Imaging equipment and its consumables: preparatory study for Ecodesign

Technical Working Group Meeting

24th November 2022

Joint Research Centre

European Commission

Meeting Item	Approximate start time
Dial-in / Connection	9:00
Introduction & Policy background	9:15
Feedback & Questions	9:30
The Preparatory Study – General methodology and Timing	9:45
Feedback & Questions	10:00
Task 1	10:15
Feedback & Questions	10:45
Task 4	11:15
Feedback & Questions	11:45
Conclusions and Next steps	12:15
End meeting	12:30

How to interact during the TWG meeting?

- Type your comments/questions in the chat box, indicating also your complete name/surname and organisation

- After each section, the JRC will give you the floor, according to the comments received in the chat, to further elaborate comments

- Remember to briefly introduce yourself: name and organisation

- Please remember to mute your microphone / close your camera at the end of your intervention

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Introduction and Policy background

The Preparatory Study

Imaging equipment and consumables

Devices

Cartridges

Methodology

- Methodology for Ecodesign of Energy-related Products (MEErP)

JRC

Task 1. Definitions and scope

JRC + External consultant (data)

Task 2. Market

JRC + External consultant (survey and analysis)

Task 3. Users

JRC

Task 4. Technologies

Task 5. Environment **JRC**

Task 6. Design options **JRC**

Task 7. Policy options **JRC**
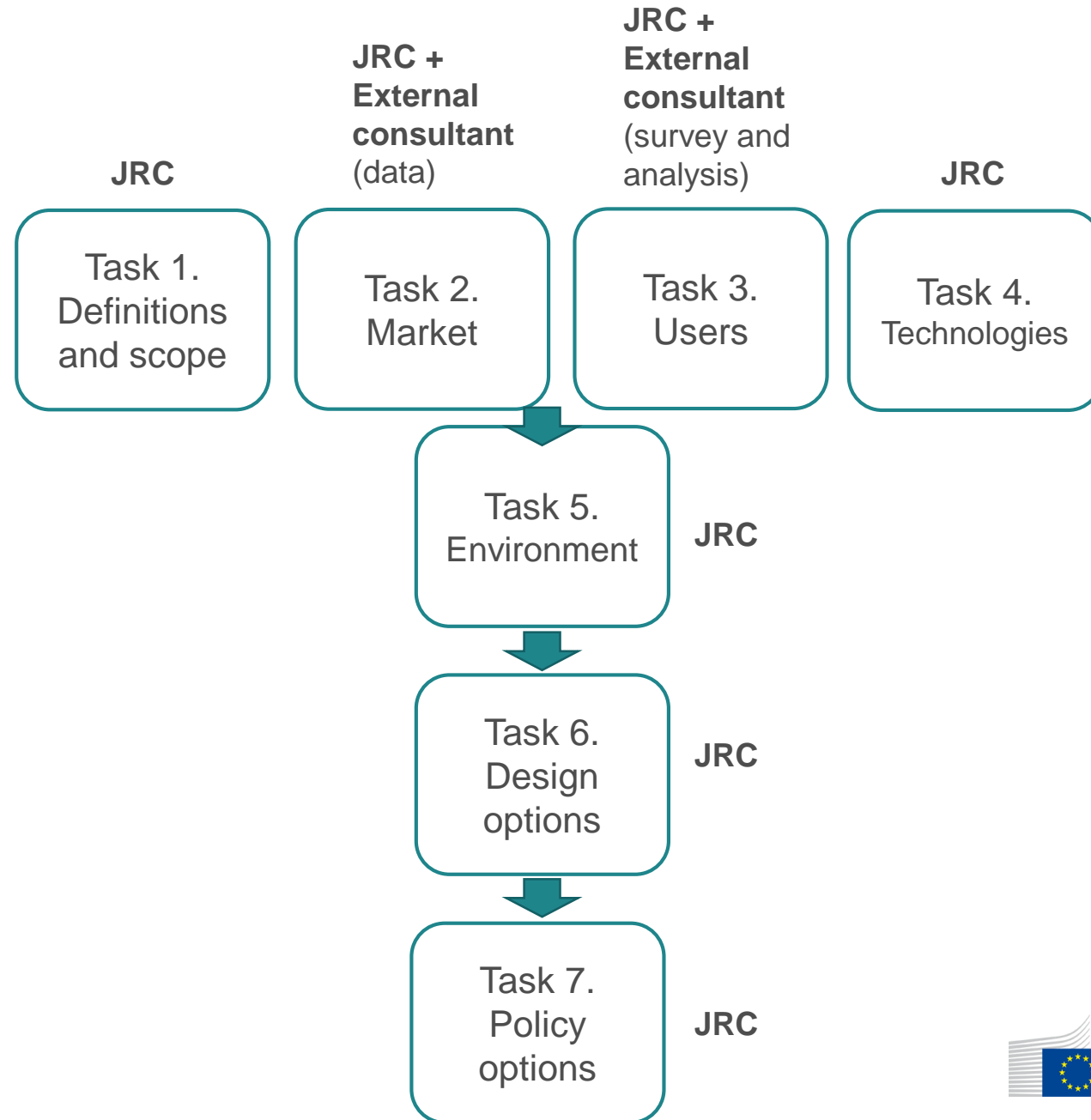
Timeline for Preparatory Study

	2022							2023											
	Jun-22	Jul-22	Aug-22	Sep-22	Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23
Kick off	■																		
Launch call for tenders				■															
Publication draft Tasks 1, 4					■														
1st TWG Meeting						■													
Publication draft Tasks 2, 3									■										
2nd TWG Meeting										■									
Publication draft Tasks 5, 6, 7															■				
Final TWG Meeting																	■		
Publication of Preparatory Study																			■

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Consultation process during Preparatory Study

- The Preparatory Study is an iterative process

- Consultation is transparent, participation is open to every stakeholder

- Official period for providing feedback is around TWG Meetings:

    - November 2022, April 2023, October 2023

- JRC Team may also be available for bilateral meetings on specific topics outside of official period for commenting

- Email: JRC-B5-IMAGING-EQUIPMENT@ec.europa.eu

Purpose of Technical Working Group meeting

- JRC to present Task 1 and Task 4 (drafts)

  - Discussions around **definitions**, **scope** and **technology** aspects

  - Focus on **describing methodology**

  - Describe in more detail some specific aspects

  - Results and data presented are subject to stakeholder feedback and on completion of Task 2 and Task 3

- Stakeholders to provide feedback/data and ask questions (in meeting / writing)

- Clarify methodological and timeline aspects

- TWG Meeting slides will be published in project website

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Practical information

- Website:

  https://susproc.jrc.ec.europa.eu/product-bureau/node/529

- Registration:

Register

If you would like to be informed about the project, register as a stakeholder in the following link: Registration for Product Groups.

- Contact: JRC-B5-IMAGING-EQUIPMENT@EC.EUROPA.EU

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Log in

Product Bureau

Home   About us   Product groups   Project team   Contact us   BATIS

European Commission > Product Policy Bureau > Imaging equipment and consumables

Imaging equipment and consumables

Home

Imaging Equipment

PRINTING

Welcome to the home page of the 'Imaging equipment and consumables' project to develop a preparatory and an impact assessment study to identify and assess the feasibility of sustainable product policy instruments for imaging equipment and consumables under the Ecodesign and Energy Labelling framework.

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Stakeholder Questions and Feedback

Task 1 – Definitions and Scope

Purpose and Methodology of Task 1

- Provide **definitions** of the key products and aspects covered in the Preparatory Study

- Propose **scope** of the Preparatory Study
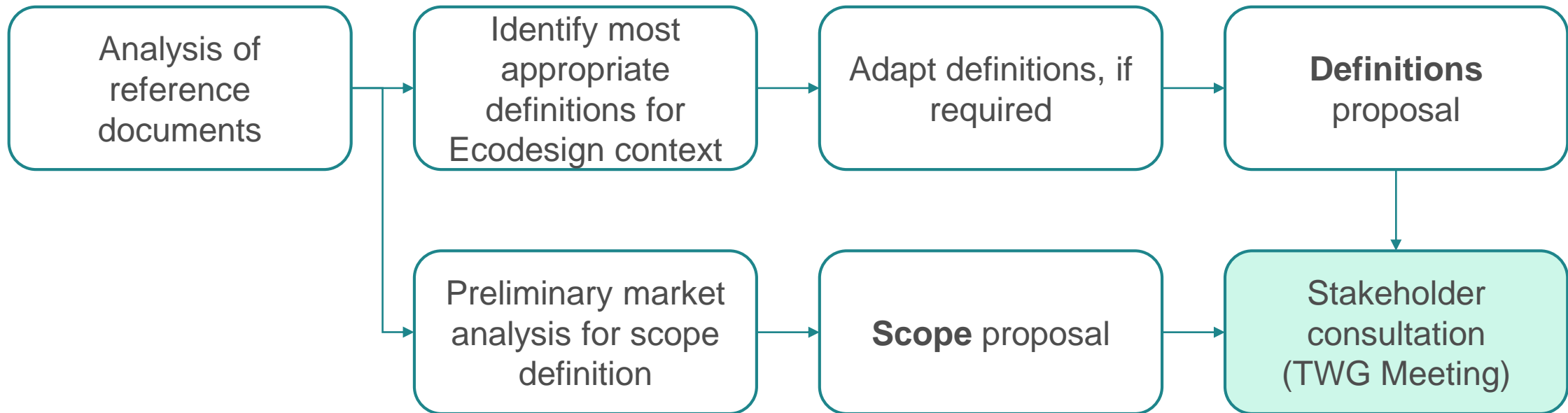
Methodology of Task 1

Provide definitions of the key products and aspects

- <u>Priority</u>: use or adapt definition provided by

    ISO 29142-1:2021 Information Technology – Print Cartridge characterization – Part 1: General: Terms, symbols, notations and cartridge characterization framework

- <u>If needed</u>: use or adapt definitions provided by other reference documents (Type I Ecolabels, GPP Criteria) or definitions proposed by stakeholders

Methodology of Task 1

- List of reference documents

Standards	- ISO 29142-1:2021 Information Technology – **Print Cartridge characterization** – Part 1: General: Terms, symbols, notations and cartridge characterization framework - ISO/IEC 29142-2:2013 — Information technology -- **Print cartridge characterization** -- Part 2: Cartridge characterization data reporting - ISO/IEC 29142-3:2013 — Information technology — **Print cartridge characterization** — Part 3: Environment - ISO/IEC 22505:2019 — Information technology — Office equipment — Method for the determination of ink **cartridge yield** for monochrome inkjet printers and multi-function devices that contain printer components - ISO/IEC 24711:2021 — Information technology — Office equipment — Method for the determination of ink **cartridge yield** for colour inkjet printers and multi-function devices that contain printer components - ISO/IEC 19752:2017 — Information technology — Office equipment — Method for the determination of toner **cartridge yield** for monochromatic electrophotographic printers and multi-function devices that contain printer components - ISO/IEC 19798:2017 — Information technology — Office equipment — Method for the determination of toner **cartridge yield** for colour printers and multi-function devices that contain printer components

Methodology of Task 1

- List of reference documents

Standards	- EN 45552:2020. General method for the assessment of the **durability** of energy-related products. - EN 45553:2020. General method for the assessment of the ability to **remanufacture** energy-related products. - EN 45555:2019. General methods for assessing the **recyclability** and **recoverability** of energy-related products. - EN 45557:2020. General method for assessing the proportion of **recycled material content** in energy-related products. - EN 45558:2019. General method to declare the use of **critical raw materials** in energy-related products.

Methodology of Task 1
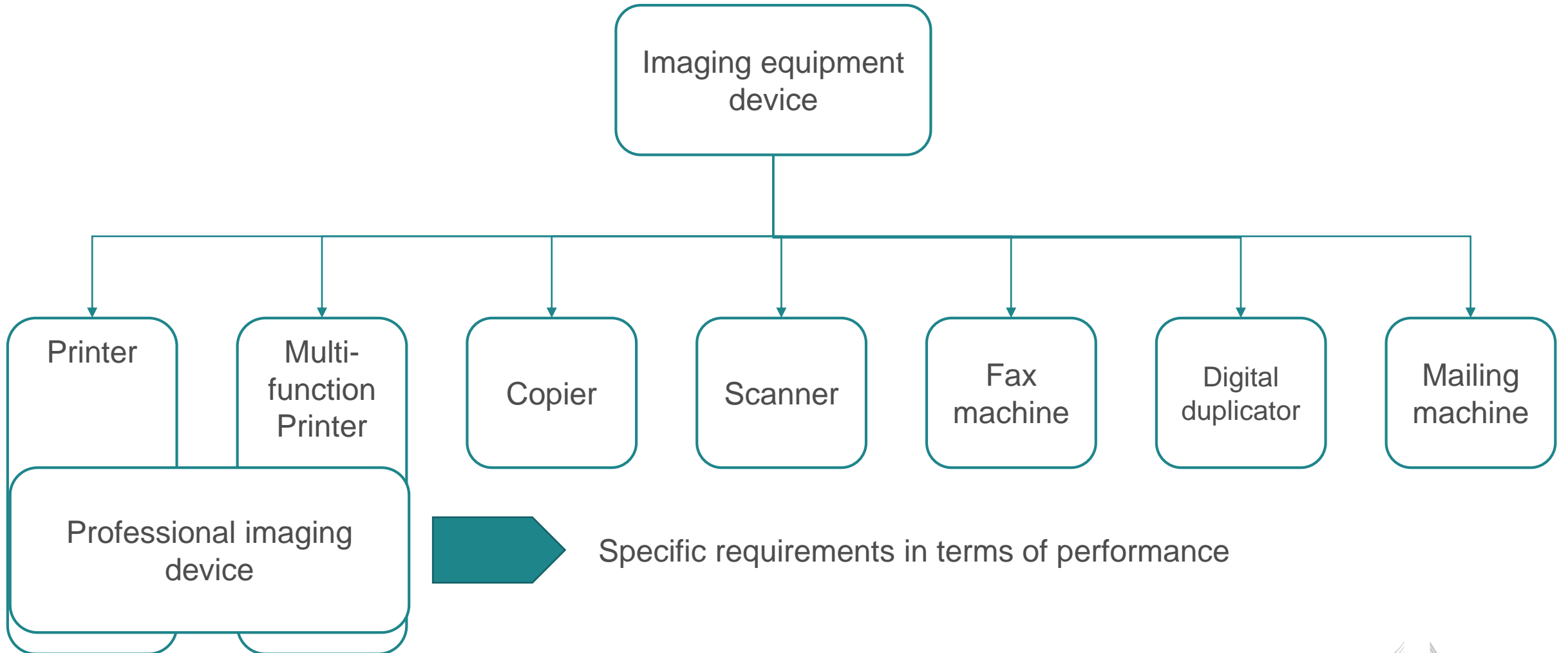
- List of reference documents

Voluntary schemes	- Voluntary Agreement for Imaging Equipment (2015 & 2021) - EU Green Public Procurement (GPP) criteria for Imaging Equipment - Energy Star v3.2 product specification for imaging equipment - Blue Angel Ecolabel for office equipment with printing functions - Blue Angel Ecolabel for remanufactured toner cartridges and ink cartridges for printers, copiers and multifunction devices - Nordic Ecolabelling for Imaging equipment version 6.7 - Nordic Ecolabelling for remanufactured OEM toner cartridges version 5.6 - EPEAT Ecolabel, based on the IEEE Standard for Environmental assessment of imaging equipment - TCO Certified Generation 9, for imaging equipment, Edition 1

Methodology of Task 1

- List of reference documents

Regulation	
	- Regulation 1275/2008 on Standby and off mode electric power consumption - Directive 2011/65 on the restriction of hazardous substances in EEE equipment - Regulation 1907/2006 (REACH) - Directive 2012/19 on waste electrical and electronic equipment (WEEE)

Definitions proposal: Devices

```
                    ┌──────────────────┐
                    │ Imaging equipment│
                    │     device       │
                    └──────────────────┘
```

| Printer | Multi-function Printer | Copier | Scanner | Fax machine | Digital duplicator | Mailing machine |

Professional imaging device → Specific requirements in terms of performance

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Definitions proposal: Consumables

Consumables
(cartridge, waste toner collection unit, fuser unit, drum unit, transfer unit, etc.)

A **product integral to the functioning of the imaging equipment product** with the intent, when depleted or worn, **to be replaced or replenished by the user during the normal usage and life span** of the imaging equipment product.

Cartridge

A **user replaceable unit** operating with a printing system that includes **at least a containing mechanism designed for materials intended for deposition on a substrate**

Ink Cartridge

Toner Cartridge

Single part ink cartridge

Ink container

Integrated ink cartridge

Ink container + Deposition mechanism

Single part toner cartridge

Toner container

Two part toner cartridge

Toner container + Developer part

All in one toner cartridge

Toner container + Developer part + Photoconductor

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Definitions proposal: Consumables
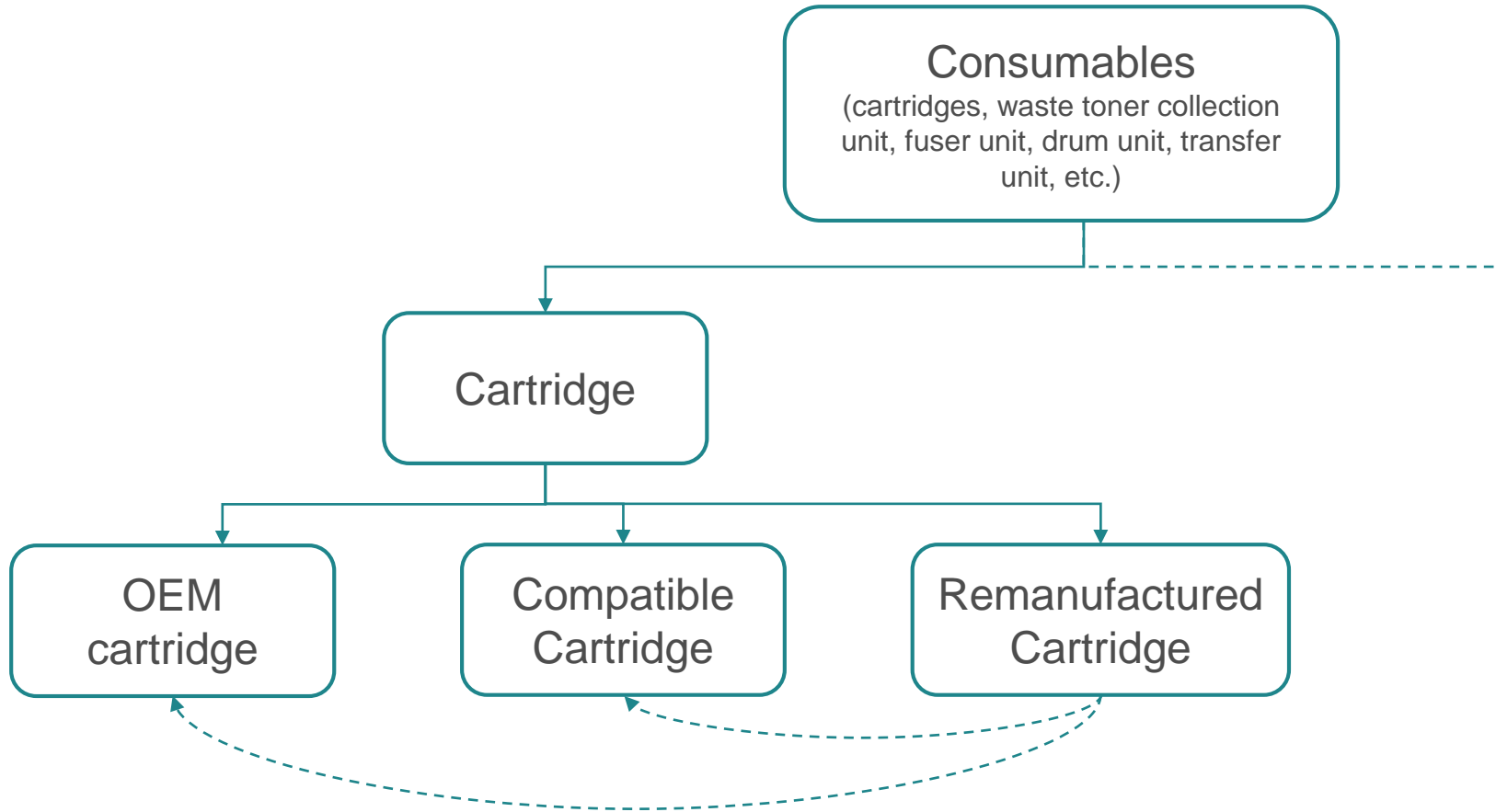
Scope proposal: Devices

In scope of Preparatory Study	Excluded from scope of Preparatory Study
Printer Multi-function printer Copier Scanner Fax machine	Digital duplicator Mailing machine Professional imaging equipment device

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Scope proposal: Cartridges

Deposition material	Configuration	Life condition	Supplier
-Ink cartridge -Toner cartridge	-Single part toner cartridge -Two part toner cartridge -All-in-one toner cartridge -Single part ink cartridge -Integrated ink cartridge	-New products, including remanufactured cartridges	-OEM cartridge -Compatible cartridge

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Task 1 JRC Questions

- *Is there any additional reference document that should be considered in the analysis?*

- *Is there any definition missing?*

- *Is there any definition proposal that should be reviewed or changed?*

- *Is the scope proposal appropriate? Should it be expanded or reduced?*

Task 4 – Technologies

Purpose and Methodology of Task 4

- Describe technical aspects of the product group that are related to environmental performance of the product

- Propose Base Cases and Best Available Technologies
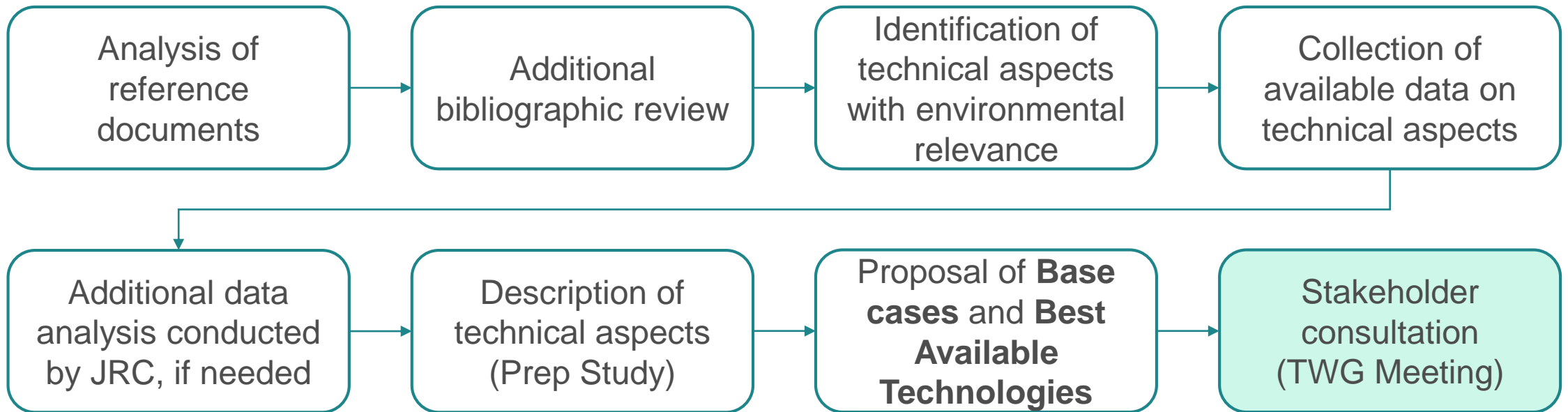
Analysis of reference documents

Document	Context
Study on the implementation of product design requirements set out in Article 4 of the WEEE Directive. The case of reusability of printer cartridges. Final Report (Waugh et al, 2018)	DG ENV / WEEE Directive
Revision of Voluntary Agreement of Imaging Equipment. Task 1-7. Final Report (Huang et al, 2019)	DG ENER / Ecodesign
Revision of the EU Green Public Procurement Criteria for imaging equipment. Final Technical Report. Final Criteria (Kaps et al, 2020)	DG ENV / Green Public Procurement

- Identify parameters with environmental relevance according to those sources

- Identify up to date / out of date information

- Identify data gaps / aspects to improve

Additional bibliographic review

Type of Document	Examples of additional bibliographic review
~15 peer-reviewed scientific papers	- Badurdeen et al (2018). A multiple lifecycle-based approach to sustainable product configuration design. - Krystofik et al (2014). When consumer behaviour dictates life cycle performance beyond the use phase. Case study of inkjet cartridge end of life management - Parthasarathy (2021). Challenges and emerging trends in toner waste recycling. A review. - Wieclawska, D. (2021). Inkjet printing of conductive structures
~15 industry reports	- Bozeman et al (2011). Life Cycle Assessment of a Solid Ink MFP Compared with a Color Laser MFP - Four Elements (2021). Life Cycle Environmental Impact Study on LaserJet Toner Cartridges HP Reused Cartridges vs. Remanufactured Cartridges - Keypoint Intelligence (2017). Original HP Inkjet print cartridges vs Third Party. - Spencerlab (2016). Monochrome cartridge reliability comparision study.
~15 articles specialized press	- Tyson (2016). How inkjet printers work - Farratech (2015). How a toner cartridge works - Aston (2022). Is cheap printer any good? - Errera, R. (2021). How long does printer toner last? - Noe, C. (2014). The manufacture of printer ink cartridges
~15 University, Government, NGO publications	- Chung et al (2013). An investigation into remanufactured toner cartridges vs OEM cartridges - Ferrari (2008). Studio life cycle assessment (LCA) del confronto tra una cartuccia originale HP 4000 e una cartuccia calligraphy rigenerata da Sapi srl - ECOS (2021). Comments on the proposed update to the industry voluntary agreement on imaging equipment - GEC (2022). State of Sustainability Research. Imaging Equipment Consumables

Reference documents and bibliographic review

JRC questions:

- *Are there any additional documents that should be evaluated?*

Aspects with environmental relevance

Technical aspects with environmental relevance
1. Device energy use
2. Device printing speed
3. Device durability
4. Device air emissions
5. Cartridge page yield
6. Cartridge shelf life
7. Cartridge print quality
8. Cartridge end of life

Focus on cartridge reuse/ability for remanufacture

JRC questions:

- *Is there any aspect with environmental relevance that should be considered?*

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1. Device energy use

Analysis of Energy Star database of registered products

Source: https://www.energystar.gov/productfinder/product/certified-imaging-equipment/results

2412 products, including 1179 MFD and 882 printers, including professional/non professional (≈200/ ≈2200), different marking technologies

- Data included: Model number, Brand, Page format, Color capability, Printing Speed, Typical Energy Consumption, Power in sleep/off/standby, Default delay time to sleep

- Used by JRC to analyse energy performance of devices (active, off, sleep mode)

- Used by JRC to analyse other performance aspects like printing speed of devices

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1. Device energy use

Energy Star performance and devices placed on the EU market

- The Voluntary Agreement has pursued a strong alignment of the performance of devices in the EU market with the Energy Efficiency requirements under Energy Star, also confirmed by the Voluntary Agreement monitoring reports

- Based on the last data available on this product group, the US Environmental Protection Agency (EPA) reports a market penetration of 90% for Energy Star compliant MFD and printers in US

- Our assumption is that Energy Star, with some adjustments, can provide a proxy of the energy performance of devices placed on EU market,

1. Device energy use

- **On mode**

  - *Active state*: the power state in which a product is connected to a power source and is actively producing output, as well as performing any of its other primary functions.

  - *Ready state*: The power state in which a product is not producing output, has reached operating conditions, has not yet entered into any lower-power modes, and can enter Active State with minimal delay

- **Off mode:** The power state that the product enters when it has been manually or automatically switched off but is still plugged in and connected to the mains. This mode is exited when stimulated by an input, such as a manual power switch or clock timer to bring the unit into Ready State.

- **Sleep mode:** A reduced power state that a product enters either automatically after a period of inactivity (i.e., **Default Delay Time**), in response to user manual action (e.g., at a user-set time of day, in response to a user activation of a physical switch or button), or in response to external electrical stimulus (e.g., network stimulus, fax call, remote control).

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1. Device energy use

JRC Analysis: OFF mode (inkjet printers)

Power in Off Mode (Watts) for non professional Imaging Equipment (registered Energy Star[R] devices)

According to the Regulation (EC) No 1275/2008 **power consumption of equipment in off mode shall not exceed 0,50 W**.

Electronic Displays Commission Regulation (EU) 2019/2021 **shall not exceed 0,30 W**.
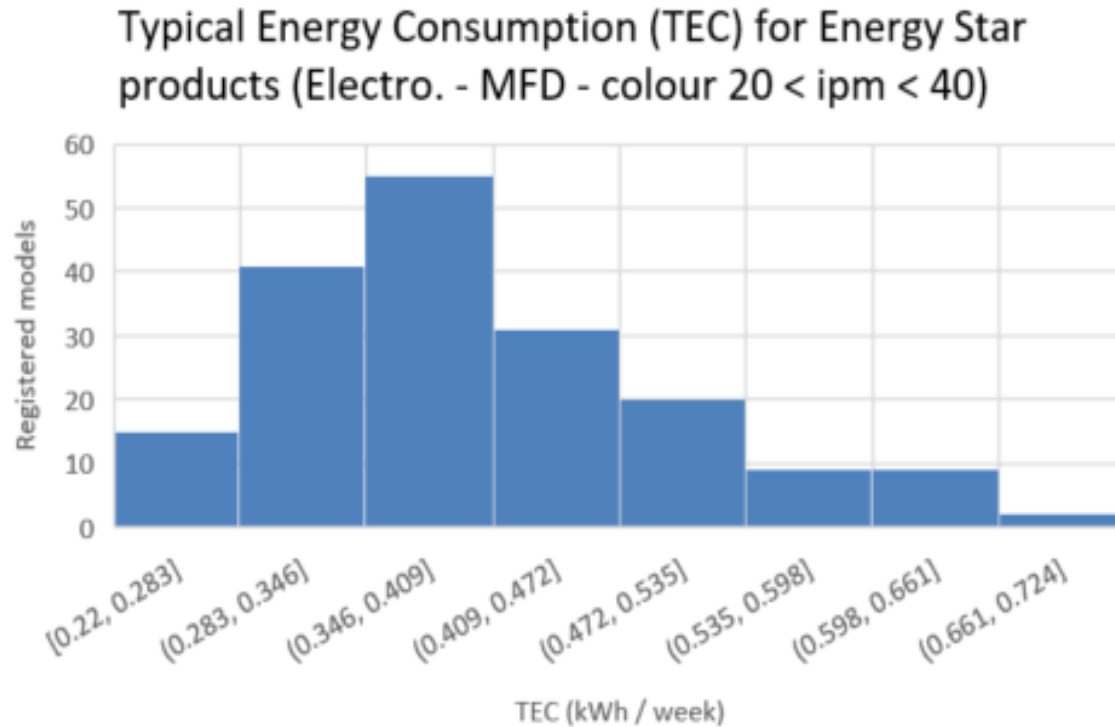
Data: Energy Star database 3.2 registered products (September 2022)

1. Device energy use

JRC Analysis: SLEEP mode (inkjet printers)
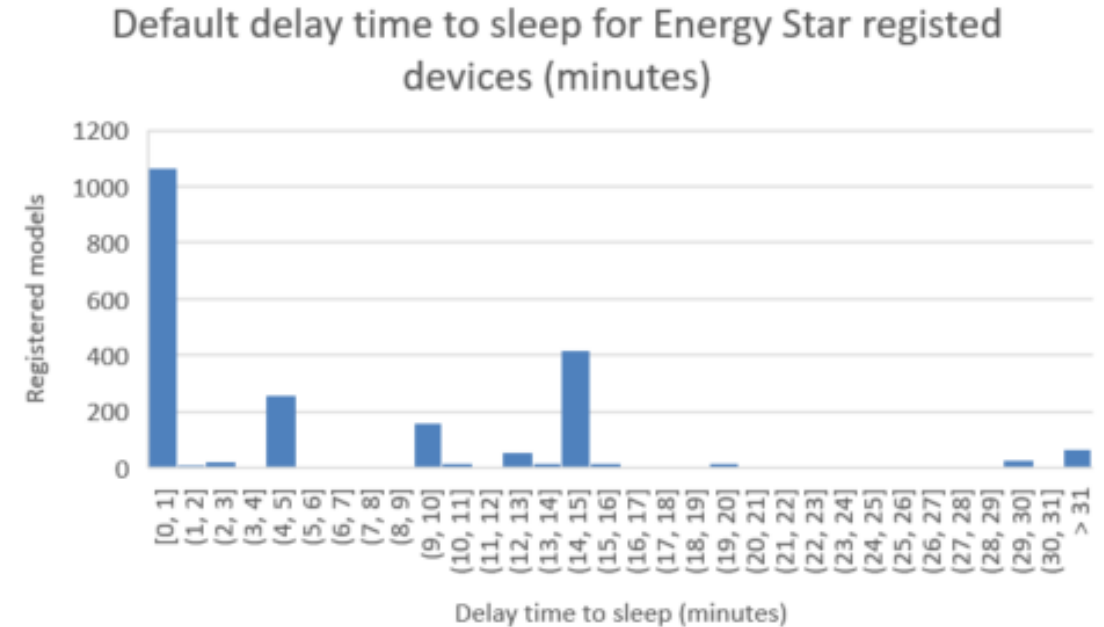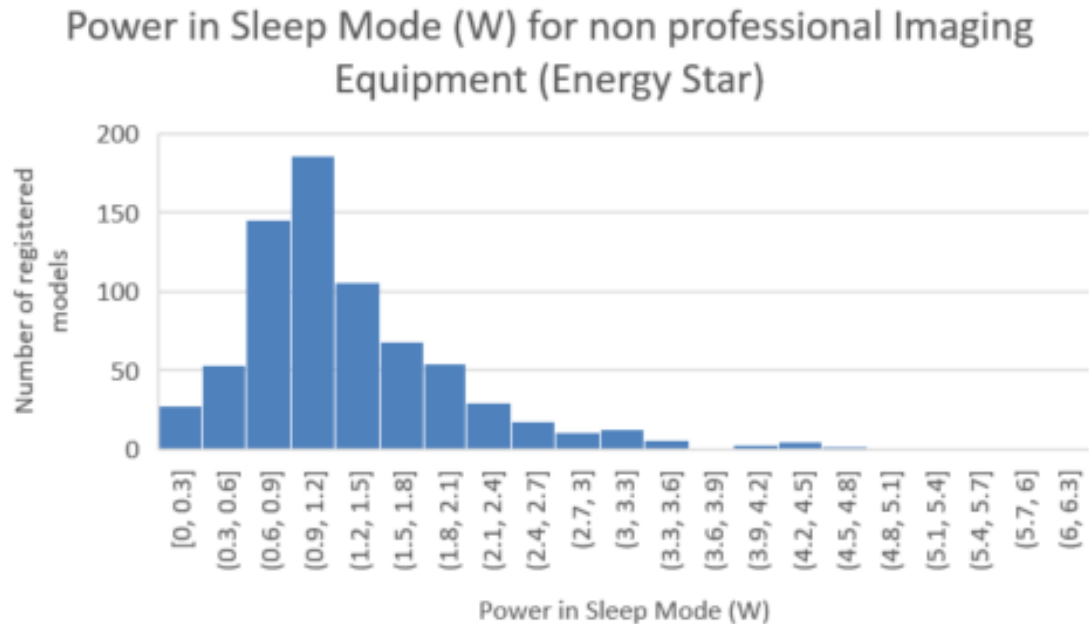
Power in Sleep Mode (W) for non professional Imaging Equipment (Energy Star)

Default delay time to sleep for Energy Star registed devices (minutes)

Data: Energy Star database 3.2 registered products (September 2022)

1. Device energy use

JRC Analysis: Active mode

Typical Energy Consumption (TEC) for Energy Star products (Electro. - MFD - colour 20 < ipm < 40)

Data: Energy Star database 3.2 registered products (September 2022)

According to the Energy Star data:

- Average TEC = 0,40 kWh/week

- Best 10% TEC < 0.29 Kwh/week

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1. Device energy use

JRC questions:

- *Is Energy Star database a good representation of the current EU market in terms of energy consumption?*

- *Are there alternative sources of data for energy consumption?*

- *What is the expected improvement potential in terms of energy?*

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5. Cartridge page yield

Cartridge page yield

- **ISO 24711**: page yield is the value determined by counting the number of test pages printed between cartridge installation and end of life (measured in number of pages)

- Page yield is relevant because lower page yields result in more frequent cartridge replacements (waste generation)

Cartridge material efficiency

- Cartridge material efficiency = page yield / mass of cartridge (measured in pages / gram)

- A measure of the efficiency in the use of resources to produce a cartridge

5. Cartridge page yield

Examples of cartridges with different material efficiency
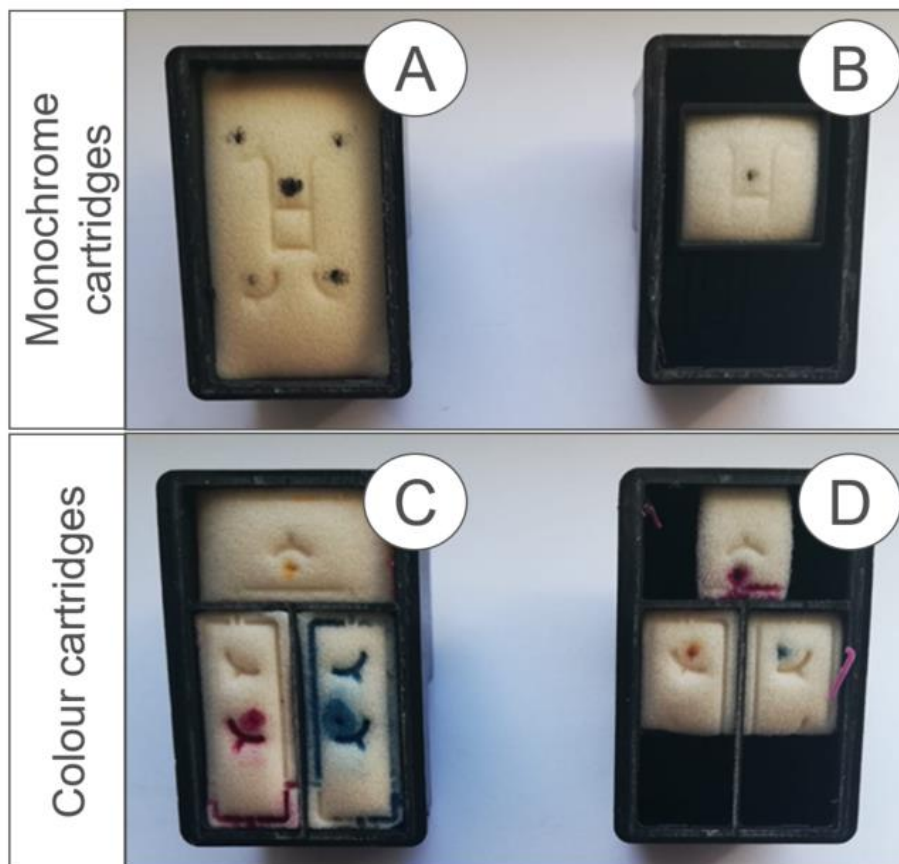
Source: ETIRA
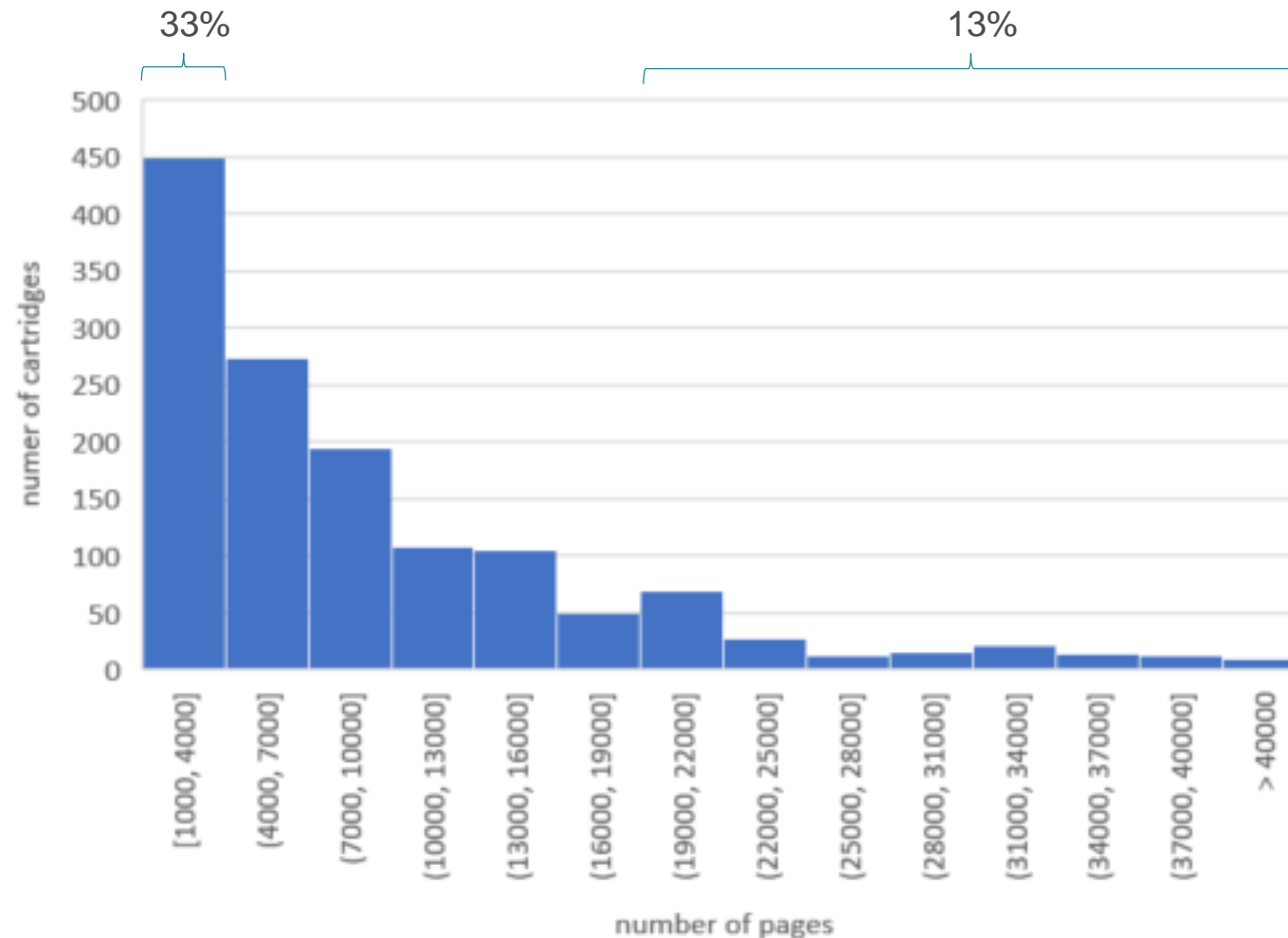
5. Cartridge page yield

Analysis of ETIRA database of <u>toner cartridges</u>

<u>Source</u>: shared by ETIRA via email on September 2022

- 1420 products, including different cartridge configurations, drums, toner collection units.

- <u>Data included</u>: Model number, Brand, Description, Configuration, Page yield, Mass (empty, full, packaging)

- Used by JRC to identify average / max / min cartridge page yield

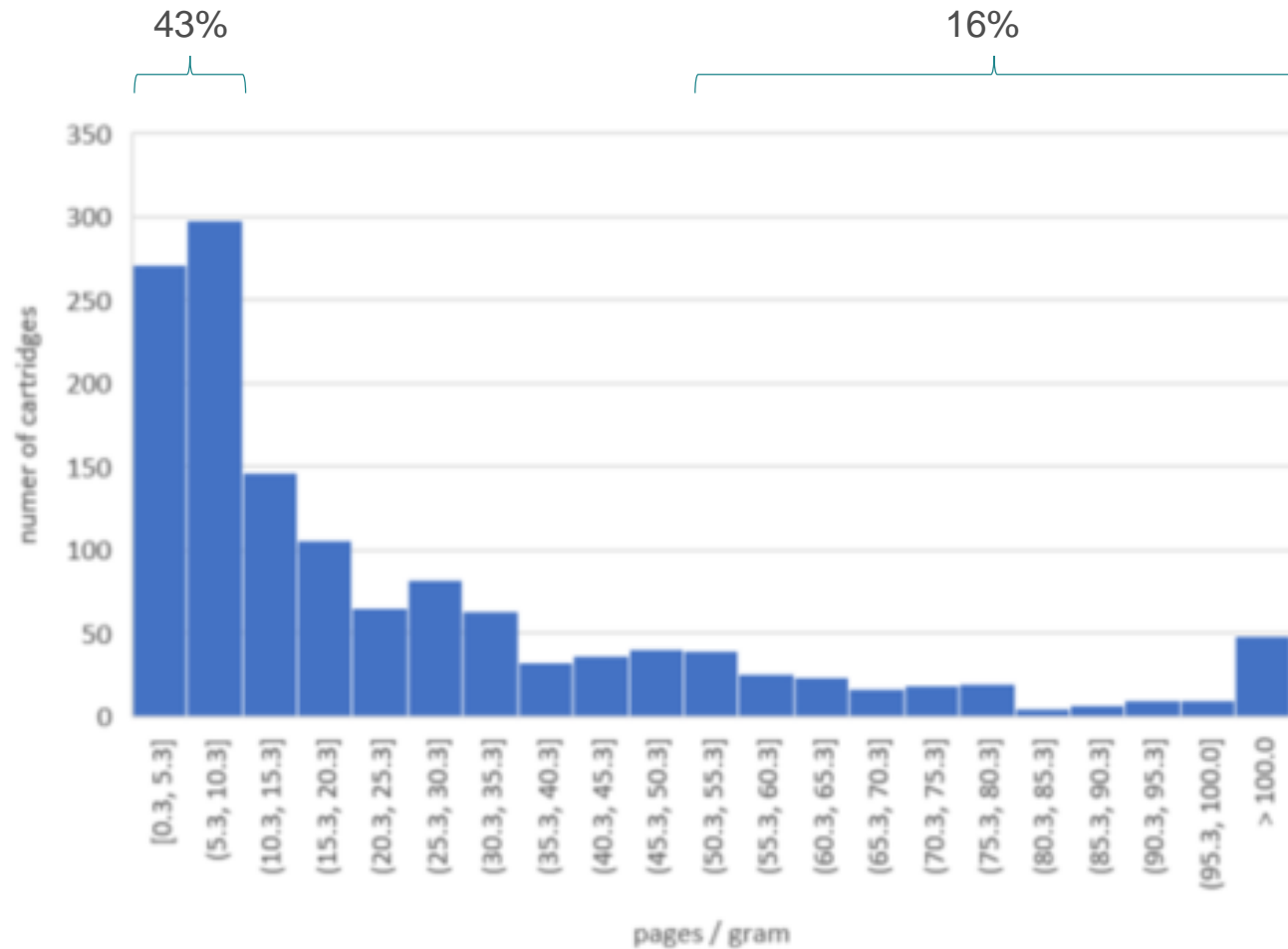- Used by JRC to identify average / max / min cartridge material efficiency

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5. Cartridge page yield

- Page yield analysis (toner cartridges):

5. Cartridge page yield

- Cartridge material efficiency analysis (toner cartridges):

5. Cartridge page yield

JRC questions:

- *Are there alternative sources of data for toner page yield?*

- *Is there similar data available for ink cartridges?*

- *The analysis presented (page yield, material efficiency), are they a good representation of the toner market today?*

- *What are the barriers for increasing average page yield of cartridges?*

- *Does page yield influence other parameters (such as cartridge reuse)?*

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8. Cartridge end of life

Cartridge reuse

- At end of life, a cartridge may be reused via refilling or remanufacturing

- Cartridge reuse is relevant because it contributes to reducing the consumption of virgin materials

- Cartridges can be reused, but not indefinitely

8. Cartridge end of life

Cartridge reuse rates

Reference	Reuse rates
Waugh et al (2018).	Toner cartridges: 25% Ink cartridges: 18%
Huang et al (2019).	15-20%
Comments on the proposed update to the industry voluntary agreement on imaging equipment. https://www.coolproducts.eu/wp-content/uploads/2021/06/ECOS-eNGO-Comments-on-Imaging-Equipment-December-2020.pdf ECOS (2021)	10%
Minutes EVAP subgroup Targets Sixth Meeting. Eurovaprint (2021)	Toner cartridges: 27% Ink cartridges: 7%

8. Cartridge end of life

Cartridge reuse potential

Technical reuse potential: refers to the ability of a printer cartridge to technically be processed for reuse

Economic reuse potential: refers to the economic business case for undertaking reuse

	Technical potential	Economic potential
Toner cartridges	92%	86%
Inkjet cartridges	87%	84%

Waugh et al (2018)

8. Cartridge end of life

Design-related barriers for cartridge reuse

- Electronic circuitry that cannot be reset by independent remanufacturers

- Firmware updates that block the use of 3rd party remanufactured cartridges
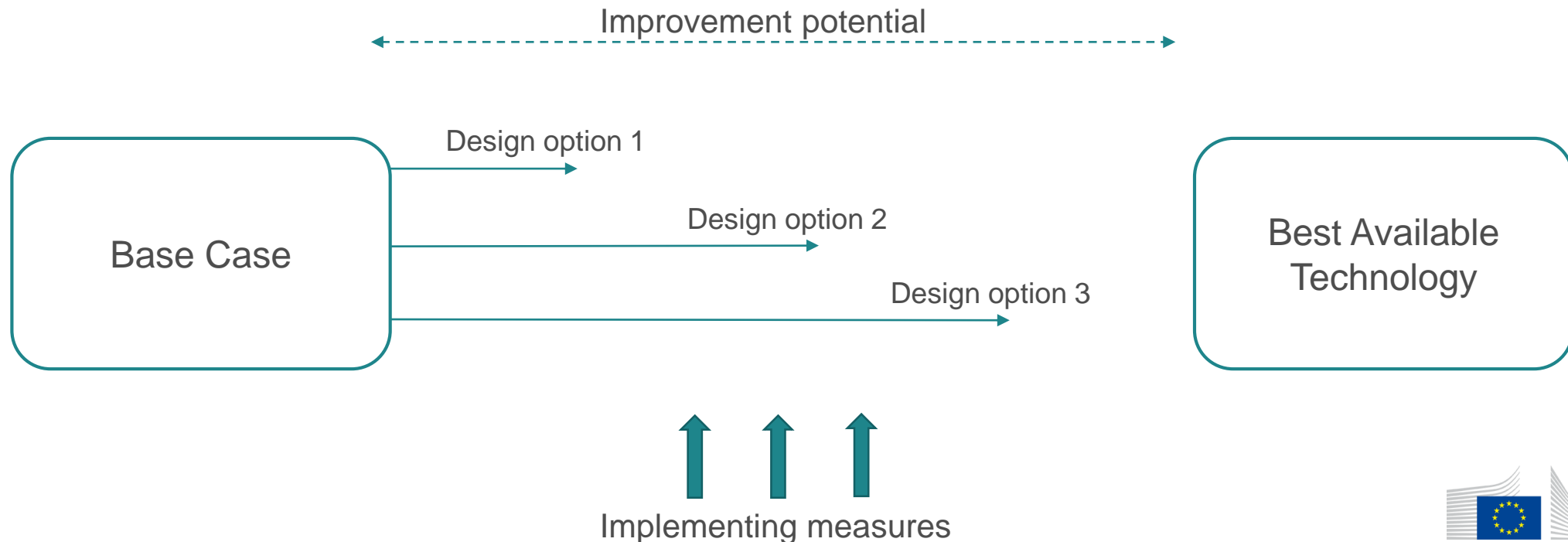
- Disassembly barriers

8. Cartridge end of life

JRC questions:

- *Cartridge reuse rates: which of the figures presented reflects better the current situation?*

- *Cartridge barriers for reuse: are the design-related barriers presented the main ones today?*

- *What are the main design aspects that make a cartridge reusable?*

Base Cases and Best Available Technologies

- <u>Base case</u>: average performing product on the market, in terms of technical aspects identified

- <u>Best Available Technology</u> (BAT): best performing product on the market

Improvement potential

Base Case

Design option 1

Design option 2

Design option 3

Best Available Technology

Implementing measures

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Base Cases and Best Available Technologies

Devices

Base Case	Description	Typical use
BC1Dev	Colour laser multi-function printer, 20 < s < 40	Laser office multi-function printer
BC2Dev	Colour inkjet multi-function printer, s<20	Inkjet home printer

Cartridges

Base Case	Description	Typical use
BC1Car	Two part toner cartridge (colour)	In BC1Dev
BC2Car	Single part ink cartridge (colour)	In BC2Dev

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Stakeholder feedback

Topic	Recap of JRC questions
Reference documents	Are there any additional documents that should be evaluated?
Aspects with environmental relevance	Is there any aspect with environmental relevance that should be considered?
Device energy use	Is Energy Star database a good representation of the current EU market in terms of energy consumption?
	Are there alternative sources of data for energy consumption?
	What is the expected improvement potential in terms of energy?
Cartridge page yield	Are there alternative sources of data for toner page yield?
	Is there similar data available for ink cartridges?
	The analysis presented (page yield, material efficiency), are they a good representation of the toner market today?
	What are the barriers for increasing average page yield of cartridges?
	Does page yield influence other parameters (such as cartridge reuse)?
Cartridge reuse	Cartridge reuse rates: which of the figures presented reflects better the current situation?
	Cartridge barriers for reuse: are the design-related barriers presented the main ones today?
	What are the main design aspects that make a cartridge reusable?
	Cartridge reuse rates: which of the figures presented reflects better the current situation?
	Cartridge barriers for reuse: are the design-related barriers presented the main ones today?
	What are the main design aspects that make a cartridge reusable?

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Next steps

Next steps

- Gather and process comments from TWG Meeting

- Deadline for sending comments 9th December

- Re-work on Task 1 and Task 4

- Carry on work on Task 2 and Task 3

- Publication of draft Task 2 and Task 3: March 2023

- 2nd TWG Meeting: April 2023

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Thank you

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