicated by the IPPC 4th assessment Report. For regional air pollutants, the 'range' shows the variation found between the EU Member States. For other pollutants in the list, the 'range' is the 68% confidence interval.

General principles for Task 3

a) Direct environmental costs, externalities and other indirect costs ideally should be included in the analysis.

b) Monetary valuation is the practice of converting measures of social and biophysical impacts into monetary units. There are several approaches to calculate monetary valuation coefficients. These approaches are categorized according to their underpinning hypothesis, assumptions and monetary valuation methods.

c) This method can adequately capture both direct environmental costs as well as externalities and other indirect costs.

Monetary valuation methods

Observed preferences - the marginal value of a good is identified on the basis of its market price.

Revealed preferences - the marginal value of a non-market good is identified on the basis of the market price of a surrogate good,

Stated preferences - the marginal value of a non-market good is identified on the basis of the preferences expressed in response to hypothetical trade-off questions.

Budget constrain - the marginal value of a Quality-Adjusted Life Year is identified on the basis of the potential economic production per capita per year.

Abatement cost - the change in availability of a non-market good is assessed in terms of the potential costs of the marginal counter-balancing change (replacement) or marginal measure that prevents the change.

Damage cost - the potential cost related to the damages resulting from pollution (the damage cost monetary valuation method evaluates the damage derived from an emission or derived from other changes in natural capital).

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Progress on Task 4:

"More refined evaluation of the economic impacts in task 7 of the MEErP"

Joint
Research
Centre

Effects on demand for manufacturing labour

A number of different effects must be taken into account for this task, namely:

1. A direct effect if the Ecodesign requirements change the amount of labour needed to produce one unit of the product (this will amount to a direct change in the employment factor). If present, this effect would be expected to be of a positive sign thus increasing the total labour demand associated with the product group.
2. An indirect effect caused by possible changes in the production costs of the products that were induced by the Ecodesign requirements. It is expected that firms respond to a change in production costs (including changes in the amount of labour required) adjust the pricing of their products in order to keep their profits unchanged. In turn, this change in price might induce a change in the demand of the product. If present, this effect would be expected to be of a negative sign thus decreasing the total labour demand associated with the product group.
3. Finally, and perhaps the most relevant effect, an indirect effect caused by changes in the longevity of the products that will affect yearly sales and thus the demand for the product. This change in demand induced by longevity changes can be estimated by the dynamic sales and stock model already presented. This effect is expected to be of a negative sign thus decreasing the total manufacturing labour demand associated with the product group, *i.e.*, increased longevity is expected to result in decreased demand.

Regional and sectorial redistribution effects

1) Redistribution effects between countries can be estimated just by checking what is the fraction of the total products sold that is originated in each country and allocating the calculated changes in manufacturing labour accordingly.
2) Keeping in mind that the increased longevity of the products in is many case due to an improvement in reparability and upgradability, we can conclude that the expected decrease in manufacturing labour requirement will be offset by an increase in labour requirements for the repair and upgrade sectors. The exact final balance is hard predict in advance.
3) The effect of increased reparability and upgradability will always be of a positive sign, *i.e.*, it will always cause an increase in labour requirements for these sectors and is of an intrinsically local nature, therefore concentrating its effects on the country where the product is being used.
4) The overall effect of Ecodesign on employment on a given country will then have to be estimated by the Study-Team taking into account the combined effect of the impact exerted on the manufacturing sector, the service sector (repair and upgrade) and the distribution of the country of manufacturing of the products sold. In countries where the tertiary sector outweighs the secondary sector (like in most of the EU countries), it is expected that the overall effect is positive (*i.e.*, a net increase in employment) but the detailed calculation will have to be carried out by the Study-Team on a case-by-case basis in order to confirm this intuition.

European Commission

Modelling for Task 4

The detailed modelling of the previously mentioned effects is complex, but can be done in a simplified way under the following assumptions:

1. The demand elasticity facing the firms is constant.
2. The relative increase in manufacturing costs is the same for all products.
3. The products' stock is constant.
4. The share of product that is imported is constant.

Under the above mentioned, the impact of Ecodesign requirements on employment can be estimated in a not too complex way that is depicted in the accompanying report.

An Example: laptop computer

As an illustration of the kind of results that can be possible to obtain, we present below an example of possible values for an hypothetical laptop computer (values are used for purely exemplification purposes).

Effect of reparability level on EU manufacturing labour for laptop computers.

Level	L_{M0} [h]	L_{M1} [h]	L_{t0}/L_{t1}	CV_1/CV_0	ΔL_M [million h]
1	1.1	1.1	0.83	1.06	-2.07
2	1.1	1.1	0.86	1.04	-1.58
3	1.1	1.1	0.91	1.02	-0.93
4	1.1	1.1	1.00	1.00	0

Effect of reparability level on EU repair labour and aggregated labour for laptop computers.

Level	L_{R1} [h]	L_{t0}/L_{t1}	CV_1/CV_0	ΔL_R [million h]	ΔL [million h]
1	0.8	0.83	1.06	55.43	53.35
2	1.1	0.86	1.04	81.67	80.08
3	1.5	0.91	1.02	122.58	121.65
4	0	1.00	1.00	0	0

European Commission

JRC / DG GROW Project on the "Review of the Methodology for Ecodesign of Energy-related Products - MEErP"

Progress on Task 5:

"Other updates and integrations"

Joint Research Centre

Systematic updates

Some parameters necessary for the economic analysis are liable to change in the short term. Therefore, a method to update these parameters in a systematic way is proposed for the parameters that have been identified as of interest.

<u>Energy prices and prices growth rate</u> – From Eurostat data.

<u>Primary energy factors</u> – From the (latest) Energy Efficiency Directive.

<u>Discount rate (d)</u> - Social discount rate recommended by the European Commission (currently 3%).

<u>Inflation rate (i)</u> - Medium term target inflation rate set by the European Central Bank (currently 2%).

<u>Escalation rate (e)</u> – Calculated from historical data both for prices and for inflation (both from Eurostat).

<u>Present Worth Factor (PWF)</u> – Calculated directly from (d) and (e) according to a given formula.

Thank you for your attention

Task 4-5: Questions / Comments?

Thank you for your attention