Imaging equipment and its consumables: preparatory study for Ecodesign

2nd Technical Working Group Meeting

12th April 2023

Joint Research Centre

European Commission

Meeting agenda	
Dial-in / Connection	14:00
Task 1 + Feedback & Questions	14:15 – 14:45
Task 2 + Feedback & Questions	14:45 – 15:15
Task 3 + Feedback & Questions	15:15 – 15:40
Coffee break	5-10 min
Task 4 + Feedback & Questions	15:50 – 16:50
Next steps	16:50 – 17:00
End meeting	17:00

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Purpose of 2nd Technical Working Group meeting

- JRC to present Task 1, 2, 3 and 4
  - Present proposal of definitions and scope (Task 1)
  - Describe key aspects of market (Task 2)
  - Provide preliminary results of user behaviour study (Task 3)
  - Describe technical aspects affecting environmental performance (Task 4)
  - Present proposal of base cases (Task 4)

- Stakeholders to provide feedback/data and ask questions
  - Questions on policy process and/or impact assessment at the beginning of meeting or in writing

How to interact during the TWG meeting?

- Type your comments in the chat box, indicating also your name and organisation
- After each section, the JRC will give you the floor, according to the comments received in the chat, to further elaborate comments
- Please remember to mute your microphone and close your camera at the end of your intervention
- TWG Meeting slides will be published in project website

Task 1

Scope and Definitions

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Scope and definitions

Work carried out after 1st TWG Meeting

- Analysis of comments from stakeholders
- Changes and addition of definitions
- Refinement and clarification of scope

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Key definitions - Devices

Concept	Definition	Changes from previous draft
Imaging equipment device (or 'device')	Product marketed for office or domestic use, or both, and whose function is one or both of the following: a) to produce a printed image, either from a digital image or from a hardcopy, through a scanning/copying process; b) to produce a digital image from a hard copy through a scanning/copying process.	No changes
Printer	Device intended to apply ink or toner to a substrate in response to a digital signal.	No changes
Multi-function printer	Printer with an operating part to apply ink or toner on a substrate, and also providing additional functions such as faxing, scanning or copying.	Changed (Scanning function added)
Standard format	Products designed for standard-sized media (e.g., Letter, Legal, Ledger, A3, A4, B4), including those designed to accommodate continuous form media between 210 mm and 406 mm wide. Standard-size products may also be capable of printing on small-format media. a) A3-capable: Standard Format products with a paper path width equal to or greater than 275 mm	New
Large format	Products designed for A2 media and larger, including those designed to accommodate continuous form media greater than or equal to 406 mm wide. Large-format products may also be capable of printing on standard-size or small format media.	New

Key definitions - Devices

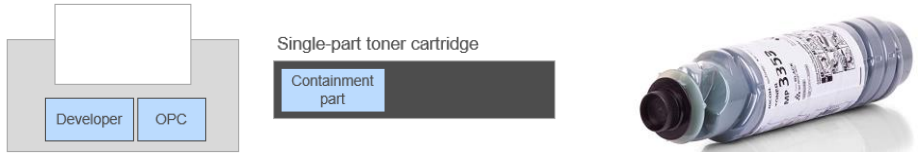
Concept	Definition	Changes from previous draft
Professional imaging product	A printer or multi-function printer marketed as intended for producing deliverables for sale, with the following features: a) Supports paper with basis weight greater than or equal to 141 g/m2; b) A3-capable; c) If product is monochrome, monochrome product speed equal to or greater than 86 ipm; d) If product is colour, colour product speed equal to or greater than 50 ipm; e) Print resolution of 600 x 600 dots per inch or greater for each colour f) Weight of the base model greater than 180 kg; and five of the following additional features for colour products or four for monochrome products, included standard with the Imaging Equipment product or as an accessory: g) Paper capacity equal to or greater than 8,000 sheets; h) Digital front-end (DFE); i) Hole punch; j) Perfect binding or ring binding (or similar, such as tape or wire binding, but not staple saddle stitching); k) Dynamic random access memory (DRAM) equal to or greater than 1,024 MB. l) Final-party color certification (e.g., IDEAlliance Digital Press Certification, FOGRA Validation Printing System Certification, or Japan Color Digital Printing Certification, if product is color capable); m) Coated paper compatibility.	No changes

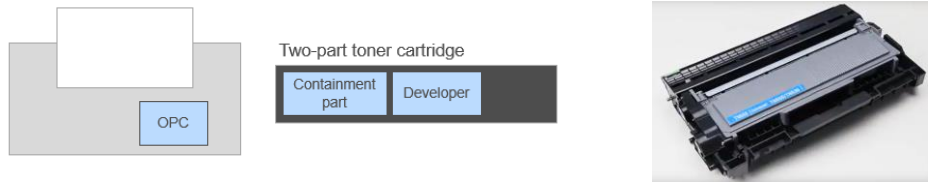
Key definitions - Cartridges

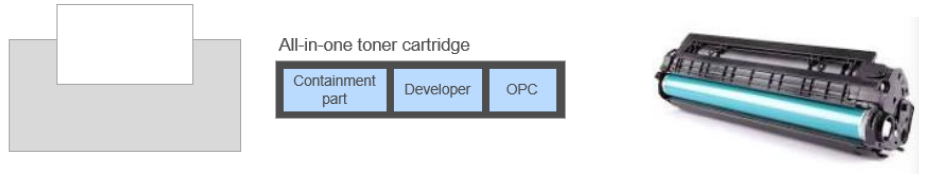
Concept	Definition	Changes from previous draft
Consumable	A product integral to the functioning of the imaging equipment with the intent, when depleted or worn, to be replaced or refilled during the normal usage and life span of the imaging equipment. ~~Consumables may include: toner, toner containers, toner bottles, toner cartridges, waste toner cartridges, ink cartridges, ink heads, ink sticks, ribbon ink, thermal paper, copy paper, imaging units, transfer belts, transfer roller, fusers, drum maintenance units, and other associated items.~~	Changed
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~~ A user replaceable unit within a printing system that contains materials intended for deposition onto paper or other physical output media.	Changed
Starter cartridge	A cartridge which is sold together with a printer or multi-function printer	New

Cartridge configurations - Toner

Configuration	Definition	Changes from previous draft
Single part toner cartridge	A toner cartridge that includes only a toner containment part	No changes (omitted in Preparatory Study by mistake)
Two part toner cartridge	A toner cartridge that includes a toner containment part and a developer part and does not include a photoreceptor part	No changes
All-in-one toner cartridge	A toner cartridge that includes a toner containment part, a developer part and a photoreceptor part	No changes

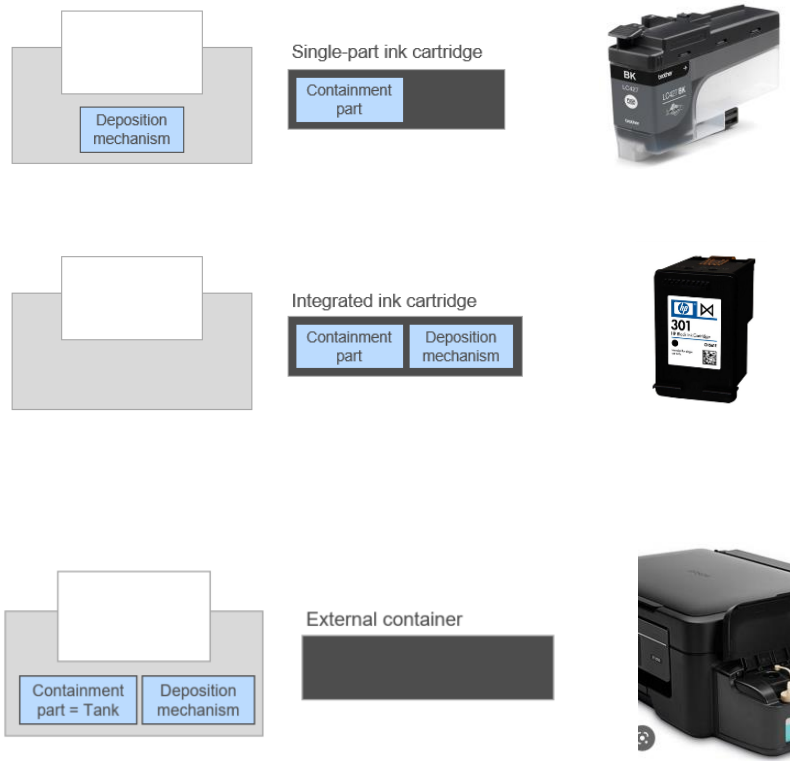






Cartridge configurations - Ink

Configuration	Definition	Changes from previous draft
Single part ink cartridge	A cartridge that includes ~~only~~ an ink containment part and does not include an ink deposition mechanism.	Changed
Integrated ink cartridge	A cartridge that includes an ink containment part and a ink deposition mechanism	No changes
Tank	~~Printer component used to hold toner or ink, used in specific technologies, which is filled from an external container that will not be inserted into the device~~ Printer component which is used to hold toner or ink, filled from an external container.	Changed
External container	Device which contains toner or ink, not intended to be inserted or connected to the imaging equipment device.	New



Scope proposal

Stakeholder feedback from 1st TWG – Clarifications required:

- The inclusion of containers
- The inclusion of refillable cartridges
- The inclusion of marking technologies such as direct thermal, dye sublimation, etc.
- Reasons for excluding professional equipment

Scope proposal

	In scope	Out of scope
General	Devices intended for **household** and **office** use	Devices intended for professional use, or other than household/office use
Printers, multi-function printers and copiers	Standard format	- Large format - Devices designed to operate directly on 3-phase power
Scanners	All scanners	--
Fax machines	All fax machines	--
Digital duplicators	--	All digital duplicators
Mailing machine	--	All mailing machines
Consumables	Consumables designed to be installed or used with any of the devices within the scope	Consumables designed to be installed or used with devices out of the scope

Task 2

Market

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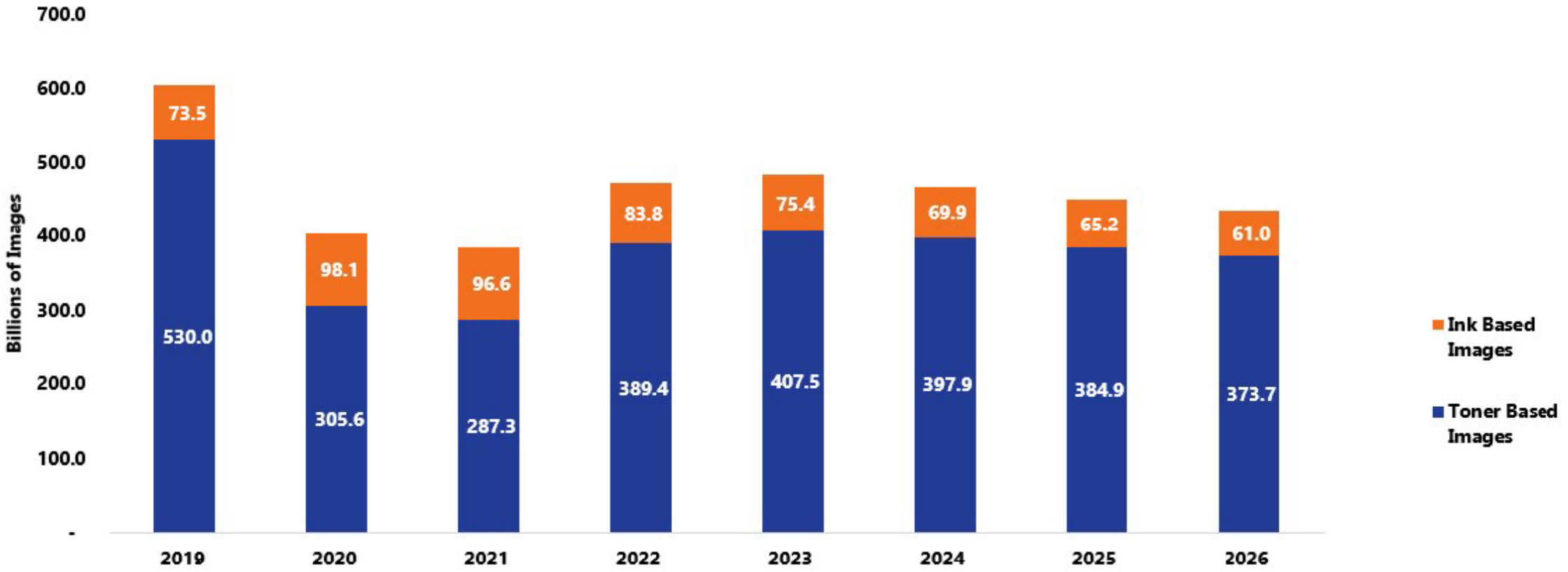
Market analysis

	Document	Source	Data included	Geographical coverage
Devices	*Western Europe Laser MFP and Printer forecast 2022-26* *Western Europe Inkjet forecast 2022-26*	IDC	Total number of printed pages Sales of laser and inkjet devices Market insights and trends on devices	Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the UK (414 million people, 93% of EU)
Cartridges	*Market data on imaging equipment consumables*	Keypoint Intelligence	Sales of toner and ink cartridges Devices installed base Page yield and pages/gram of typical cartridges Market insights and trends on cartridges	Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the UK (425 million people, 95% of EU)

Print volume trends (by technology)



Source: Keypoint Intelligence, 2023

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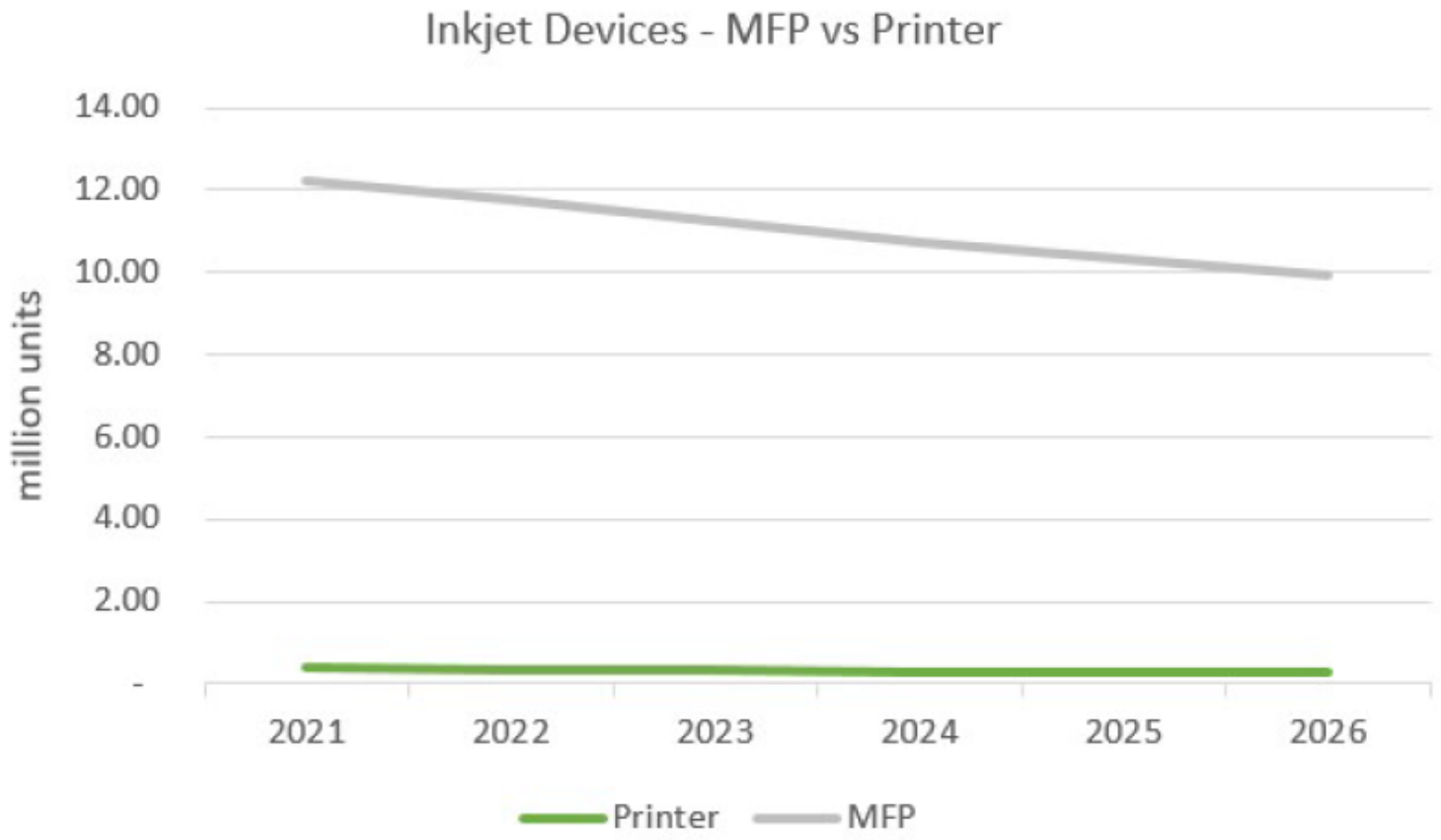
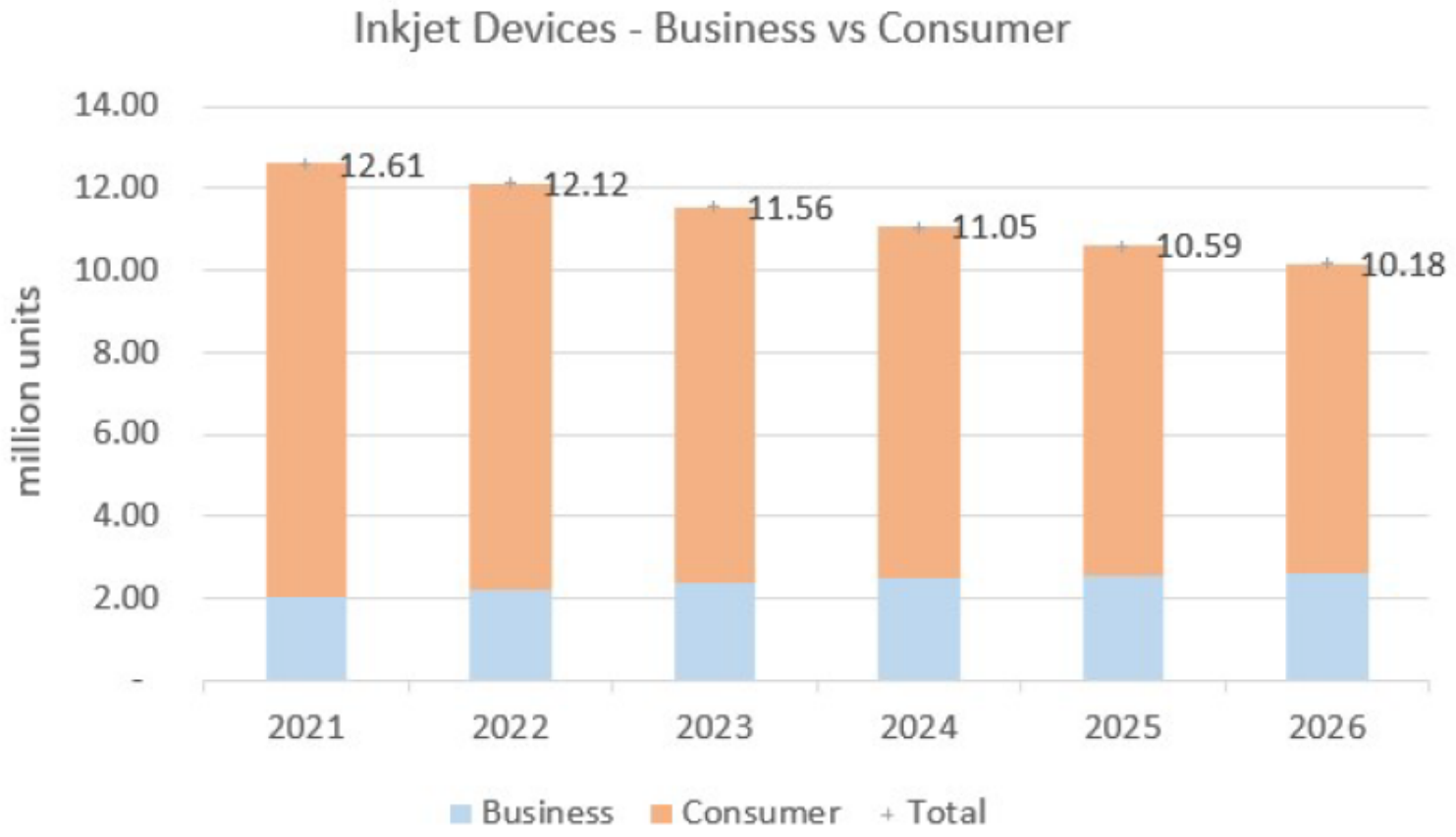
Inkjet devices (MFP vs Printer)



Source: IDC, 2023

Inkjet devices (Business vs Consumer)



Source: IDC, 2023

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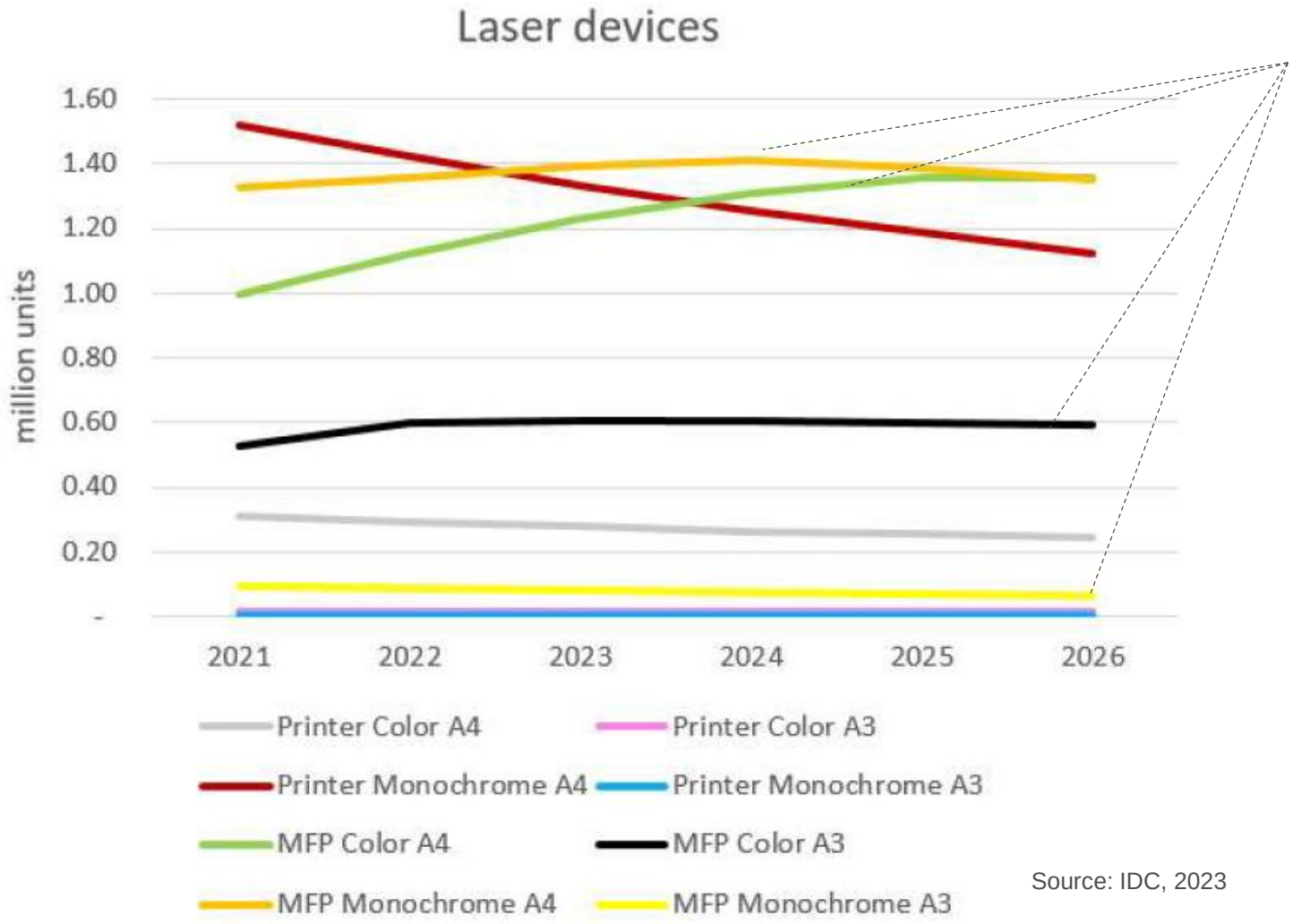
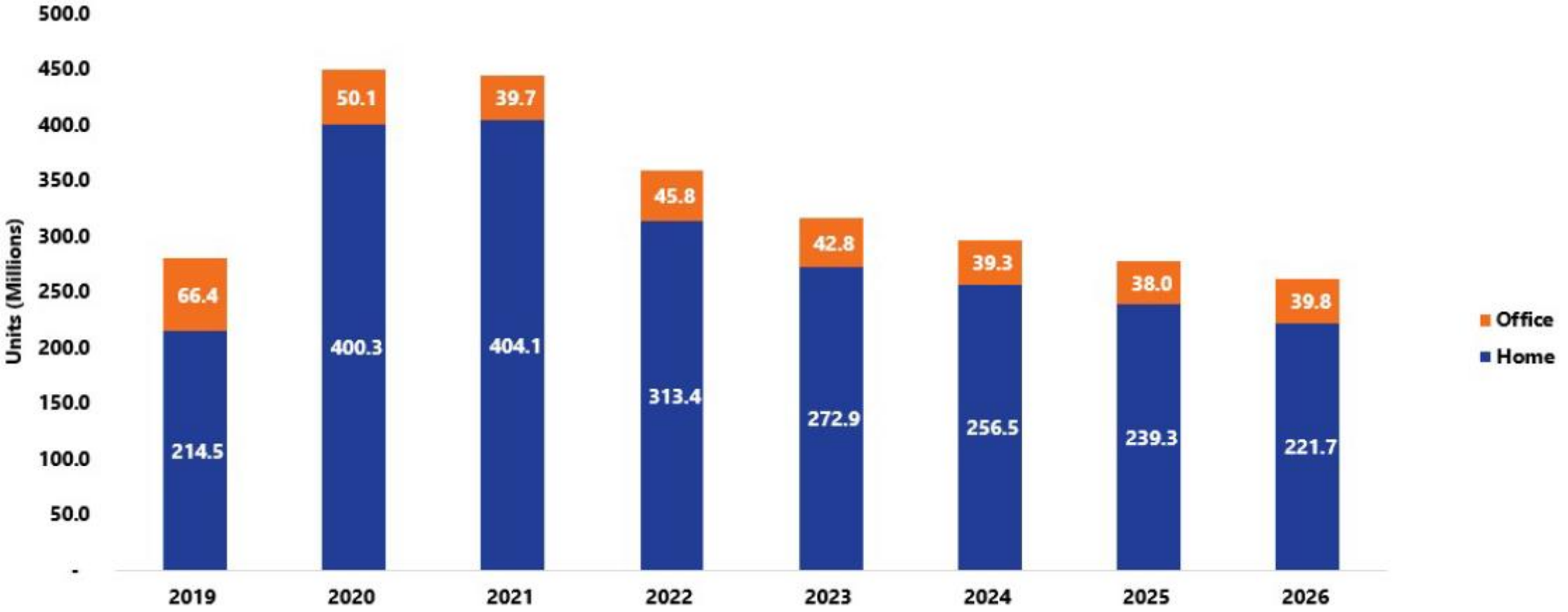
Laser devices



Multi-function

Source: IDC, 2023

Ink cartridges



Source: Keypoint Intelligence, 2023

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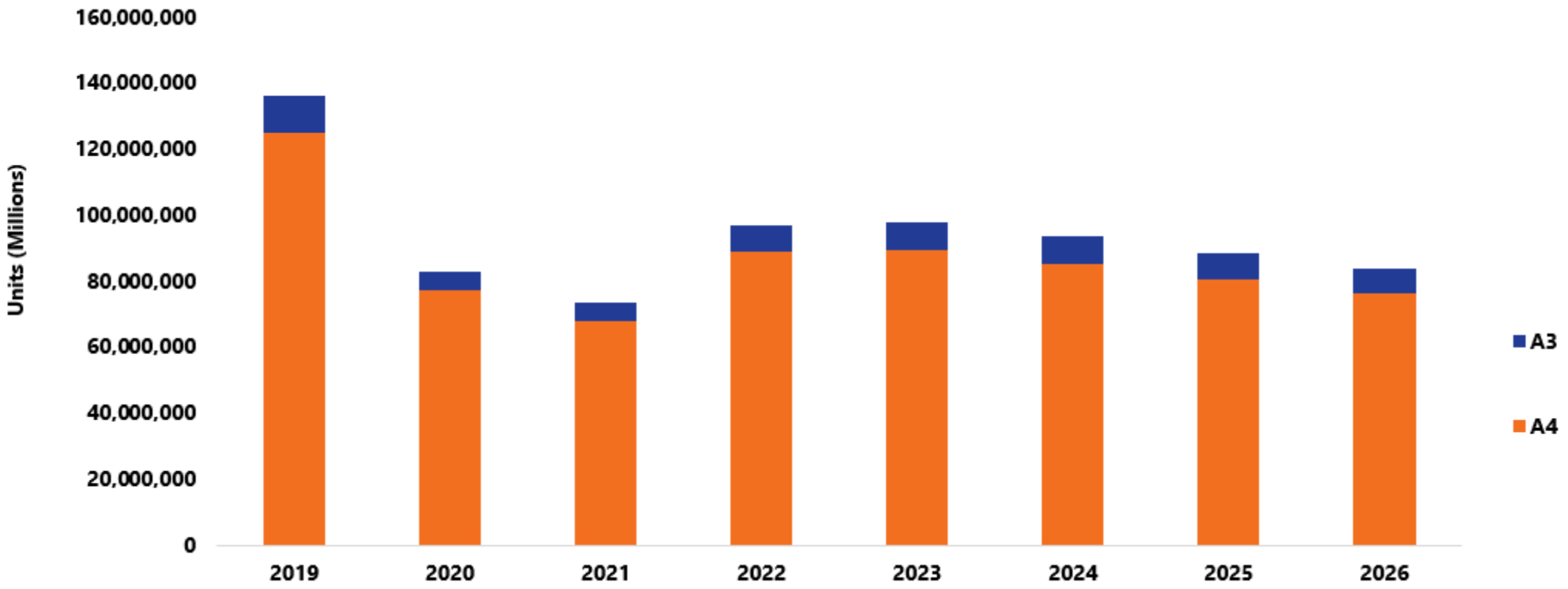
Toner cartridges



Source: Keypoint Intelligence, 2023

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Task 3

Users

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User behaviour study

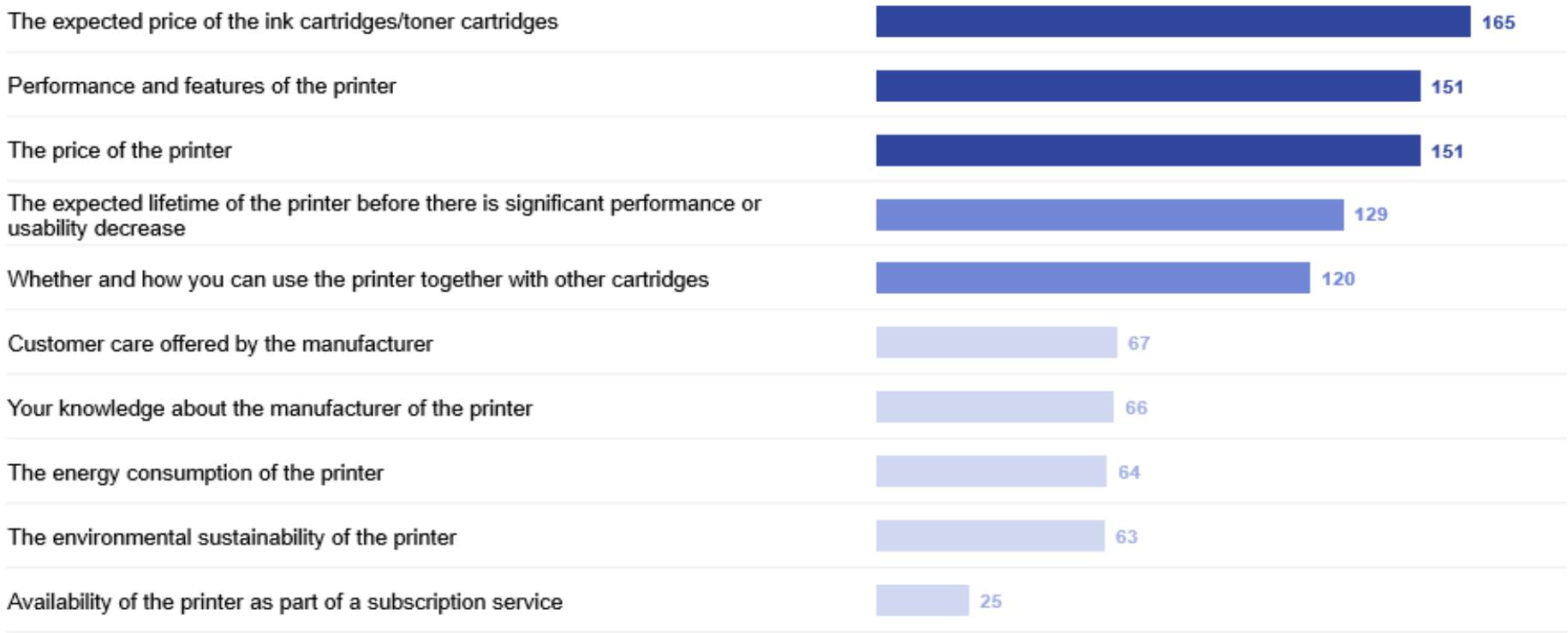
- JRC contracted IPSOS(1) to carry out a consumer survey and report
- Target population: 7 EU Member States and 800 interview per MS
- Focus on consumer printers
- How the different aspects of imaging equipment affects consumers' **purchase decisions**
- **Consumers' habits** in relation to the use of printers and cartridges
- Printers' and cartridges' **circularity**

(1) https://www.ipsos.com/en

Purchase-influencing factors

Relative importance of factors when buying a device

Score = 100 -> **average** importance relative to other factors
Score = 200 -> the factor is 2x more important than average



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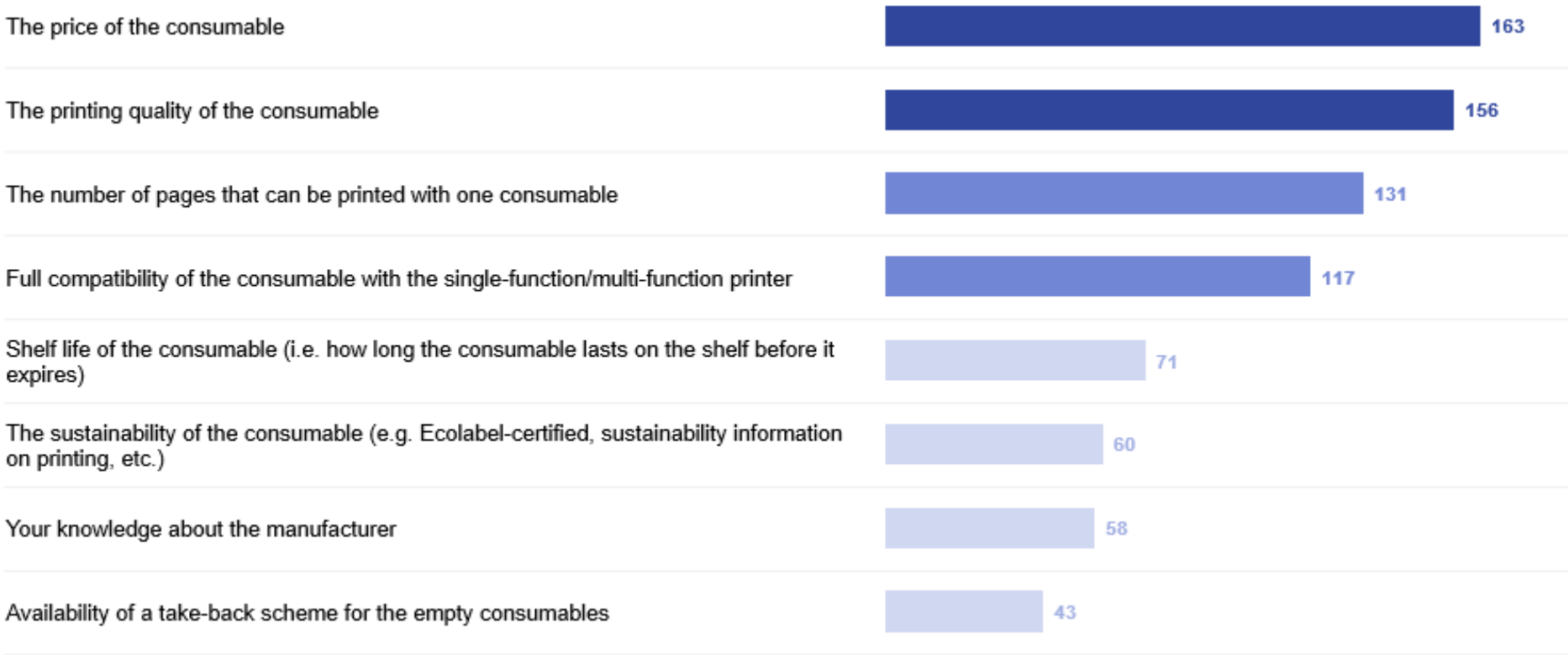
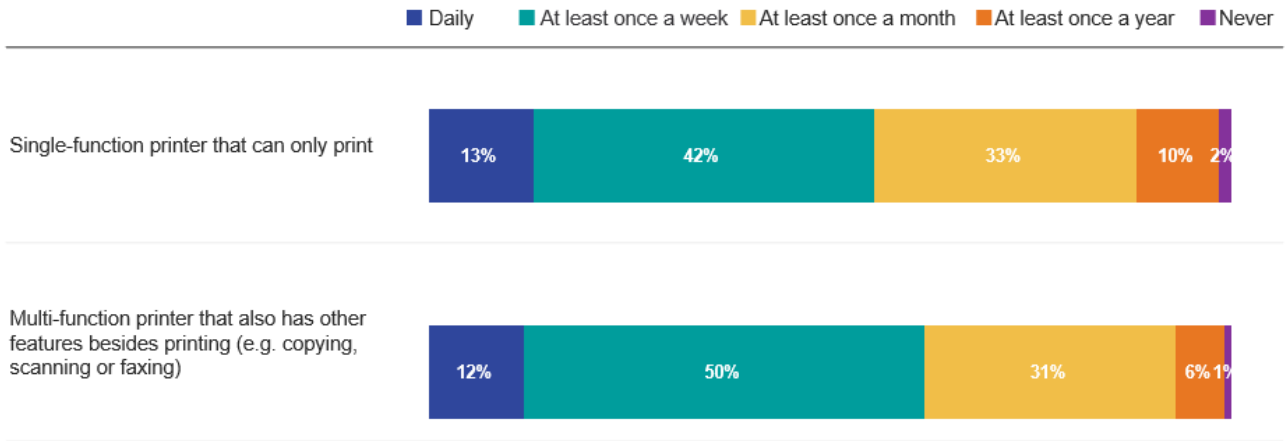
Purchase-influencing factors

Relative importance of factors when buying a consumable

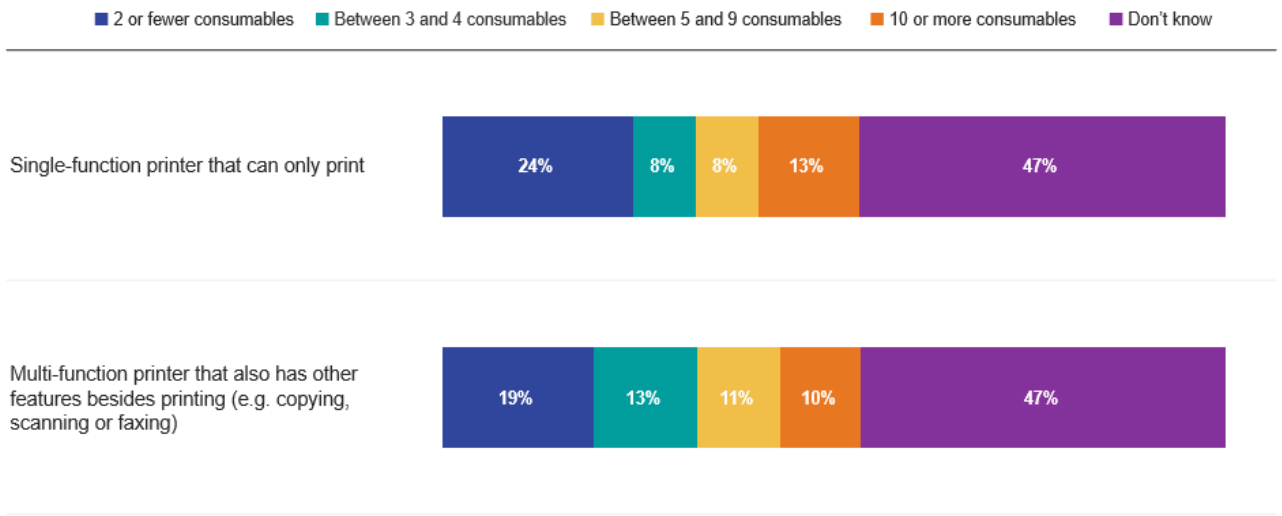


Usage frequency and intensity

How often do you use these devices?



On average, how many consumables do you use every year?



Printer lifetime and reparability

Reasons for printer replacement (1)

(1) Assuming the printer still works

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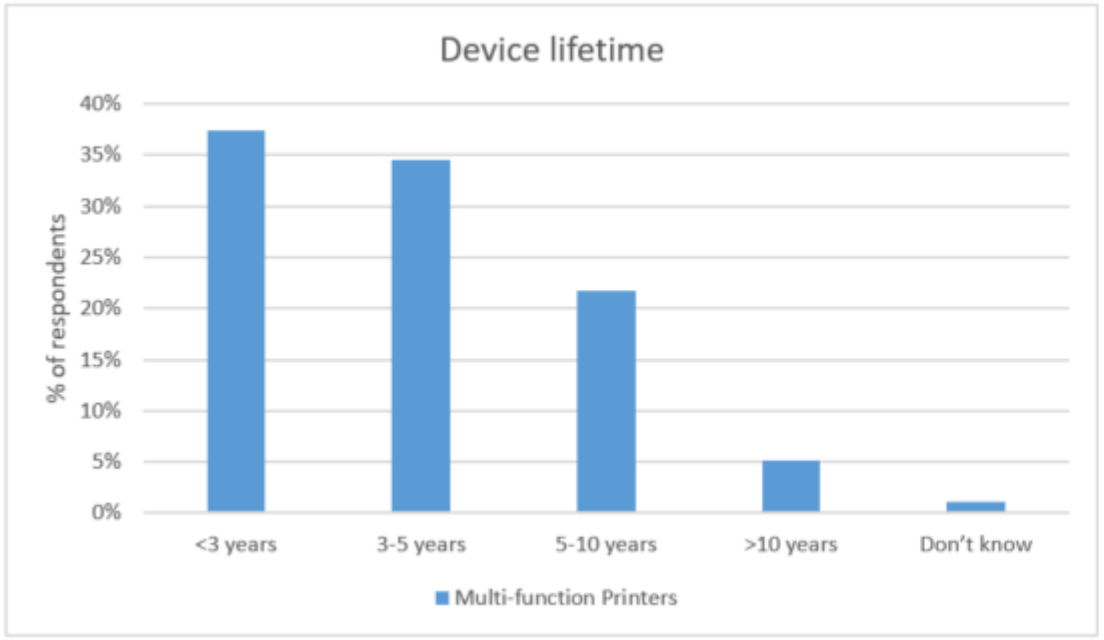
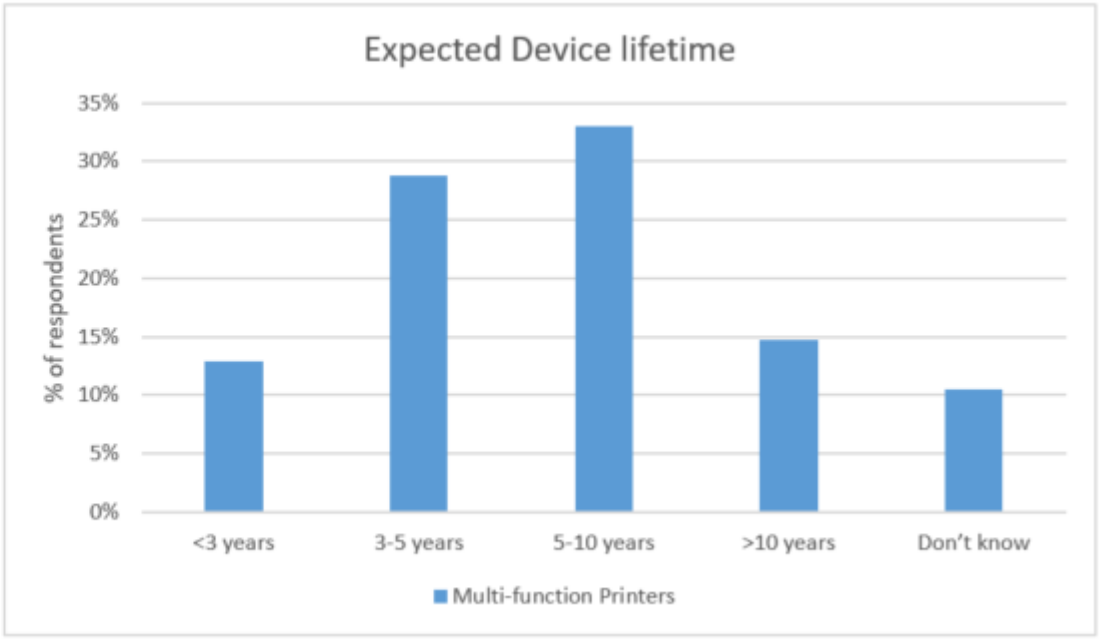
Printer lifetime and reparability

Device lifetime – current versus expected





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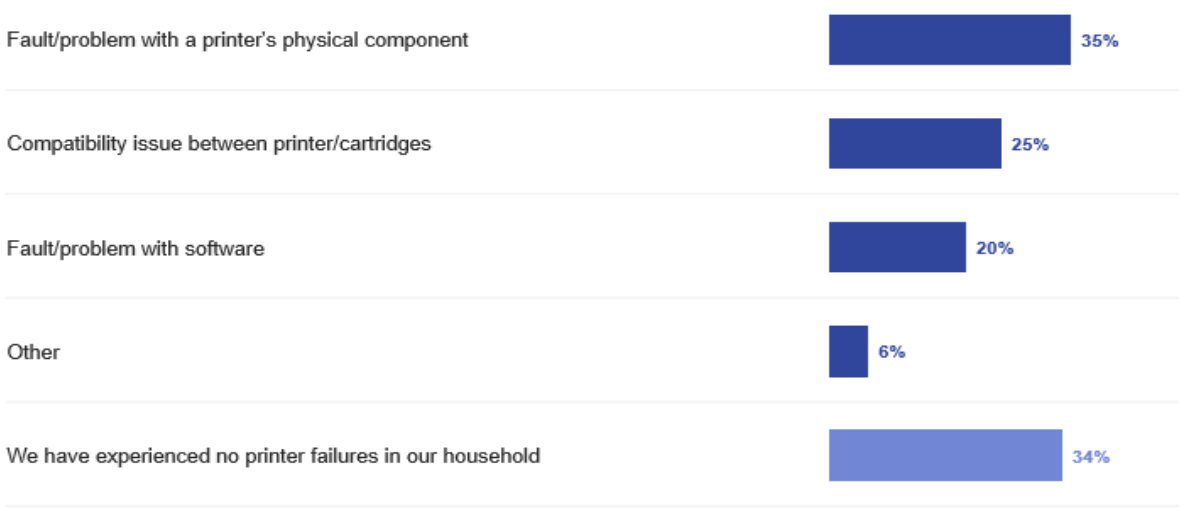
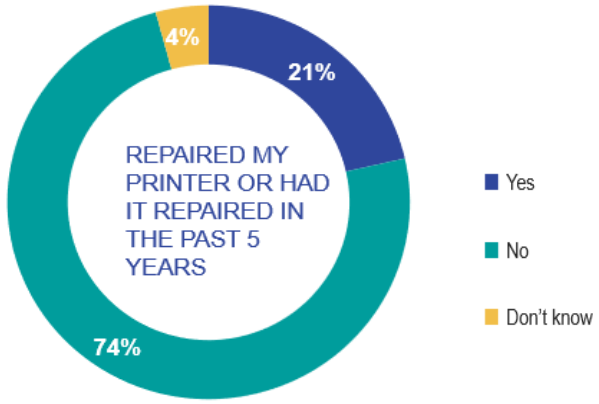
Printer lifetime and reparability

Common printer failures



68% of consumers experienced an issue with the printer

Consumers repairing printers



21% of consumers repaired their printer

Preliminary results from user behaviour study

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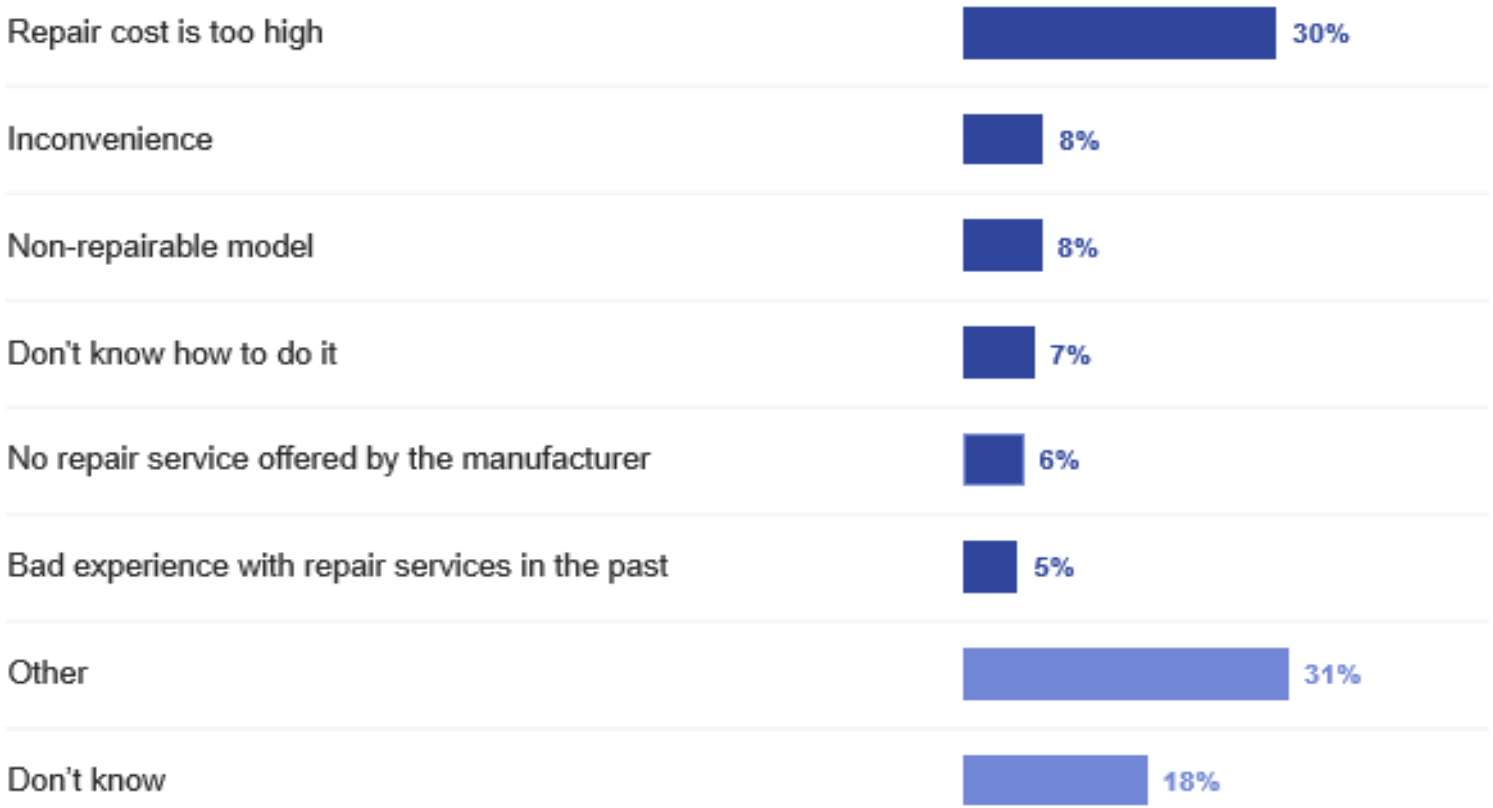
Printer lifetime and reparability

Reasons for not repairing a printer



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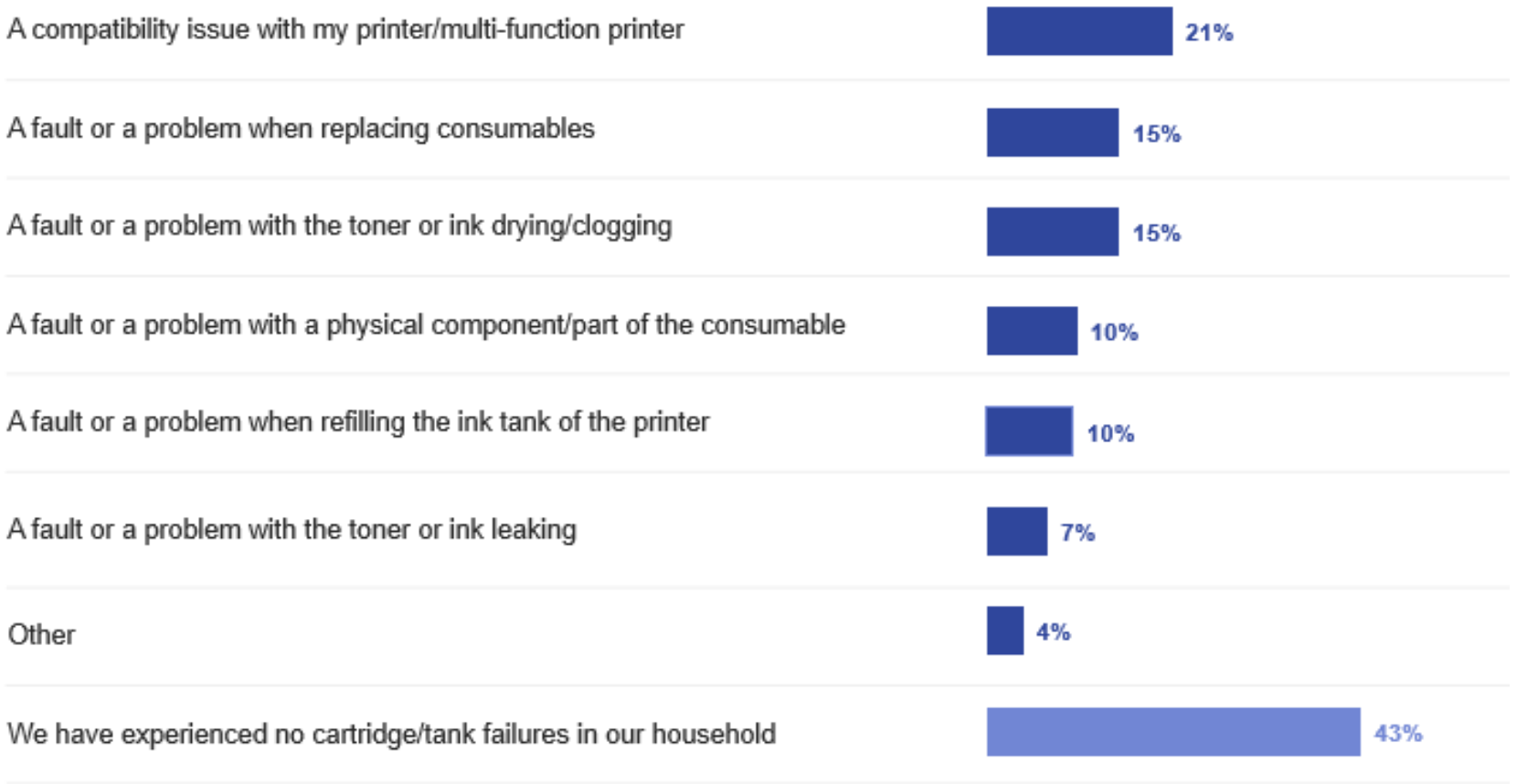
Cartridge circularity

Common cartridge failures



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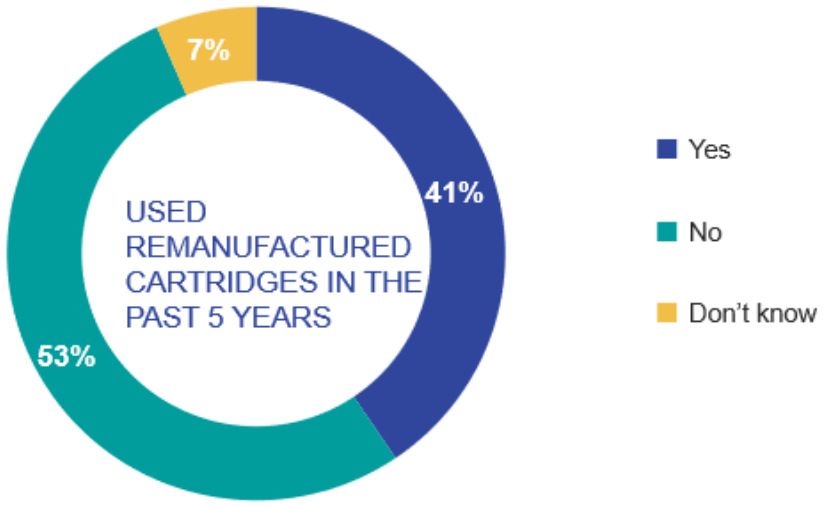
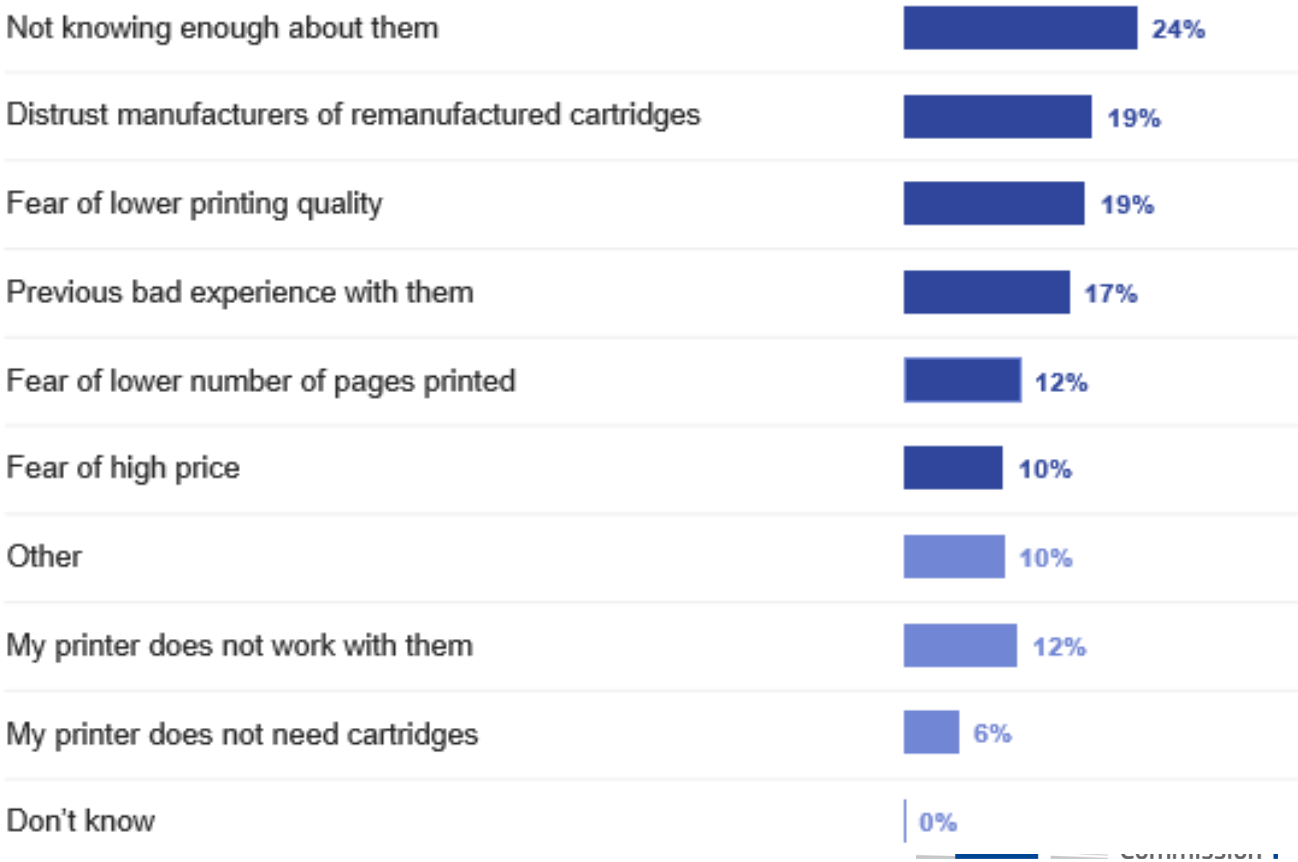
Cartridge circularity

Consumers using remanufactured cartridges





Task 4

Technologies

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Technical aspects influencing environmental performance

- Device energy use
- Device lifetime
- Device reparability
- Cartridge page yield
- Cartridge material efficiency
- Cartridge reuse
- Printer/Cartridge compatibility

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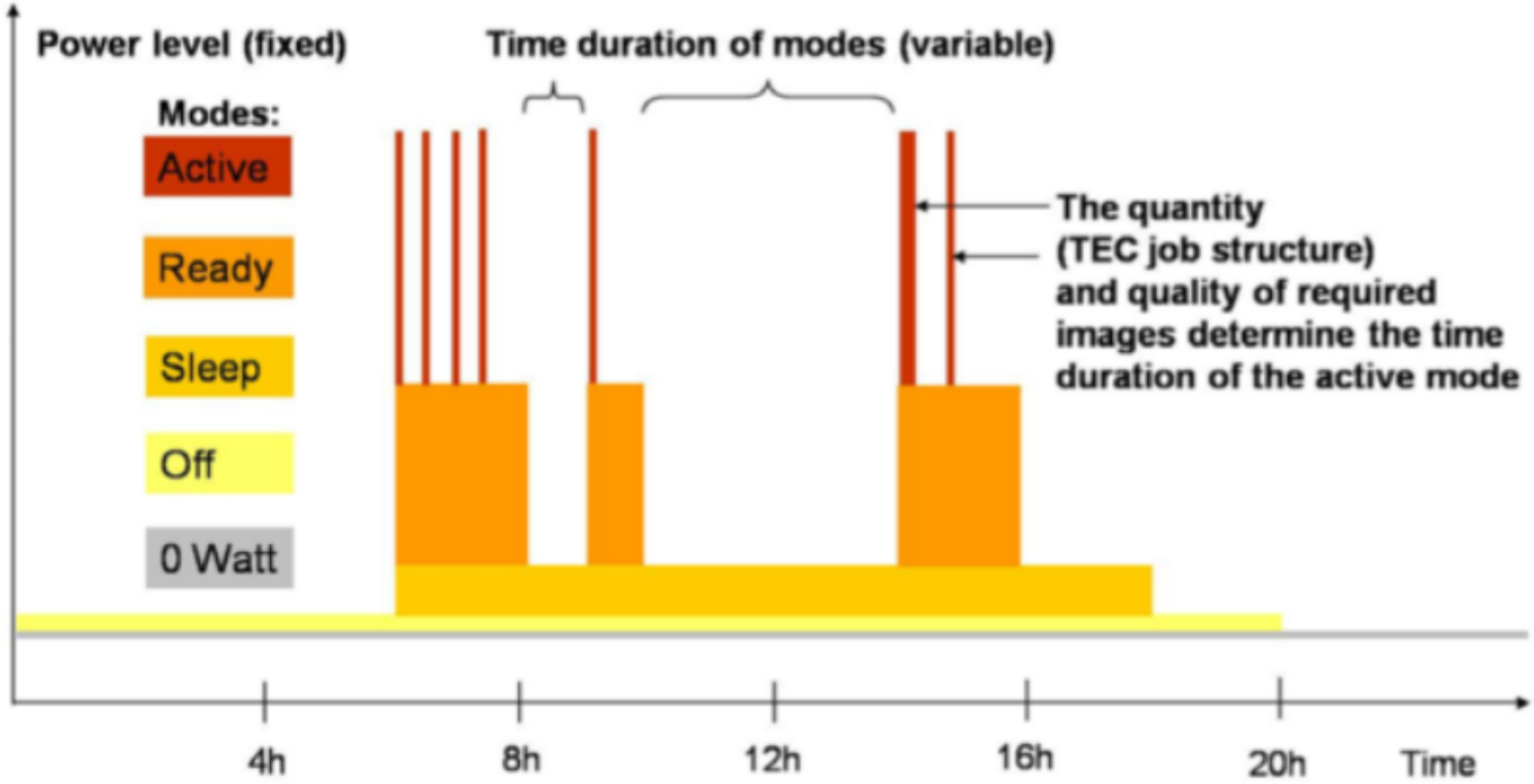
Device energy use

Device energy use

Key questions	*What is the typical energy performance of printers?* *Are there any other relevant aspect related to energy?*
Research conducted by JRC	Analysis of Energy Star database of certified products (September 2022)
Key definitions	Operating Modes (OM): - Active Mode - Ready - Standby Mode / Sleep Mode - Off Mode Typical Energy Consumption (TEC): a combination of the modes above

Use Pattern characteristics



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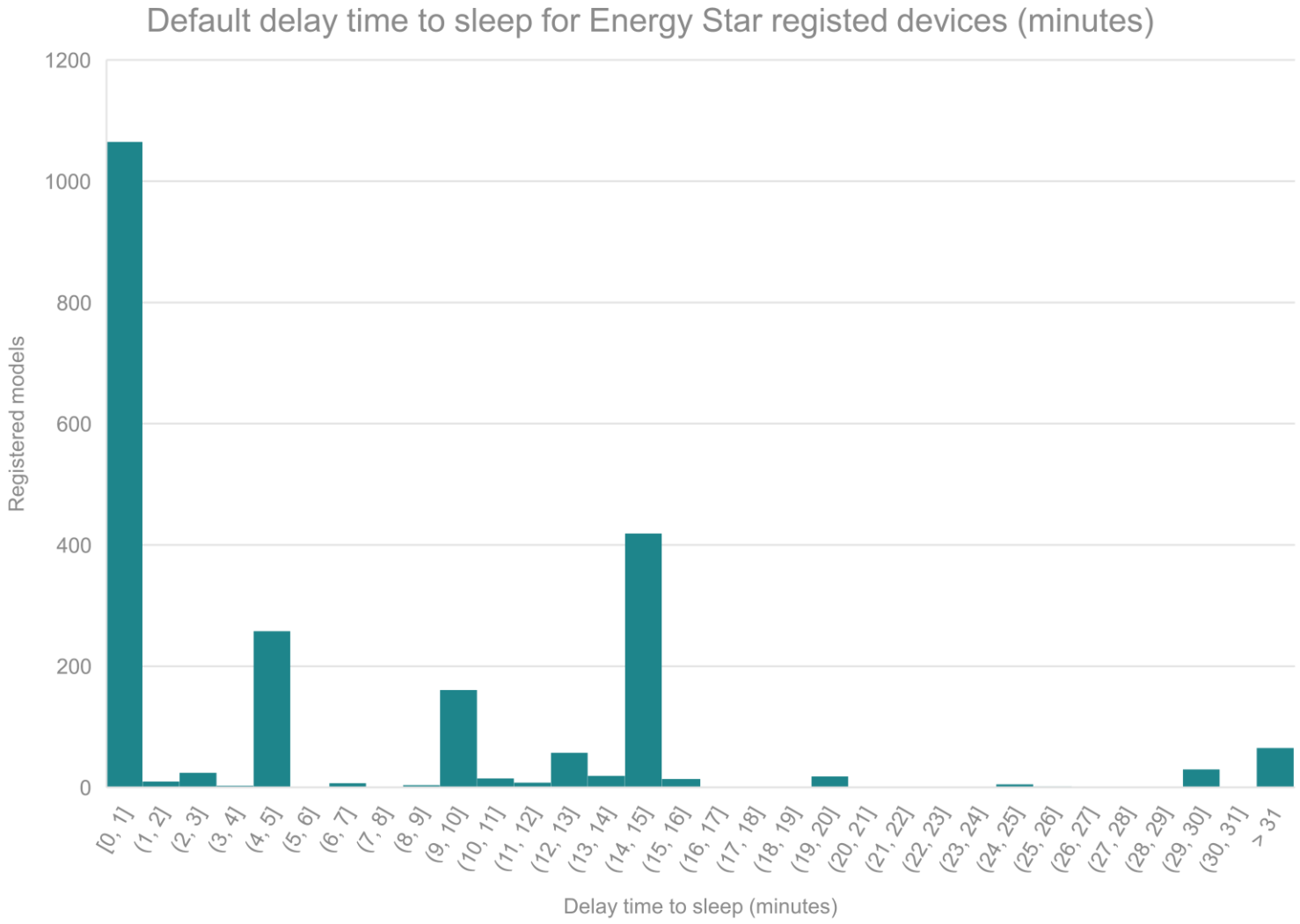
Analysis of the energy star database



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Example of energy consumption for different technologies

INKJET PRINTER	Power
Active	12 W
Ready	3 W
Sleep	0.7 W
Off-Mode	0.2 W

LASER PRINTER		Power
Active	Printing	770 W
	Printing in quiet mode	430 W
	Ready	85 W
Standby	Sleep	16.8 W
	Deep Sleep (standby mode)	1.1 W
Off mode	Power Off	0.04 W

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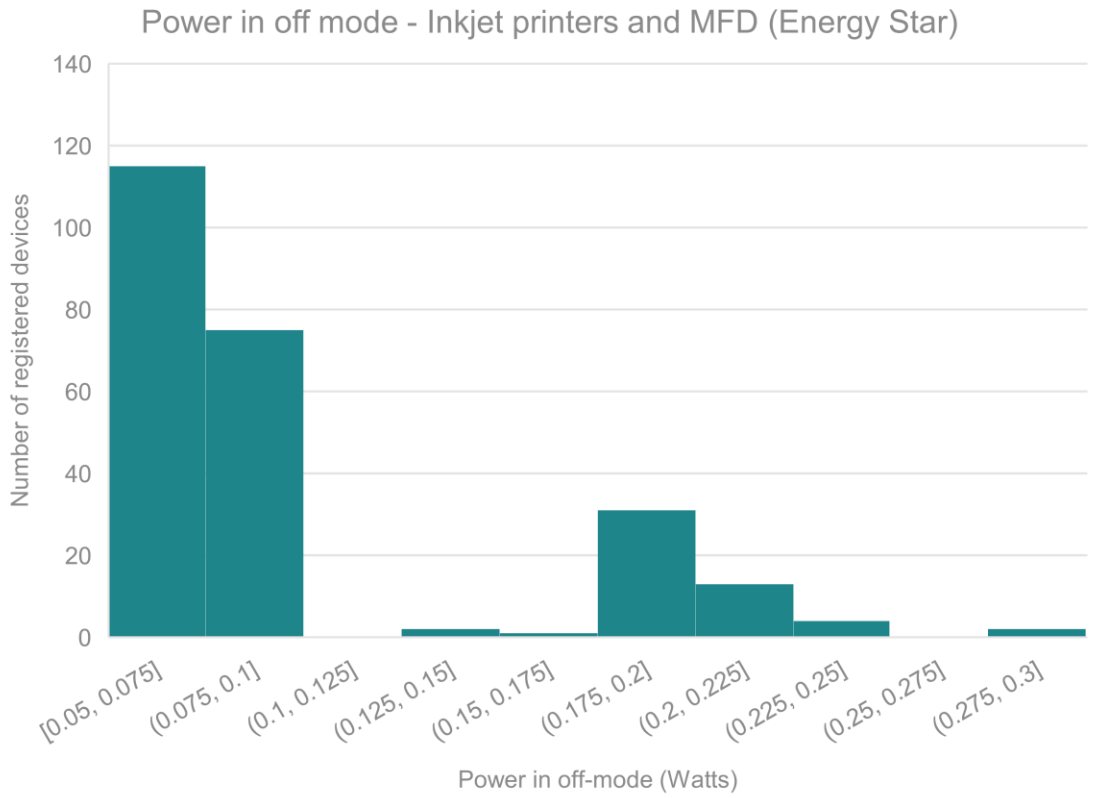
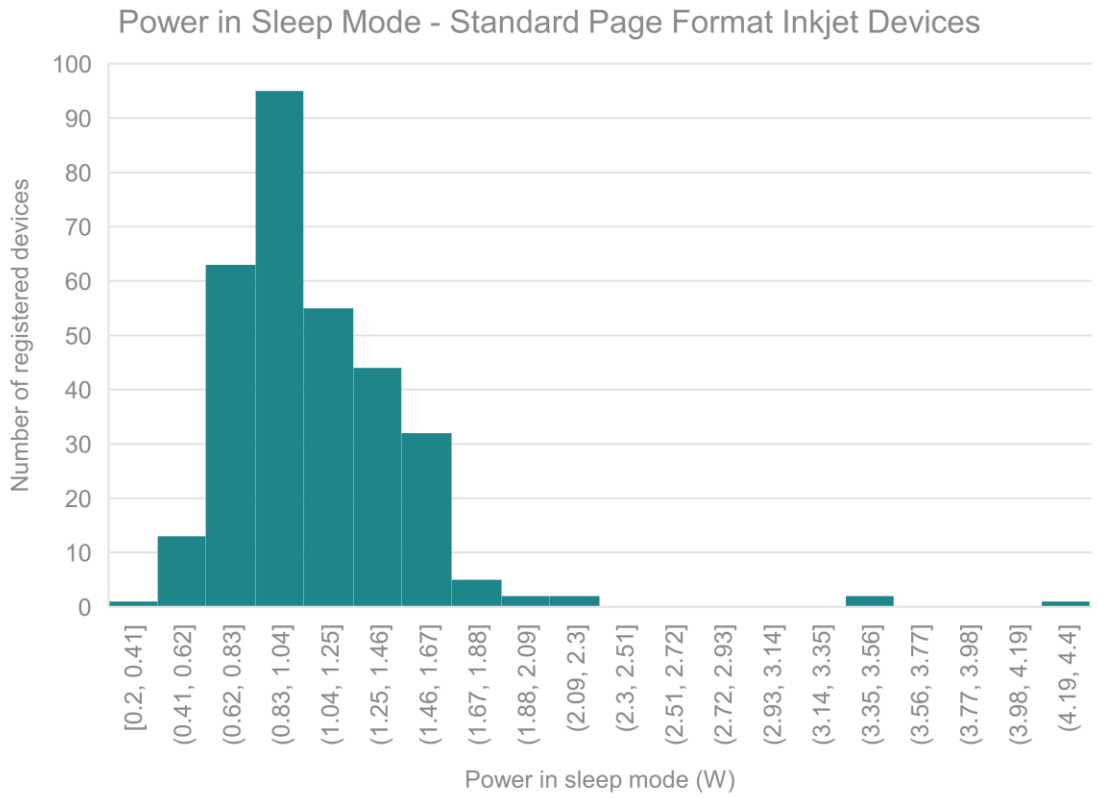
Analysis of the energy star database





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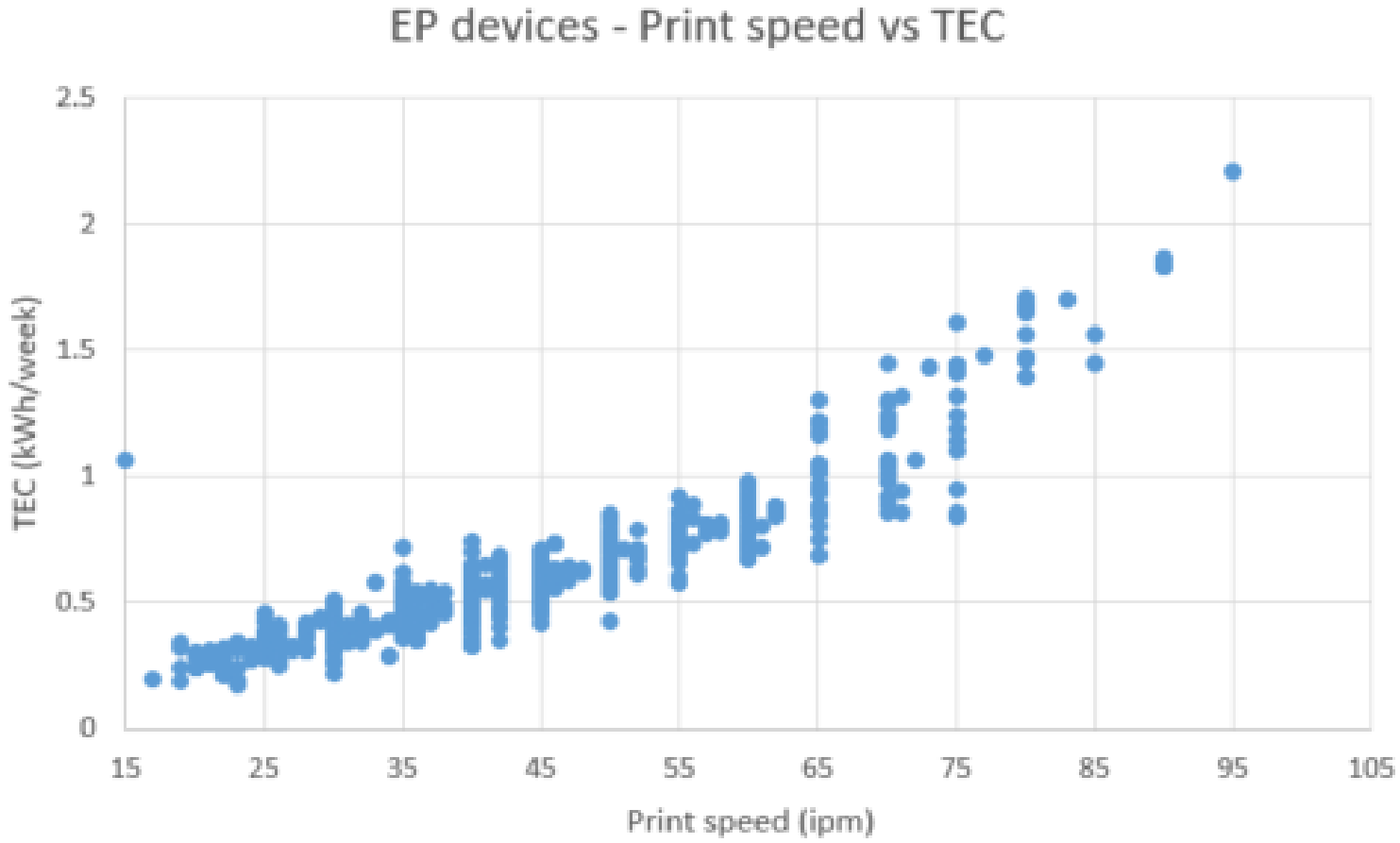
Laser printer devices



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Device energy use

Key questions	*What is the typical energy consumption of printers?* *Are there any other relevant aspect related to energy?*
Key outcomes	Inkjet printers energy consumption have a very low energy consumption and mainly based on sleep mode / off mode Small laser printers TEC is typically in the range 0,5 – 1 kWh/week with strong correlation between printing speed and power demand / active energy consumption Aspects as transition time to standby / sleep mode very relevant.

Device Lifetime

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Device lifetime

Key questions	*What is the technical lifetime of printers?* *Is the technical lifetime of printers usually fulfilled?*
Research conducted by JRC	Business sector ▪ Feedback from stakeholders in refurbishing sector ▪ Feedback from providers of monitoring software for MPS Domestic sector ▪ Preliminary results of user behaviour survey (Task 3)
Key definitions	▪ Technical lifetime vs functional lifetime

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Device lifetime in business sector

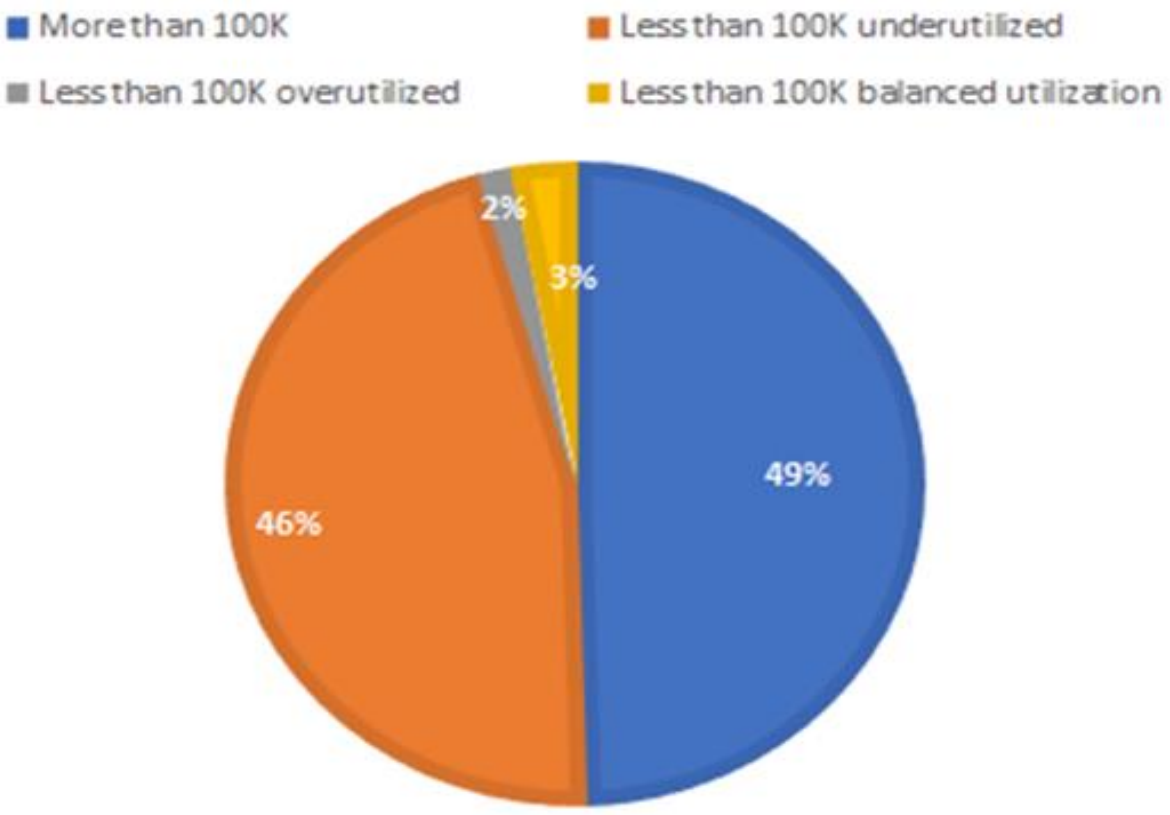
Feedback from stakeholders in the device refurbishing sector

- Average lifetime of devices collected at the end of their (first) use in is between 4 and 6 years

- The technical lifetime of devices (mainly laser printers) key components is not fully exploited, as these devices can be potentially used up to 12-14 years

Device lifetime in business sector

- 50% of printers are retired with less than 100.000 pages printed



Number of pages produced by printers retired from MPS contracts, according to data provided by stakeholder

Device lifetime in business sector

- On average, devices in office environment print around 200.000 pages in a 6 years lifetime.

Device category	Estimated Average lifetime in years	Estimated average lifetime in printed pages
Laser multi-function printer, with A4 capability, printing speed 20-40 ipm	6	200.000 pages
Laser printer, with A4 capability, printing speed 20-40 ipm	6	100.000 pages
Laser multi-function printer, with A3 capability, printing speed 40-60 ipm	6	300.000 pages

Device lifetime in the domestic sector

Device category	Estimated Average lifetime in years	Estimated average lifetime in printed pages
Inkjet multi-function printer, with A4 capability	4	4.000
Inkjet printer, with A4 capability	4	4.000

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Device lifetime

Key questions	*What is the technical lifetime of printers?* *Is technical and expected lifetime of printers usually fulfilled?*
Key outcomes	<u>Business sector</u> ▪ There is a gap between technical lifetime of printers and functional lifetime of printers ▪ Key components such as fusers, drums and transfer units are often underutilized ▪ A large % of printers retired from MPS contracts have been underutilized <u>Domestic sector</u> ▪ There is a gap between actual printer lifetime and expected printer lifetime ▪ Consumers are willing to use their devices for longer, but there are barriers preventing it ▪ Lack of compatibility with remanufactured/3rd party cartridges, and lack of customer care, may be drivers for shorter printer lifetime

Device Reparability

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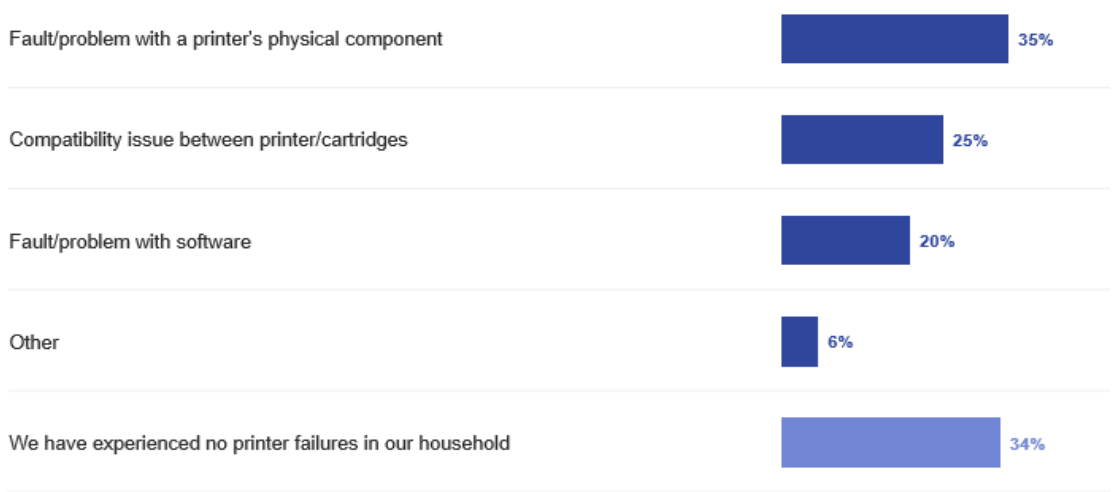
Device reparability

Key questions	*Do printers fail often?* *Can printers be easily repaired?*
Research conducted by JRC	▪ Preliminary results from user behaviour survey (Task 3) ▪ Review of priority parts in different sources ▪ Evaluation of Ritthoff et al (2023). Methods and standards for assessing the reparability of electrical and electronic devices. A methodology to assess how reparable electrical and electronic devices are. To test the methodology, the authors conducted a comprehensive analysis of aspects affecting the reparability of inkjet and laser printers. This analysis was conducted on 6 inkjet printers and 4 laser printers.
Key definitions	▪ Priority parts ▪ Parameters relevant for repair

Device reparability

Common printer failures in consumer printers



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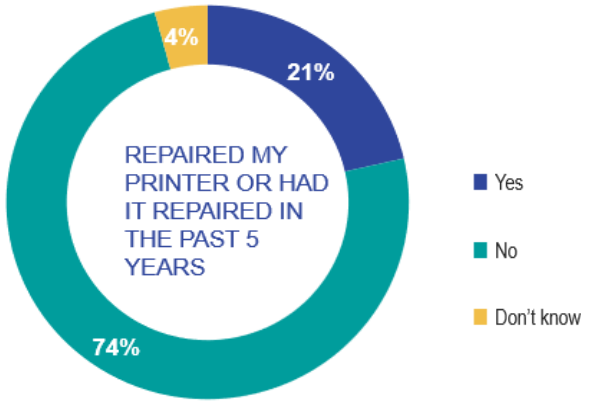

21% of consumers repaired their printer

Preliminary results from user behaviour study

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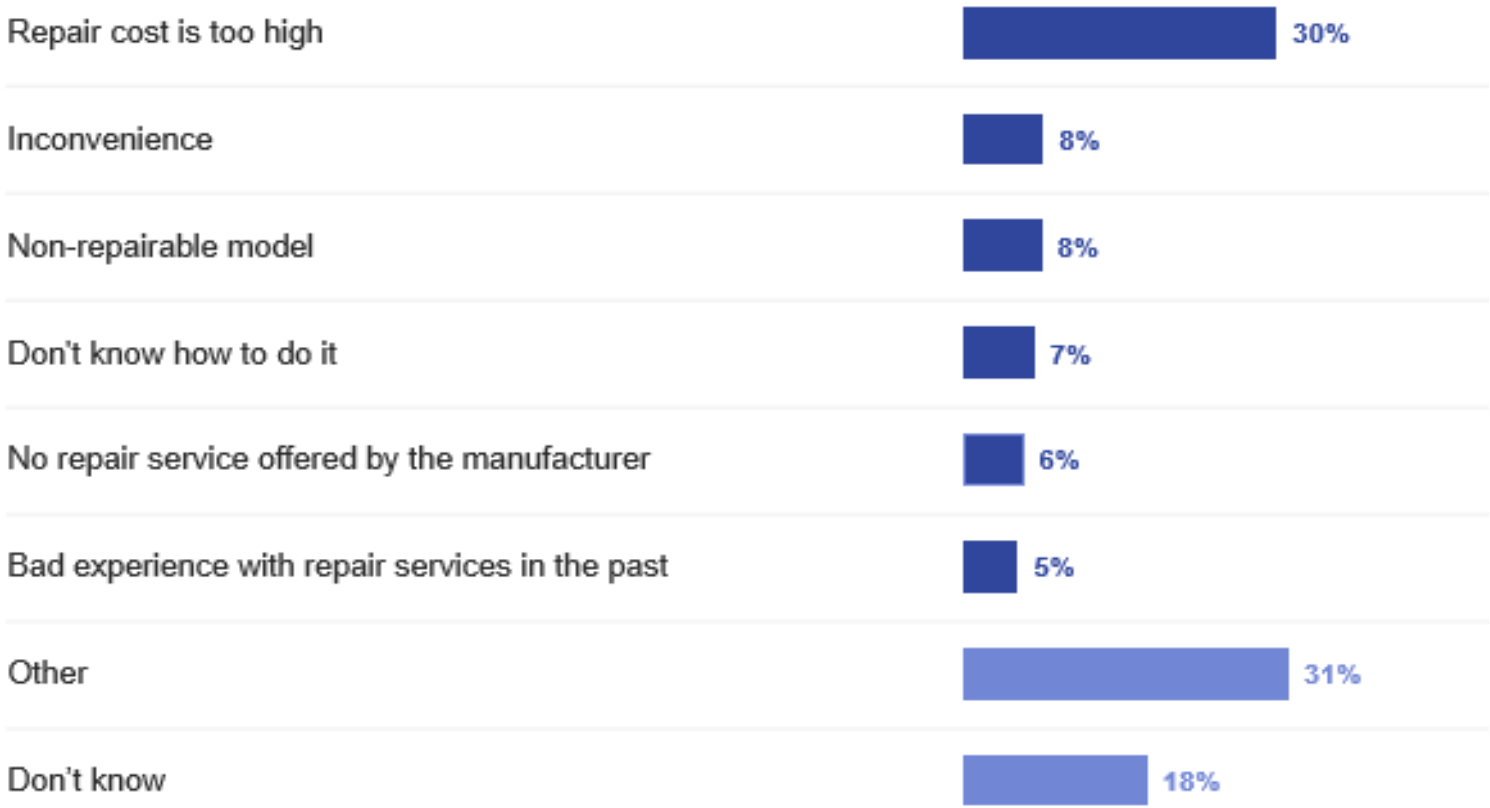
Printer lifetime and reparability

Reasons for not repairing a printer



Preliminary results from user behaviour study

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Review of priority parts in different sources

Most common priority parts in evaluated sources
-Print heads
-Internal and external power supplies, power cables
-Laser unit
-Fuser unit
-Power and control circuit boards
-Transfer belt
-Drum unit
-Storage devices
-Sheet feeders, paper trays and rollers
-Toner and ink collection units and sponges

Eurovaprint (2021). *Industry Voluntary Agreement to improve the environmental performance of imaging equipment placed on the European market*

Kaps et al (2020). *Revision of the EU Green Public Procurement Criteria for imaging equipment*

Blue Angel (2021). *The Blue Angel Ecolabel for Office Equipment with Printing Function*

Ritthoff et al (2023). *Methods and standards for assessing the repairability of electrical and electronic devices*

Ease of disassembly

***Ritthoff et al (2023)**: measured how long it takes to disassemble priority parts in different printer models*

Inkjet devices

Priority part	Disassembly time
Print head	0.33 - 90 min
Internal power supply unit	0.16 - 25 min
Ink sponge	0.5 - 27 min

Shortest and longest disassembly time from the printer models evaluated in Ritthoff et al (2023)

Laser devices

Priority part	Disassembly time
Transfer unit	1.5 - 18 min
Paper tray	7 - 25 min
Closing lid	0.33 - 15 min
Laser unit	12 - 45 min
Transfer belt	11 - 20 min
Fuser unit	15 - 50 min
Internal power supply unit	9 - 22 min
Display and control board	1.5 - 25 min
Drive motor for paper feed	12 - 25 min

Shortest and longest disassembly time from the printer models evaluated in Ritthoff et al (2023)

Spare part provision

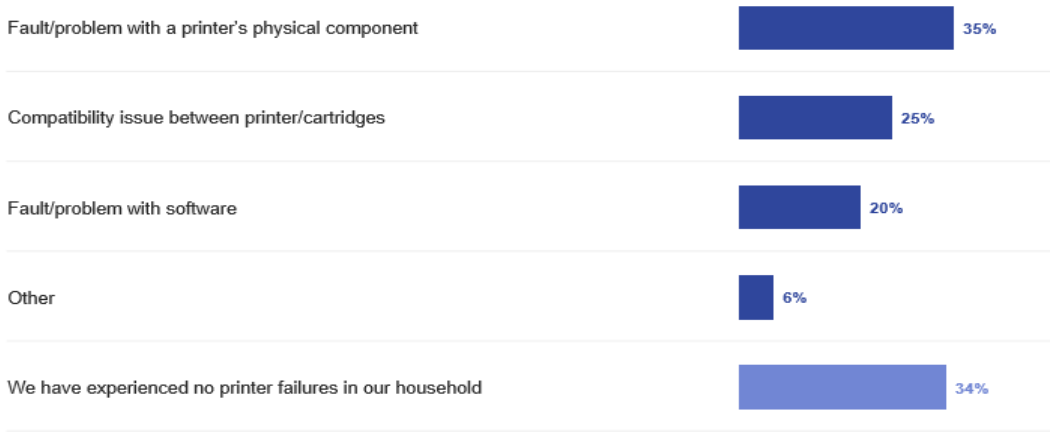
***Ritthoff et al (2023)**:* evaluated spare parts provision policy for different printer models

- There are significant differences between OEMs in terms of availability of spare parts for printers
- It is not possible for consumers today to know for how long the availability of spare parts will be guaranteed
- Delivery time of spare parts ranges between 1-2 days for ink and laser cartridges, 10-12 days for ink sponges, up to 8-10 weeks in some cases for laser printers

Software and firmware updates

Ritthoff et al (2023): evaluated software and firmware updates provision policy for different printer models

- There are no guaranteed periods for which new operating systems are guaranteed to be covered
- 20% of users experienced some sort of failure related to software of the printer



Preliminary results from user behaviour study

Device reparability

Key questions	*Do printers fail often?* *Can printers be easily repaired?*
Key outcomes	▪ 2/3 of users experienced issues with printer but only 1/5 of repaired their it, mainly due to cost ▪ Long disassembly times for several priority parts ▪ Delivery time of spare parts can range between 1-2 days, up to 8-10 weeks ▪ 1/5 of users experienced some failure related to printer software (no guaranteed coverage periods for software)

Cartridge page yield

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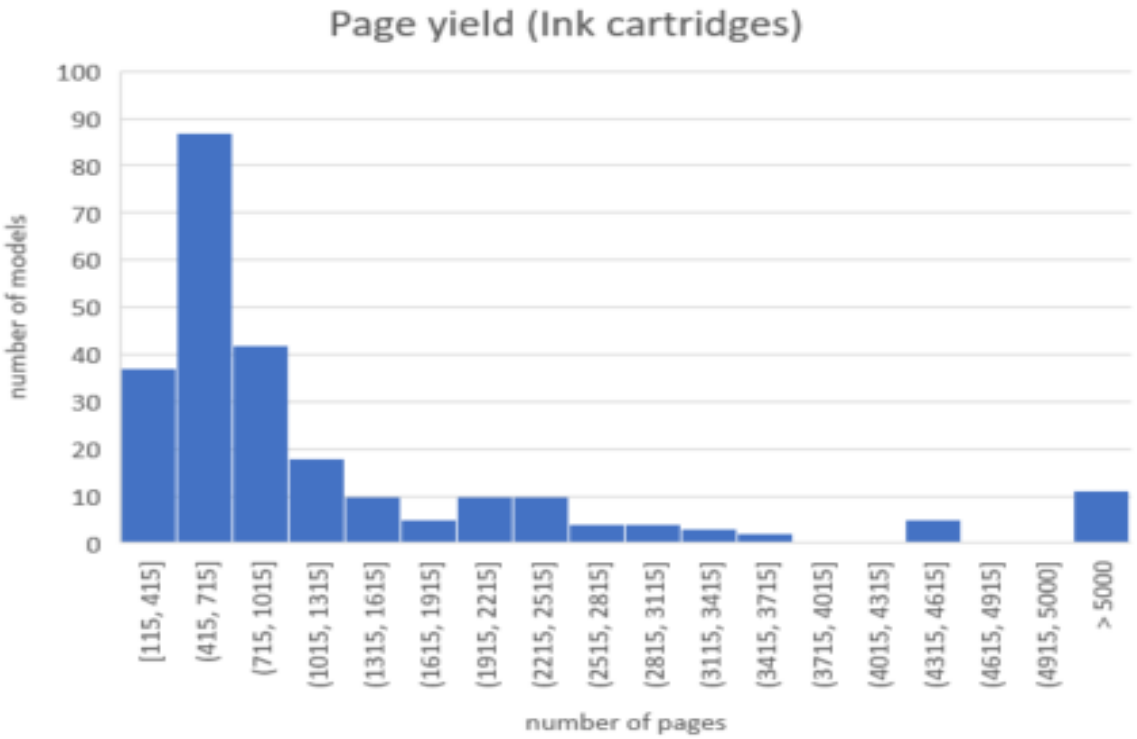
Cartridge page yield

Key questions	*How many pages can be printed with a typical cartridge?*
Research conducted by JRC	▪ Analysis of page yield based on data from different sources: ▪ JRC market analysis. Ink cartridges on sale in retailers in Spain. 150 models from 4 different OEMs. ▪ ETIRA database of cartridges. 297 models of toner cartridges and 248 models of ink cartridges from 13 different OEMs. ▪ Keypoint Intelligence analysis (not available at this point)
Key definitions	Page yield: *value determined by counting the number of test pages printed between cartridge installation and end of life (ISO 19752)* Page yield = the number of pages that can be printed with a cartridge Related with: - Capacity (available volume to hold ink or toner) - Fill level

European Commission

Page yield of ink cartridges

ETIRA database



- Ink cartridges in the market tend to provide between 100-1000 pages, with some configurations providing more than 5000 pages.

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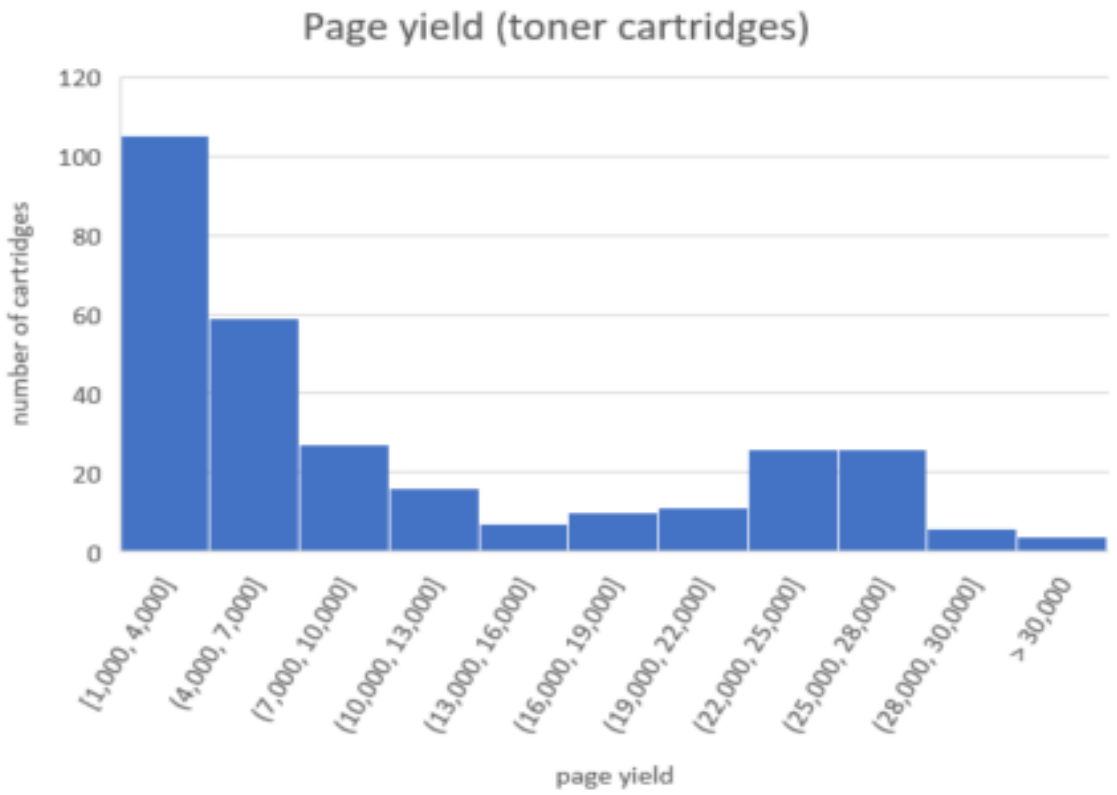
Page yield of toner cartridges

ETIRA database

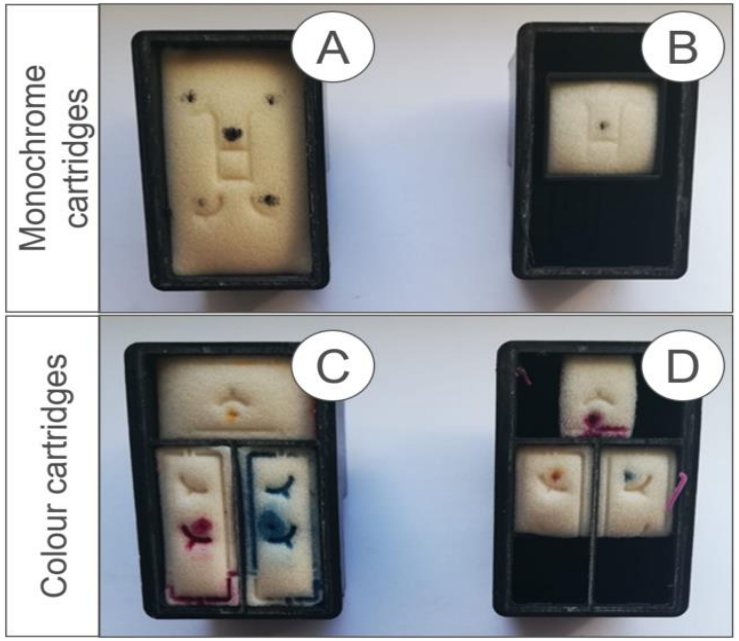


- Toner cartridges in the market tend to provide between 1.000-4.000 pages, with some configurations providing more than 20.000 pages.

European Commission

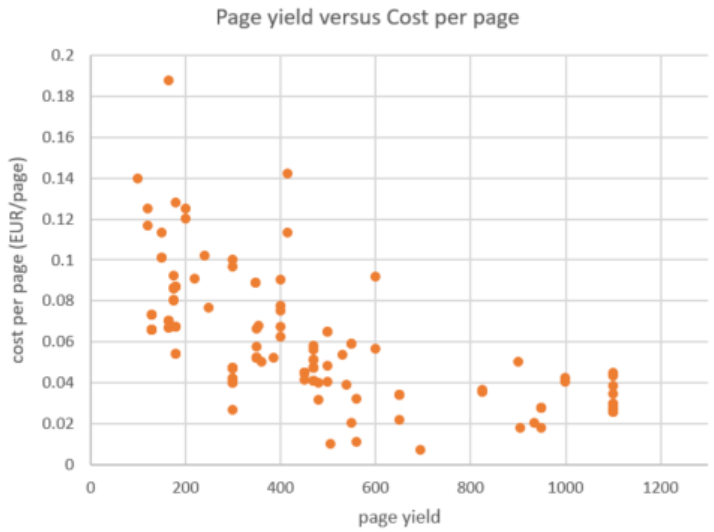
Cartridges with low page yield

- Why are they relevant? Cartridges with low page yield are replaced earlier, contributing to the generation of waste.
- A % of low page yield cartridges might be starter cartridges: a cartridge which is sold together with a printer, usually with limited capacity
- A % of low page yield cartridges may have inner compartments to reduce available volume of ink
  - OEM feedback: reducing inner volume available in cartridges take into account interaction between a number of factors, including printer architecture, page volume printed by different consumers, printer and cartridge price points and avoidance of waste.
  - Remanufacturers feedback: including inner compartments is a barrier for cartridge reuse. For reuse, inner compartments need to be removed, adding complexity and cost to the remanufacturing process.



Page yield and cost per page

- Cartridges with low page yield tend to have a higher cost per page (JRC market analysis)



Example

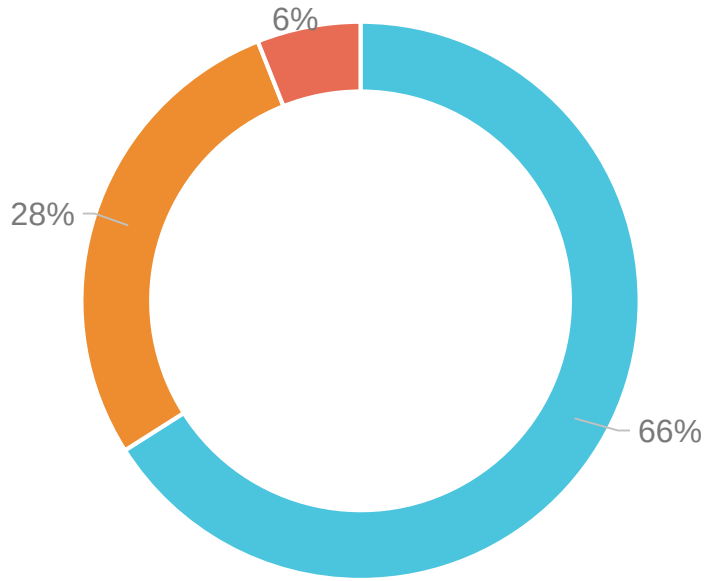
Cartridge A

Page yield: 100 pages
Price: 13.99 EUR
Cost per page: 0.14 EUR/page

Cartridge B

Page yield: 240 pages
Price: 24.49 EUR
Cost per page: 0.10 EUR/page

- Consumers give more importance to price of the cartridge (66%), rather than the expected price per page (28%)



Preliminary results from user behaviour study

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Page yield

Key questions	*How many pages can be printed with a typical cartridge?*
Key outcomes	▪ Ink cartridges: 100-1000 pages (some configurations providing >5.000 pages) ▪ Toner cartridges: 1.000-4.000 pages (some configurations providing >20.000 pages) ▪ Starter cartridges usually provide low page yield ▪ Reducing available volume of ink/toner may be a barrier for cartridge reuse ▪ Consumers give more importance to price of the cartridge, rather than the price per page

Cartridge material efficiency

Cartridge material efficiency

Key questions	*Are cartridges efficient from materials perspective?* *Is material efficiency related with cartridge configurations?*
Research conducted by JRC	▪ Analysis of page yield based on data from different sources: ▪ JRC market analysis. Ink cartridges on sale in retailers in Spain. 150 models from 4 different OEMs. ▪ ETIRA database of cartridges. 297 models of toner cartridges and 248 models of ink cartridges from 13 different OEMs. ▪ Keypoint Intelligence analysis (not available at this point)
Key definitions	Material efficiency: The amount of material used in a cartridge to produce a specific number of pages $\boldsymbol{Material\ efficiency} = \frac{\boldsymbol{Page\ yield}}{\boldsymbol{Mass\ of\ cartridge\ (empty)}}$ (in pages per gram) Why is it important? Cartridges are printer consumables. They have low collection and low reuse rates. Optimising material use may reduce waste generation and raw materials consumption.

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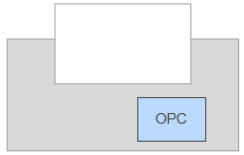
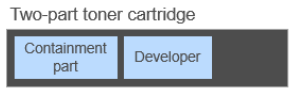
Cartridge configurations - Toner

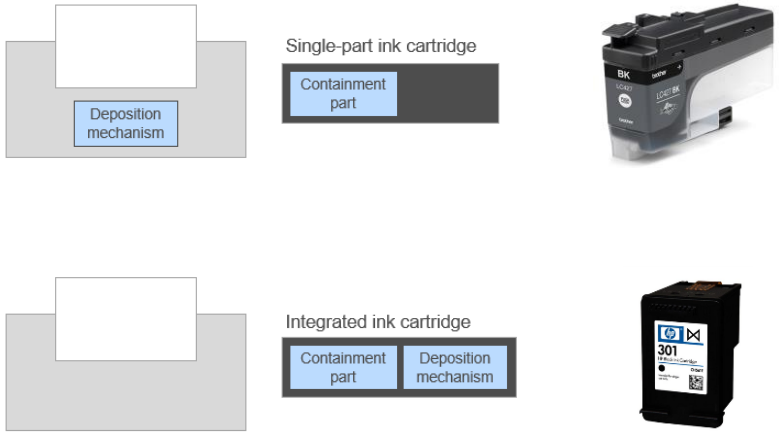
Configuration	Definition
Single part toner cartridge	A toner cartridge that includes only a toner containment part
Two part toner cartridge	A toner cartridge that includes a toner containment part and a developer part and does not include a photoreceptor part
All-in-one toner cartridge	A toner cartridge that includes a toner containment part, a developer part and a photoreceptor part





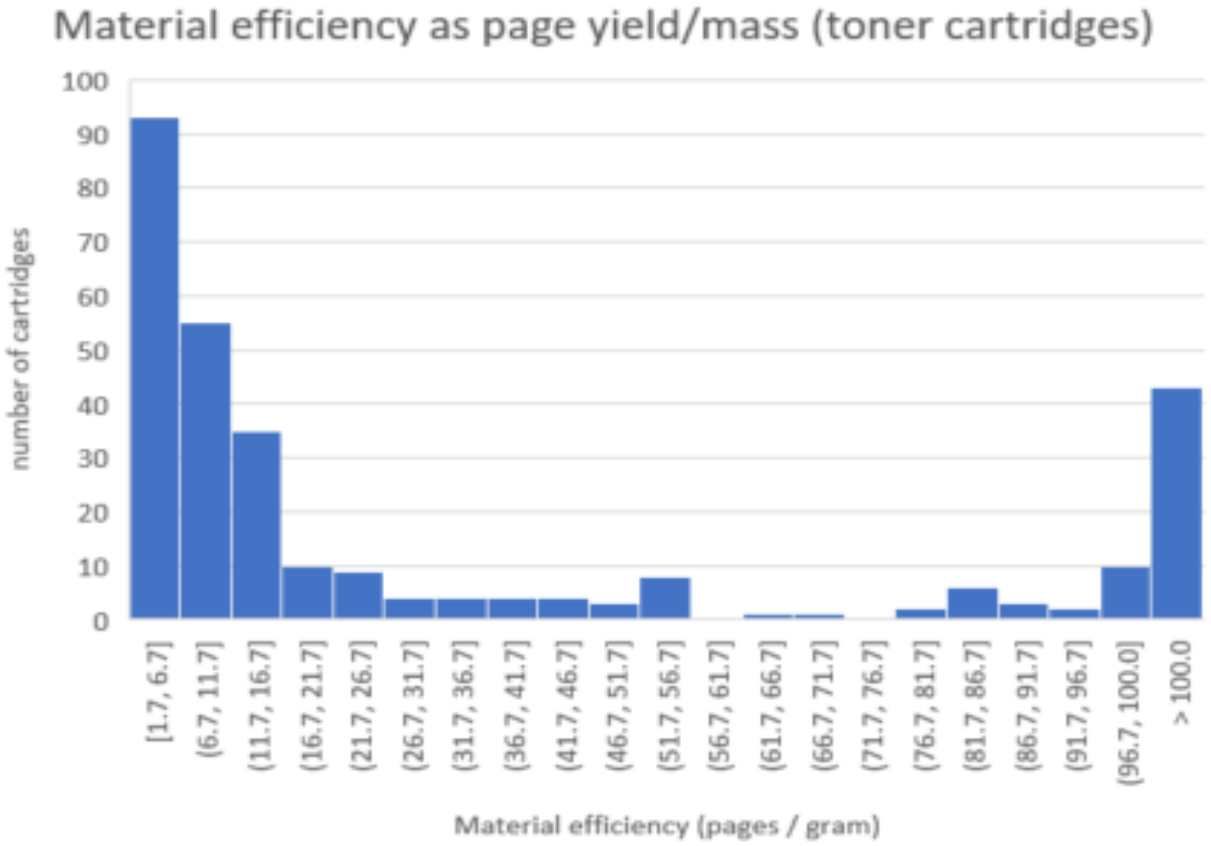
Cartridge configurations - Ink

Configuration	Definition
Single part ink cartridge	A cartridge that includes an ink containment part and does not include an ink deposition mechanism.
Integrated ink cartridge	A cartridge that includes an ink containment part and a ink deposition mechanism



Material efficiency of toner cartridges

ETIRA database (toner cartridges)



- Toner cartridges in the market tend to provide between 2-16 pages per gram of material, with some configurations providing more than 100 pages per gram

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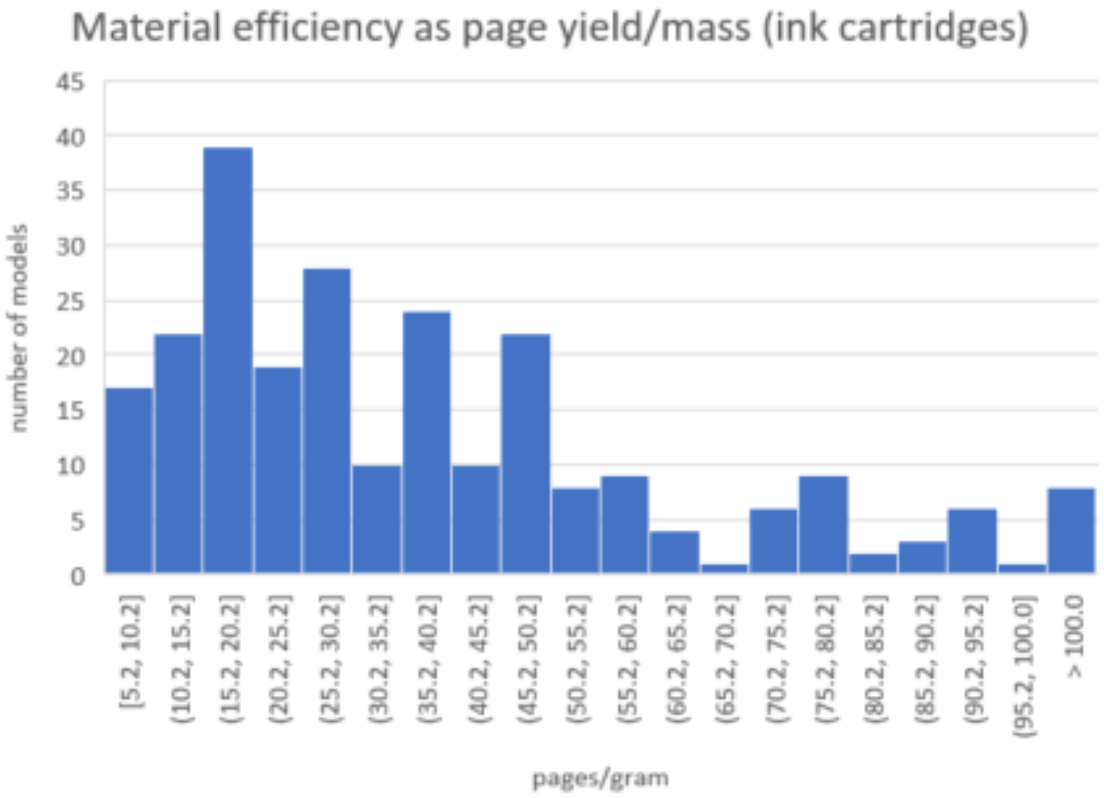
Material efficiency of ink cartridges

ETIRA database (ink cartridges)



- Ink cartridges in the market provide a wider range of pages per gram, the most common being between 15-50 pages per gram. Some configurations providing more than 100 pages per gram

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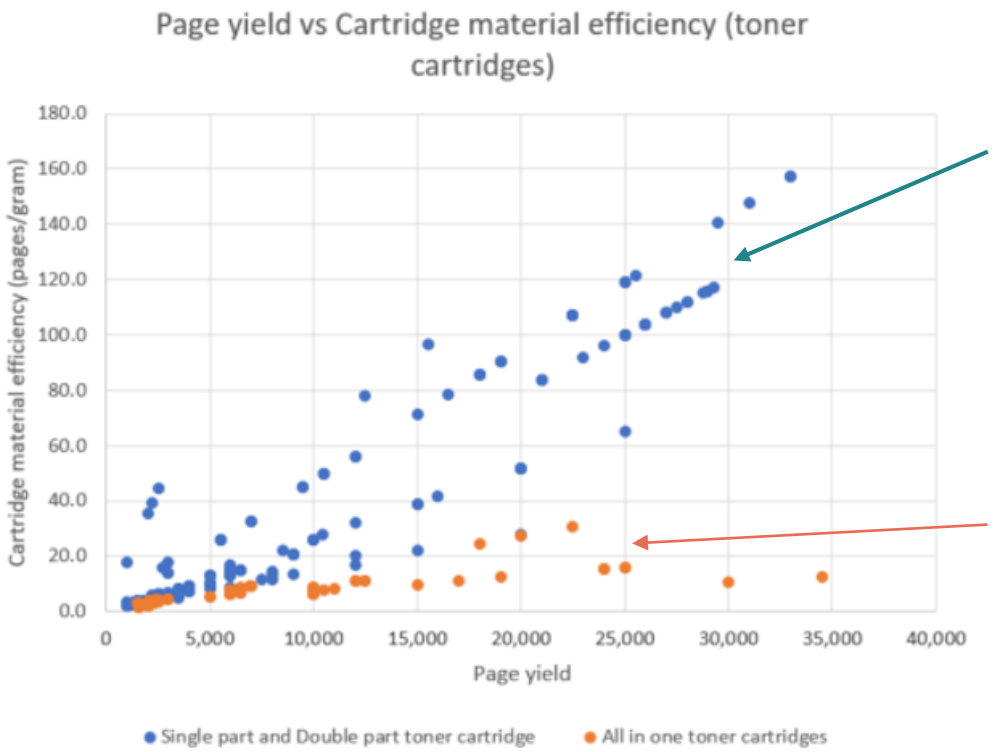
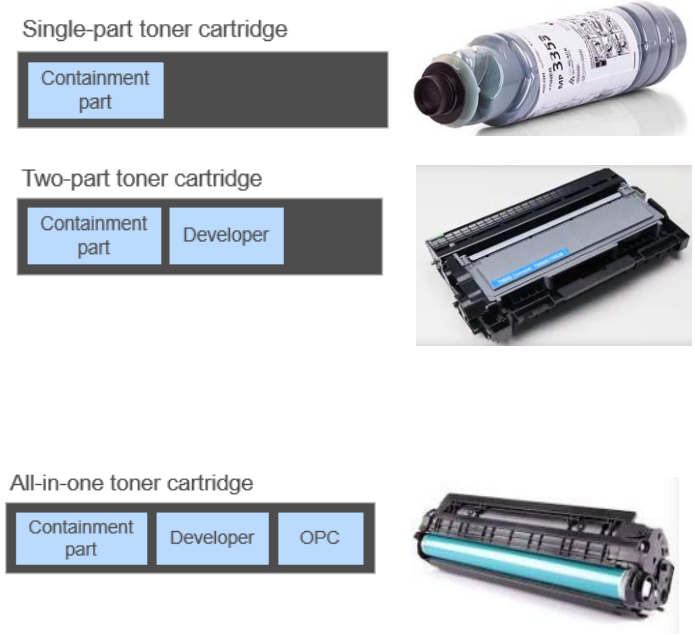
Material efficiency versus page yield

ETIRA database





- There is a correlation between material efficiency and page yield
- All-in-one toner cartridges tend to be less material efficient

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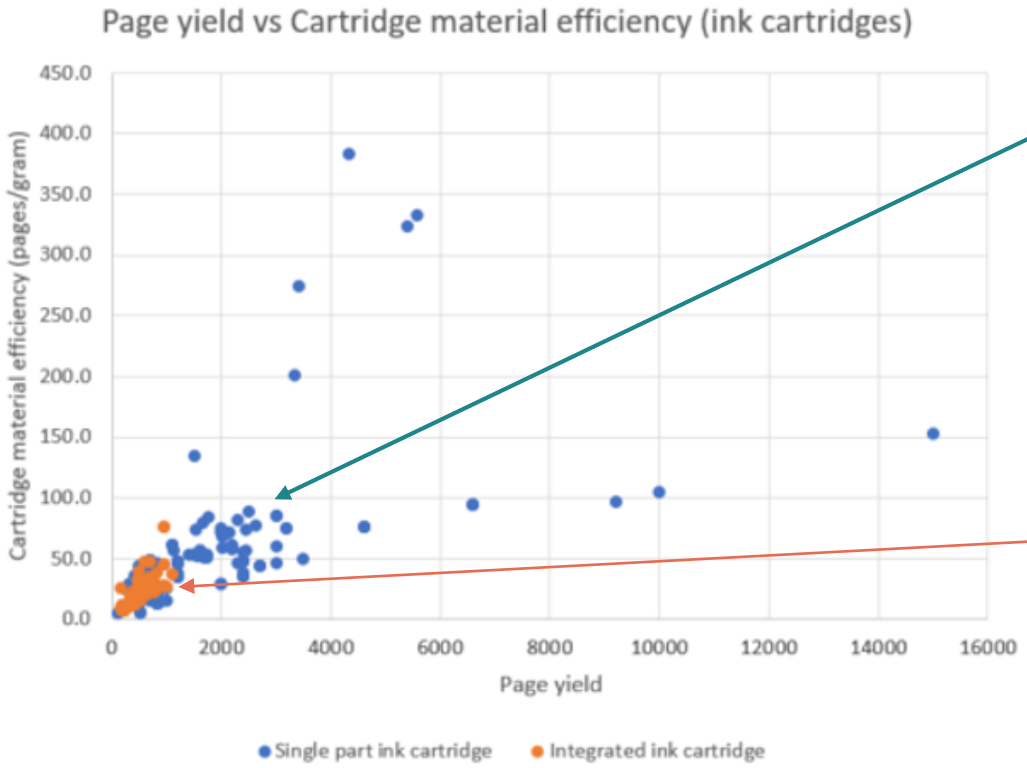
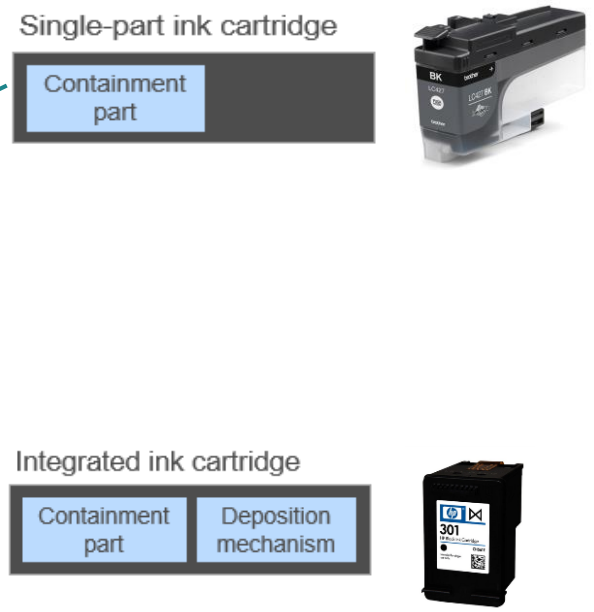
Material efficiency versus page yield

ETIRA database





- There is a correlation between material efficiency and page yield
- Integrated ink cartridges tend to be less material efficient

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Material efficiency

Key questions	*Are cartridges efficient from materials perspective?* *Is material efficiency related with cartridge configurations?*
Key outcomes	▪ Most of ink and toner cartridges are in the low range of material efficiency, with a few models providing high levels of material efficiency ▪ Cartridges with higher page yield tend to be more material efficient ▪ All-in-one/integrated configurations tend to be less material efficient

Cartridge reuse

Cartridge reuse

Key questions	*How many cartridges are currently reused?* *Are there any aspects preventing the reuse of cartridges?*
Research conducted by JRC	▪ Feedback from stakeholders in cartridge remanufacturing sector ▪ Bibliography review

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Cartridge reuse

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%

Cartridge reuse potential

	Technical reuse potential
Toner cartridges	92%
Ink cartridges	87%

Waugh et al, 2018

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Barriers for cartridge reuse

Design-related barriers (1)

a) The use of chips that cannot be reset by third party operators when the cartridge is empty

b) The use of software and firmware updates to block third party cartridges (including remanufactured cartridges)

c) The use of irreversible joining practices

d) The location of key components such as chips in areas which are not easily accessible

e) The addition of superfluous design features to make cartridges compatible with a limited number of printer models

(1) Based on bibliography review and feedback from cartridge remanufacturers

Barriers for cartridge reuse

Design-related barriers (1)

f) The location of fragile components such as photoreceptors in exposed areas

g) The use of fragile materials and non-durable design

h) The addition of logos from the OEM that need to be removed or covered by the remanufacturer

i) The design of cartridges with low capacity

j) The lack of information on cartridge life condition, model identification or device compatibility

k) The lack of information on how to remanufacture the cartridge

(1) Based on bibliography review and feedback from cartridge remanufacturers

Cartridge reuse

Key questions	*How many cartridges are currently reused?* *Are there any aspects preventing the reuse of cartridges?*
Key outcomes	▪ Low cartridge reuse rates, in contrast with high reuse potential ▪ Cartridges in the market have multiple design-related barriers preventing higher cartridge reuse rates

Printer/cartridge compatibility

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Printer/cartridge compatibility

Key questions	*Are there printer/cartridge compatibility issues?*
Research conducted by JRC	▪ Feedback from stakeholders in collection/remanufacturing sector ▪ Results from user behaviour survey (Task 3)

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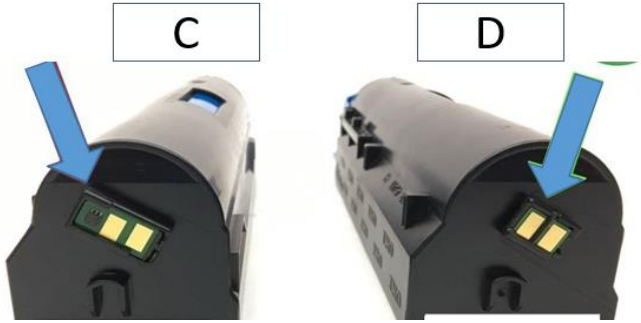
Compatibility issues - examples

Feedback from stakeholders in collection/remanufacturing sector

- Cartridges very similar in design, with minor differences



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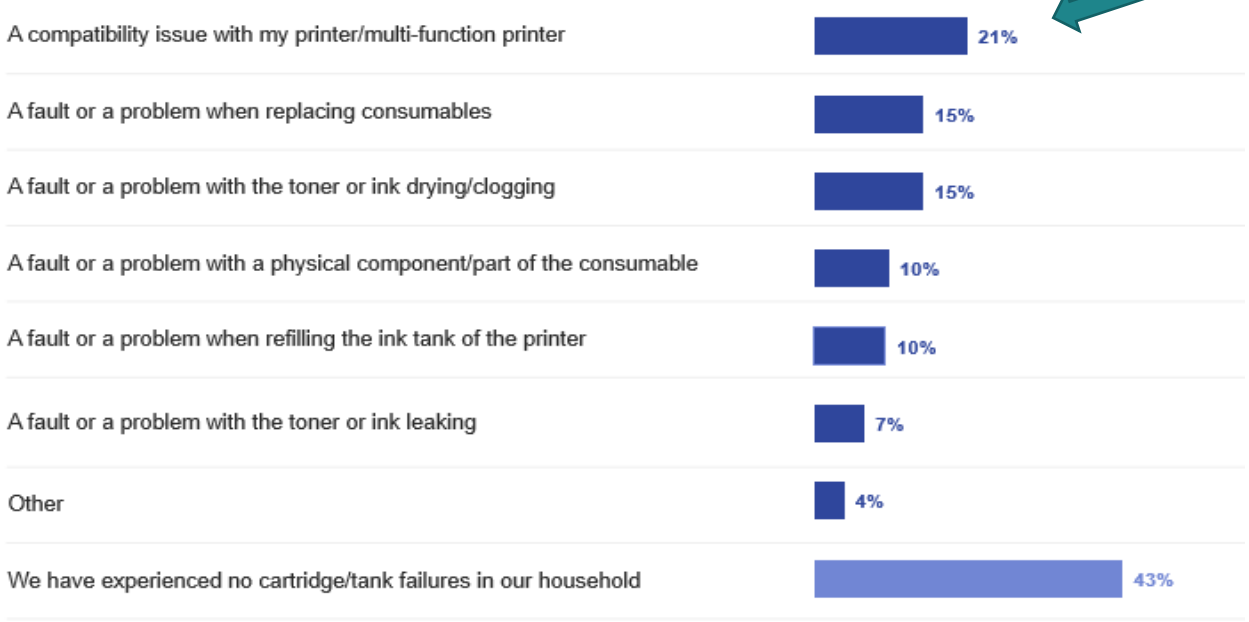
Compatibility issues - examples

Feedback from stakeholders in collection/remanufacturing sector

- Design of cartridges is changed across models of printers, resulting in a proliferation of cartridge models, linked to specific printers
- Currently more than 25.000 single cartridge models in the market (very similar in design, with slight differences not easy to identify, functionality unclear)
- Lack of printer/cartridge compatibility adds complexity to collection/sorting activities

Consumers and compatibility issues

Common cartridge failures (consumers)



Printer/cartridge incompatibility is the most common cartridge failure

Preliminary results from user behaviour study

- Incompatibility is an issue **for cartridges and for printers**: lack of compatibility with remanufactured/3rd party cartridges may be a driver for shorter printer lifetime

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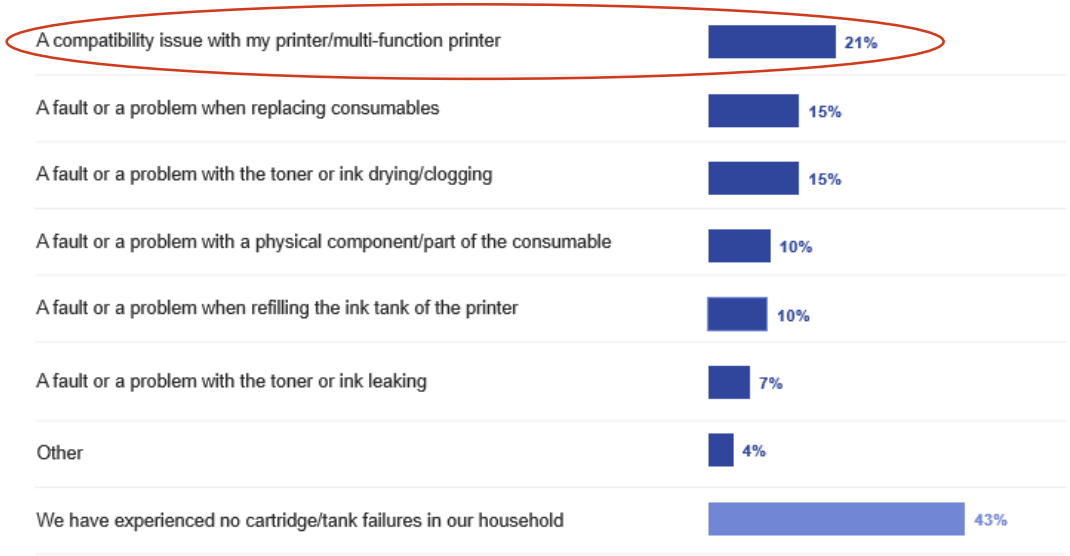
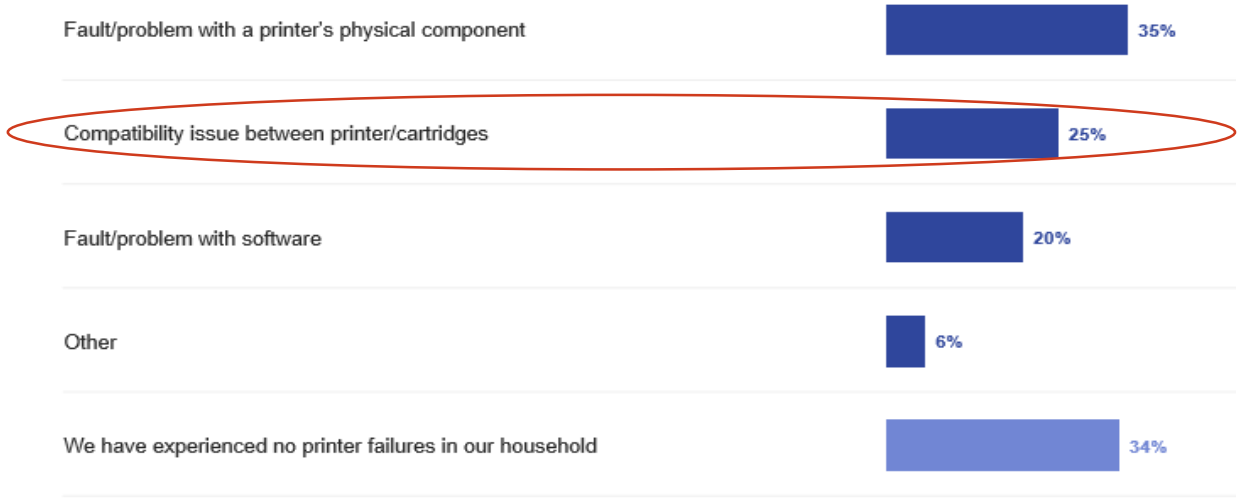
Consumers and compatibility issues

Cartridge failures



Printer failures



Preliminary results from user behaviour study

- Printer/cartridge incompatibility is the most common cartridge failure, and the 2nd most common printer failure
- Incompatibility is an issue **for cartridges and for printers**: lack of compatibility with remanufactured/3rd party cartridges may be a driver for shorter printer lifetime

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Printer/cartridge compatibility

Key questions	*Are there issues related to printer and cartridge compatibility?*
Key outcomes	▪ Printer/cartridge incompatibility is one of the most common failures for printers and cartridges ▪ Incompatibility between printer/cartridge seems to be a driver for early replacement of printers ▪ More than 25.000 of different cartridge models in the market, many of them with similar design, adding complexity to collection/sorting, acting as a barrier for cartridge reuse

Base cases

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Device Base Cases

Previous draft

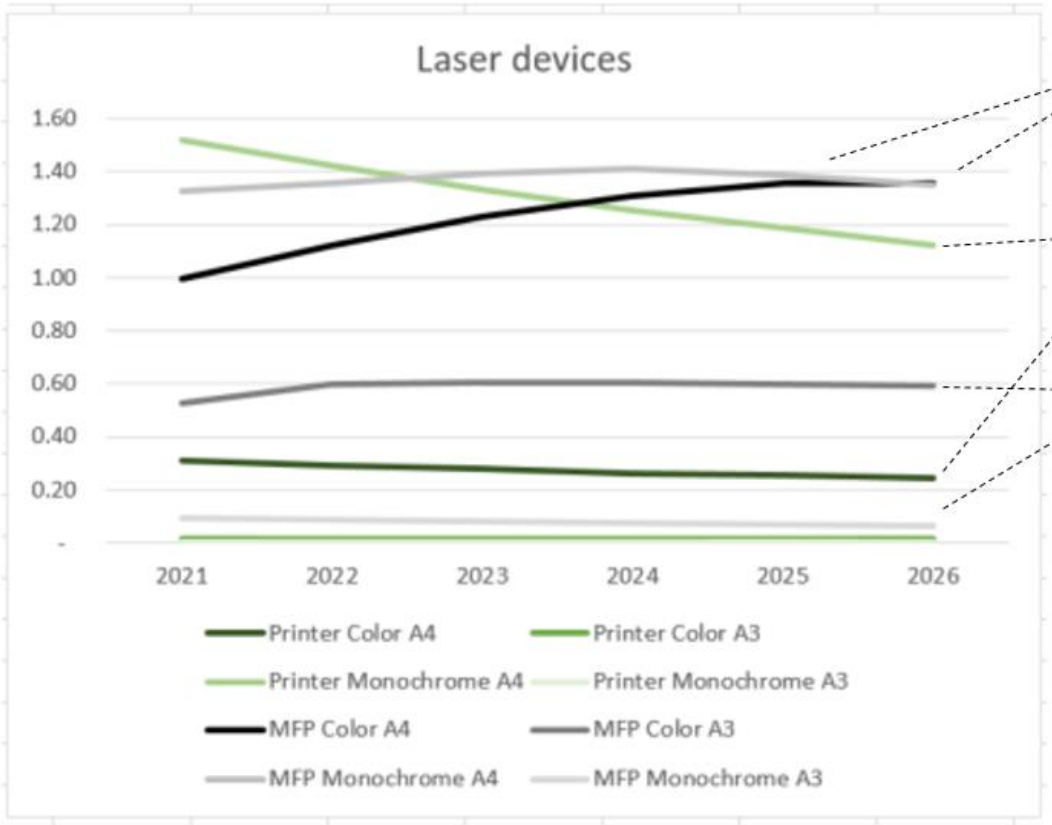
Base Case	Description
BC1Dev	Colour laser multi-function printer, 20 < s < 40
BC2Dev	Colour inkjet multi-function printer, s<20

Current proposal

Base Case	Description
BC1Dev	Laser multi-function printer, with A4 capability, printing speed 20-40 ipm
BC2Dev	Laser printer, with A4 capability, printing speed 20-40 ipm
BC3Dev	Laser multi-function printer, with A3 capability, printing speed 40-60 ipm
BC4Dev	Inkjet multi-function printer, with A4 capability
BC5Dev	Inkjet printer, with A4 capability

Device Base Cases

Current proposal



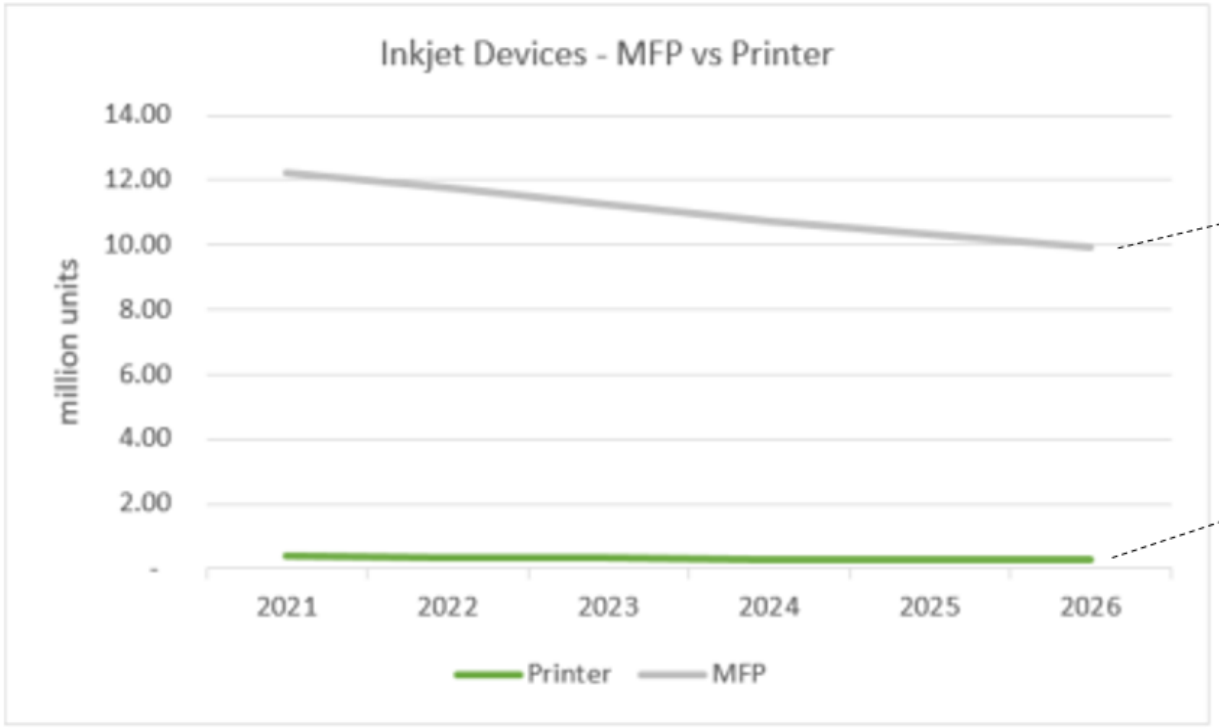
BC1: laser MFP, A4

BC2: laser printer, A4

BC3: laser MFP, A3

Device Base Cases

Current proposal



BC4: inkjet MFP

BC5: inkjet printer

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Cartridge Base Cases

Previous draft

Base Case	Description
BC1Car	Two part toner cartridge (colour)
BC2Car	Single part ink cartridge (colour)

Current proposal

Base Case	Description
BC1Car	Toner cartridge for A4 capability device, page yield: 2500 pages
BC2Car	Toner cartridge for A3 capability device, page yield: 7500 pages
BC3Car	Ink cartridge for A4 capability device, page yield: 300 pages

Next steps

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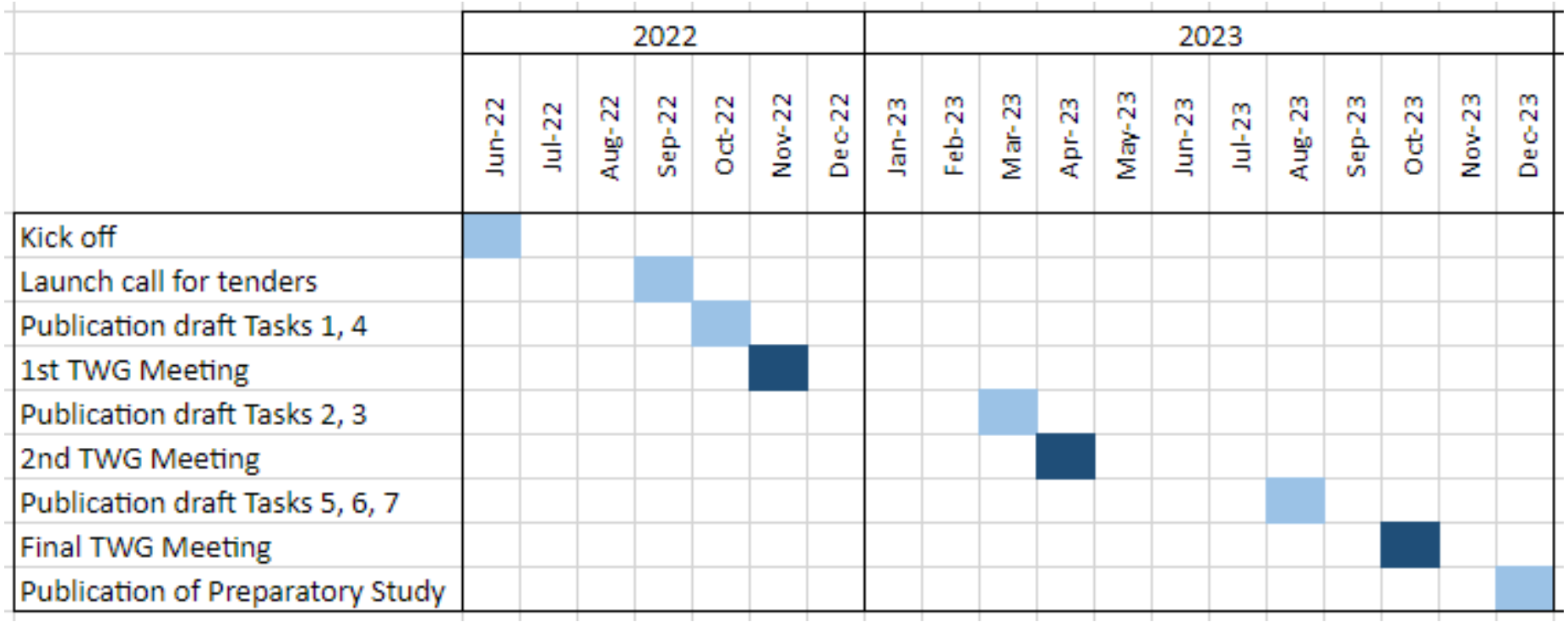
Timeline for Preparatory Study



Next steps

- Gather and process comments from 2nd TWG Meeting
- Deadline for sending written comments: 3rd May 2023 (please use template)
- Re-work on Tasks 1-4
- Start work on Tasks 5-7
- Publication of draft Tasks 1-7: Autumn 2023
- 3rd TWG Meeting: November 2023

Thank you

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