Integrating circularity into the EU product policymaking tools

A case study of a domestic oven

María González Torres

EEDAL conference, 7 October 2024

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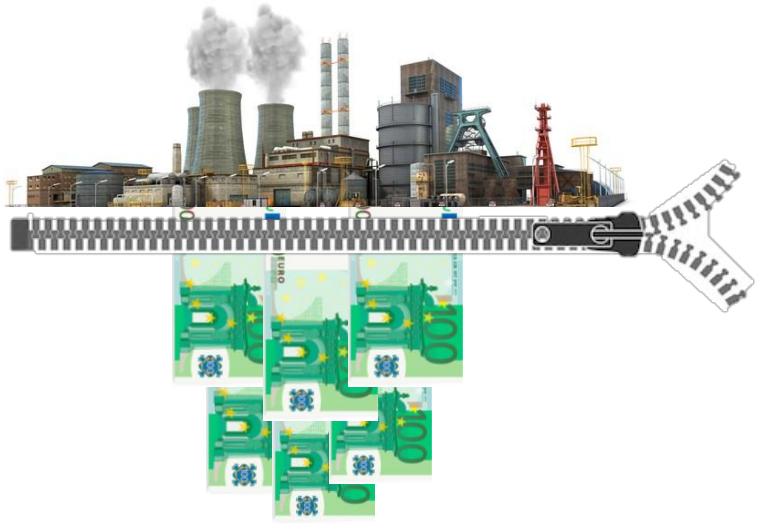
Introduction
Context and motivation

Current production and consumption system is unsustainable

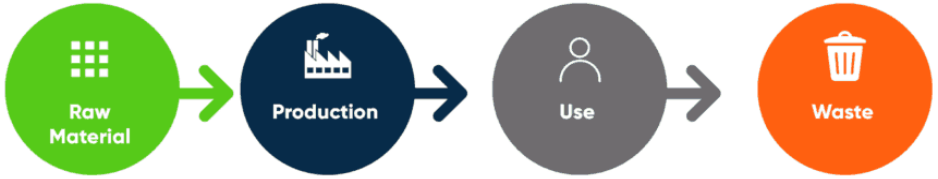
Economic growth and env. impact



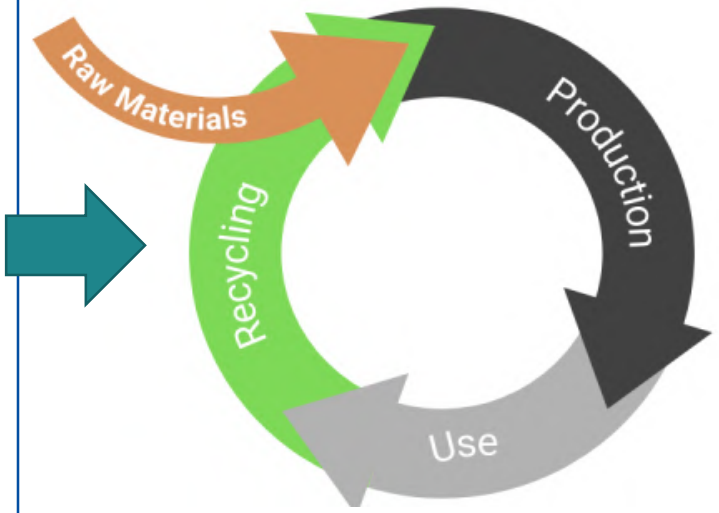
1.7 Earths

We would need 1.7 Earths to replenish the resources consumed and absorb the pollution generated

Linear Economy



Circular economy (CE) as a means towards sustainability



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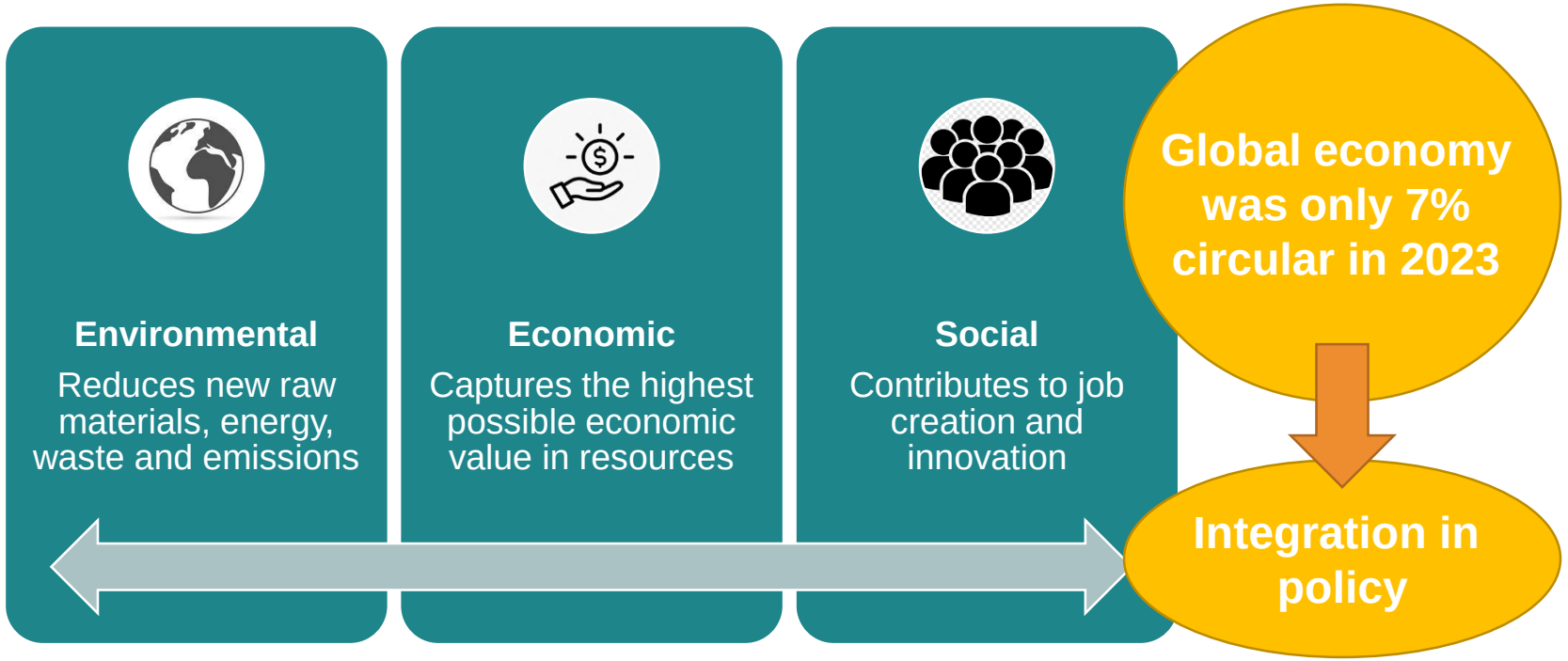
Introduction

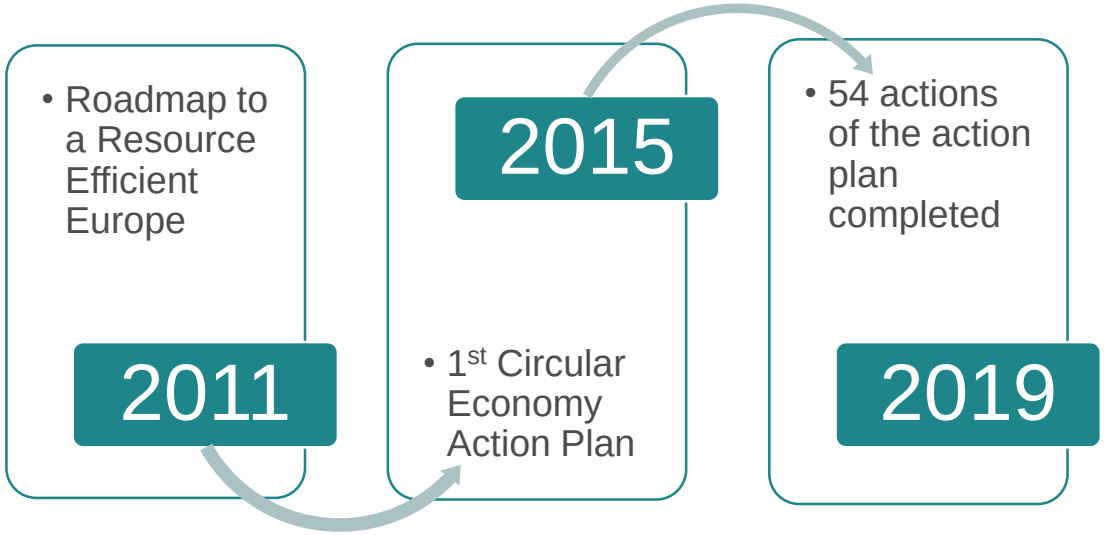
Context and motivation

Circular economy (CE) as a means towards sustainability



Introduction

Circularity in EU legislation



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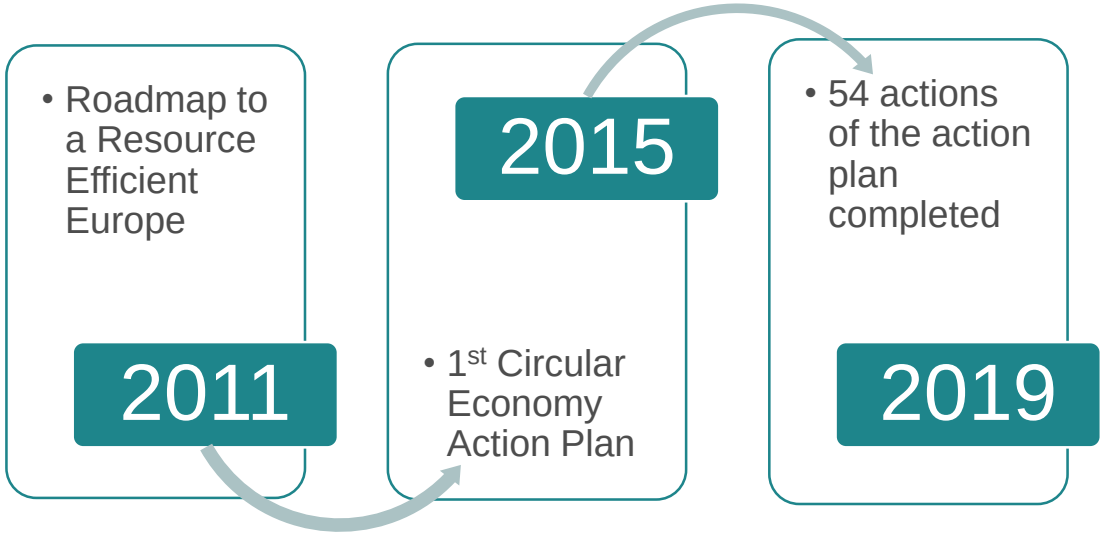
Circularity in EU legislation



↑ **Recycling rates compared to global**
↑ **Waste-related regulations**
↓ **Production-consumption measures**

Ecodesign directive (ED) as key legislative tool for the implementation of products' circularity

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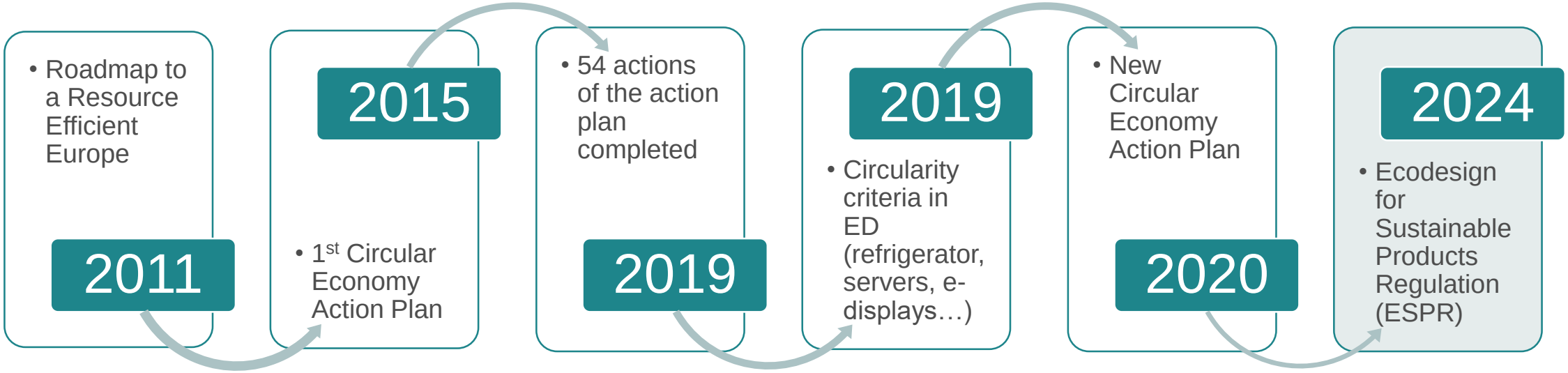
Introduction

Circularity in EU legislation



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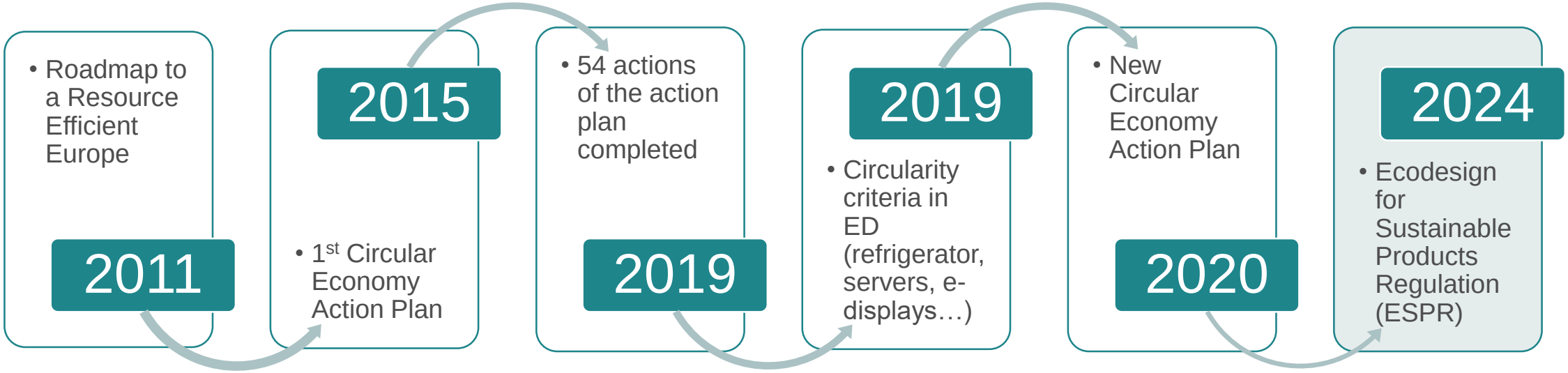
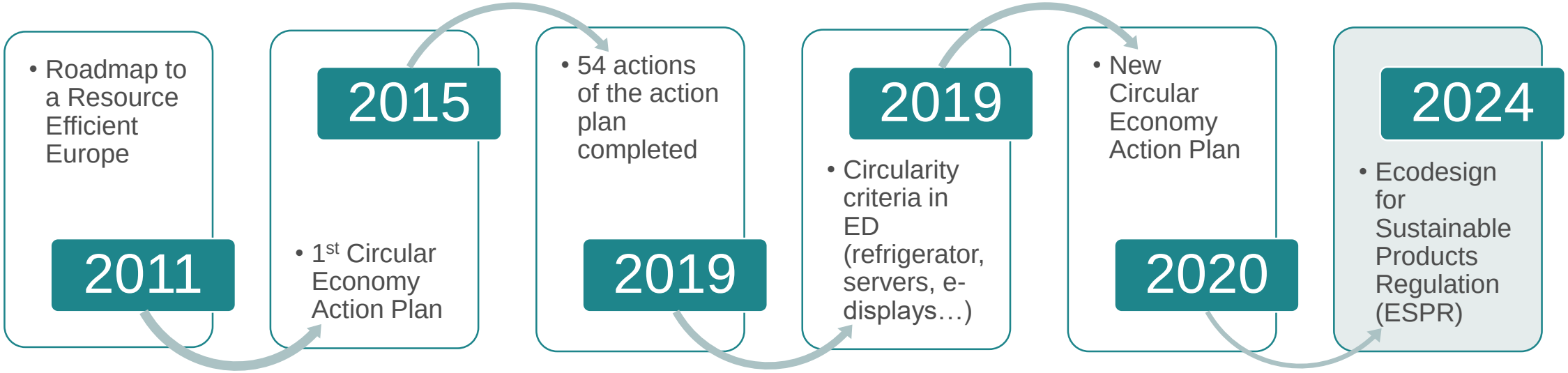
Circularity in EU legislation



Wider scope in terms of products and aspects

Introduction

Circularity in EU legislation



Need for **methods** for assessing the environmental, social, and economic impacts of circular products and business models.

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Introduction

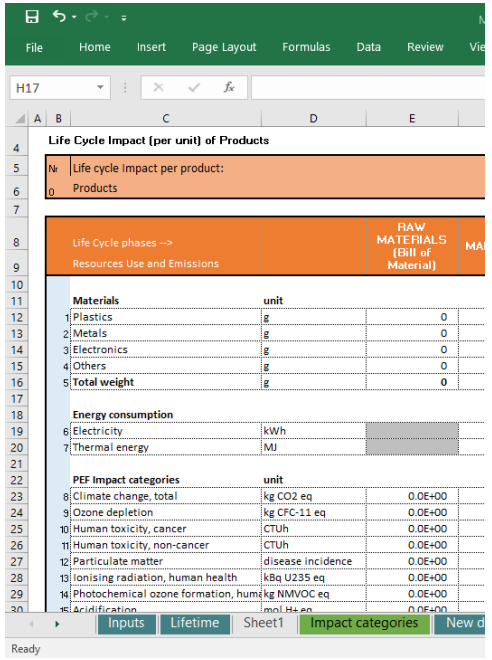
Methodology for Ecodesign of Energy-related Products (MEErP)

- Developed under the Ecodesign Directive 2009/125/EC, published in 2011.
- **Techno-economic-environmental assessment** for the definition of requirements and their level of stringency.
- Supported by the **EcoReport tool** – simplified LCA.

  Open access streamlined life-cycle based tool that is simple to use whilst being sufficiently complete to capture the main inputs and outputs at product level.

- Revisions in 2013 and 2024.

MEErP



EcoReport tool

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Introduction

Goal

Present **how the EU is integrating circularity** in their assessments to support policymaking for products and describe **how the EcoReport tool is being adapted** to the new context

- Comparison of the latest versions of the EcoReport tool (methodologies, data requirements and results)
- Case study of an oven
- Progress towards a better assessment of circularity

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Methodology
Materials

- Version 3.06 developed by VHK for the European Commission (EC) in 2011 and modified by IZM in 2014 vs. the latest revision by the Joint Research Centre (JRC) in 2024 (version 1.6).
- Review of the MEErP - Methodology for Ecodesign of Energy-related Products.
- Preparatory study of ecodesign and energy labelling measures for domestic cooking appliances.
- Additional information: literature and reports from manufacturers.
- **Case study:** gas cooker of 55-65 litres and an A energy class, aiming to represent the “typical” or “average” appliance of its kind in the EU market.

Content

1. Introduction
2. Methodology
3. **Results and discussion**
   - Methodological differences
   - Data requirements
   - Results: case study
4. Moving towards a better circularity assessment
5. Conclusions

Results and discussion

Methodological differences

	Old	New
Lifetime calculation (Lt)	Constant	Calculated based on different levels of reliability (Lt_0), reparability (ΔL_R) and upgrading (ΔL_U) $$Lt = Lt_0 \cdot (1 + \Delta L_R) \cdot (1 + \Delta L_U)$$
Stock calculation	Constant	Dynamic based on annual sales in various years and survival factor
End of Life modelling	Modelling based on mass fractions to reuse, recycling, recovery, incineration and landfill (only editable for some materials)	Simplified Circular Footprint Formula CFF (material only) $(1 - R_1) \cdot E_V + R_1 \cdot (A \cdot E_{recycled} + (1 - A) \cdot E_V) + (1 - A) \cdot R_2 \cdot (E_{recycled} - E_V)$ Recycled content (R_1), recycling output rate (R_2), impact of virgin material·(E_V), allocation factor (A)

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Results and discussion

Data requirements differences

	Old	New
Bill of Material (BoM)	Old EF database	New EF 3.1 database Possibility to include secondary datasets and parameters of the EoL modelling
Manufacturing/ assembly	Fixed manufacturing processes (adjusted by material weights)	Custom inputs of specific materials, processes and/or energy and direct emissions
Packaging	None	Custom inputs of specific materials, processes and/or energy
Distribution	Based on the volume of the package	Inserting the transport distances and weights
Use stage		Addition of direct emissions
Maintenance and repair	Included in the Use stage, based on the assumption that spare parts are 1% of the BoM.	Independent section. Adjusting the percentage of materials that need spare parts or alternatively including energy, processes and materials
Circularity strategies	EoL modelling	EoL modelling + slow resource loops strategies within the modelling of the lifetime

Results and discussion

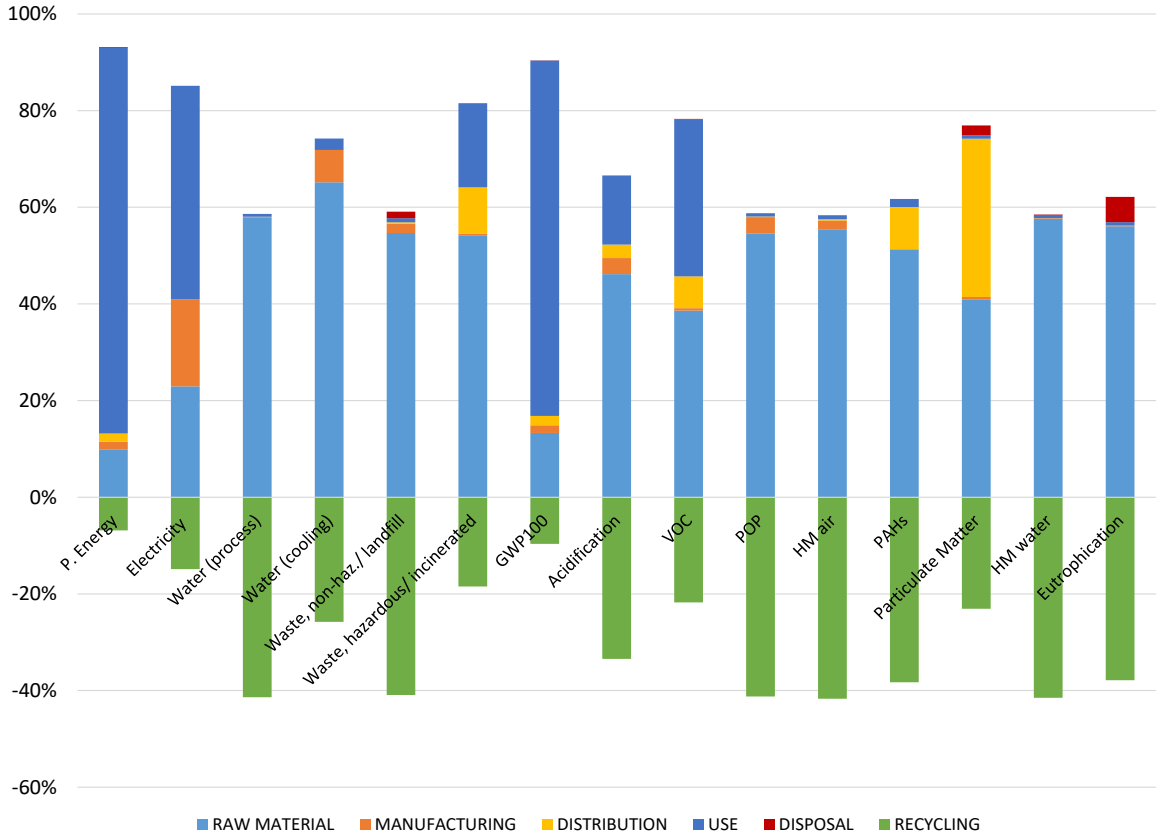
Results differences

	Old	New
Outputs	Materials and energy consumption	
	Waste (hazardous/incinerated and non-hazardous/landfill) Emissions to air Emissions to water	16 EF impact categories

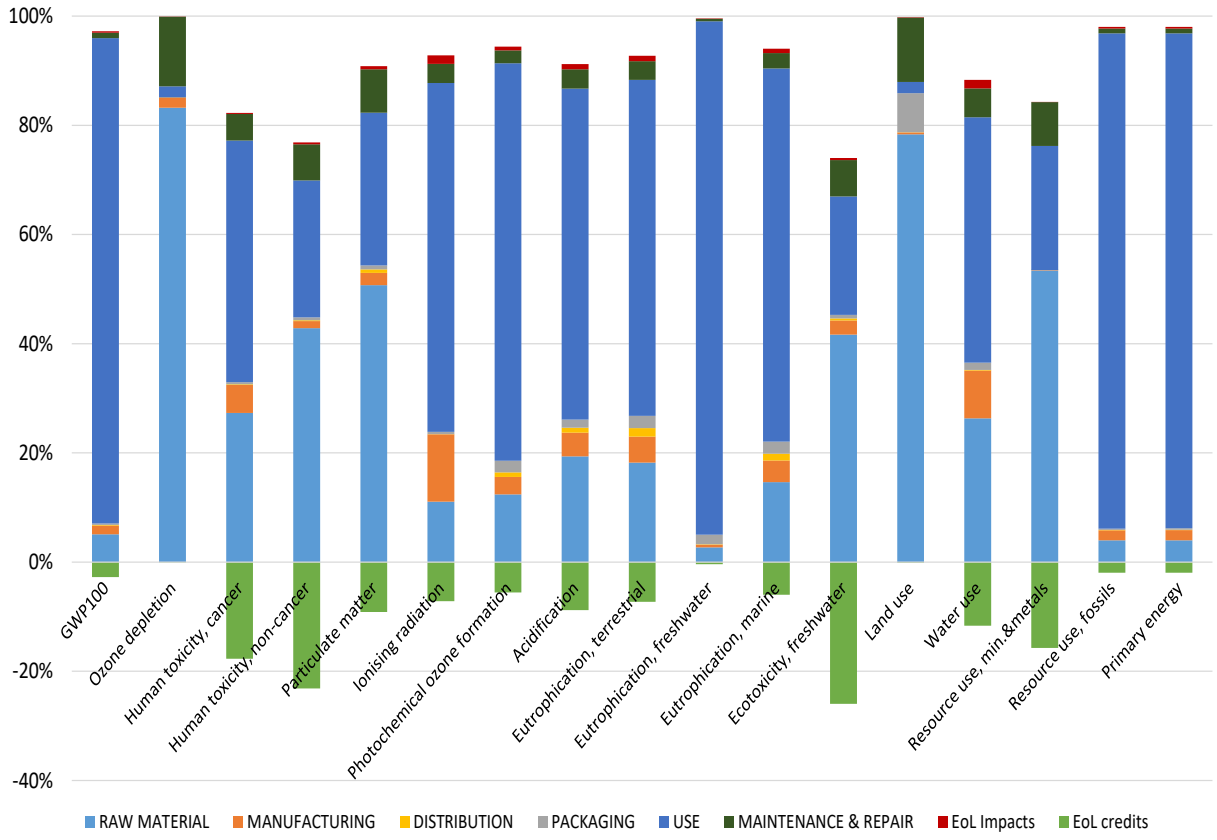
Results and discussion

Case study

Old version



New version



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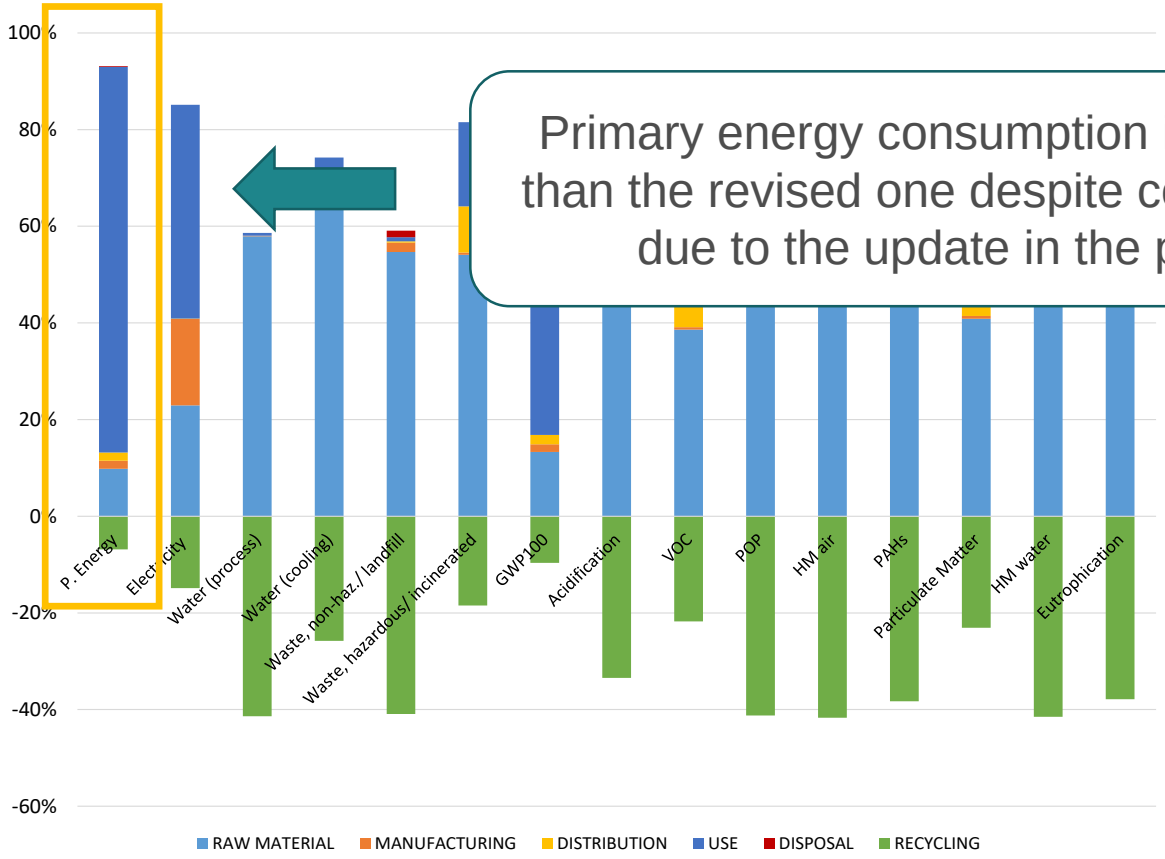
Results and discussion

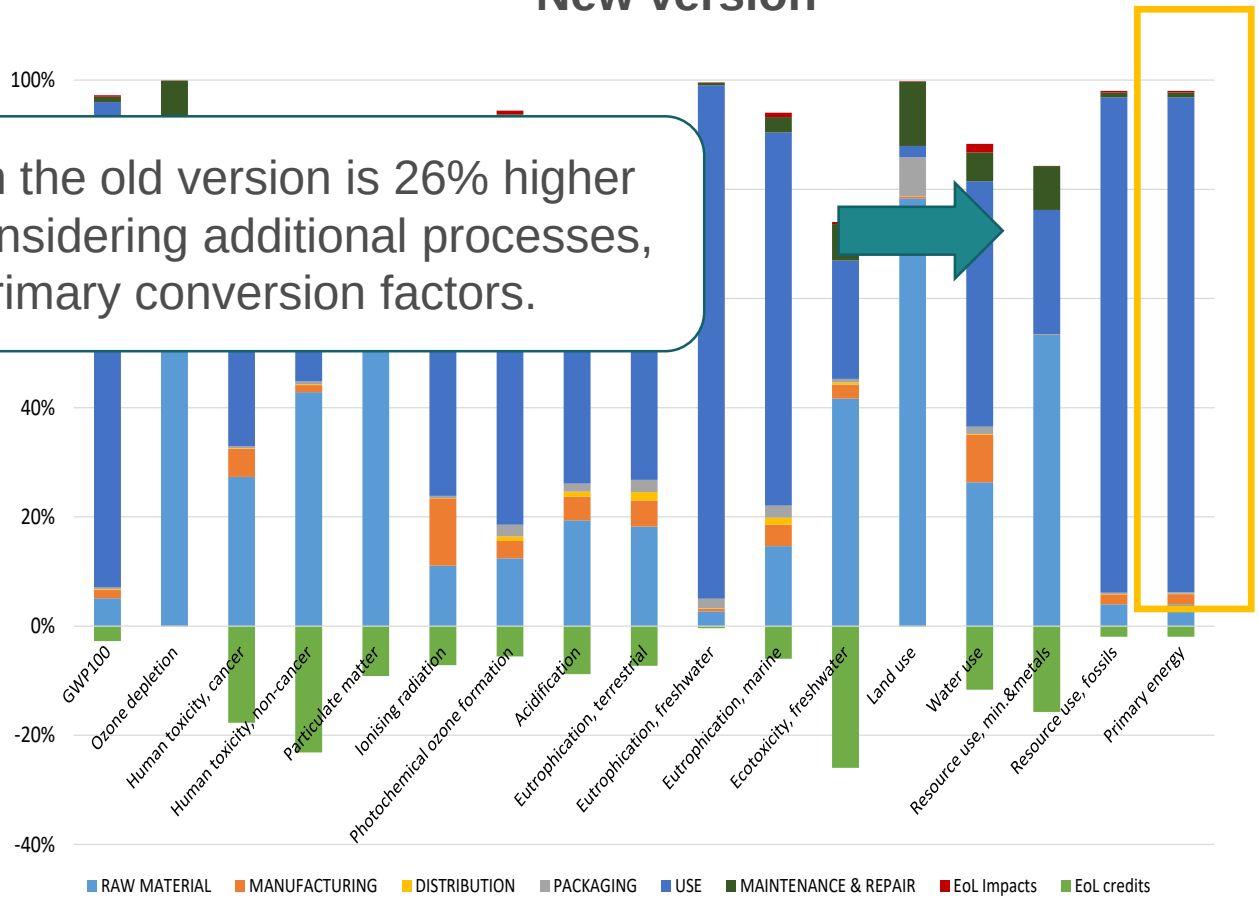
Case study

The results cannot be compared in absolute terms since they do not report the same variables with few exceptions

Old version



New version



Primary energy consumption in the old version is 26% higher than the revised one despite considering additional processes, due to the update in the primary conversion factors.

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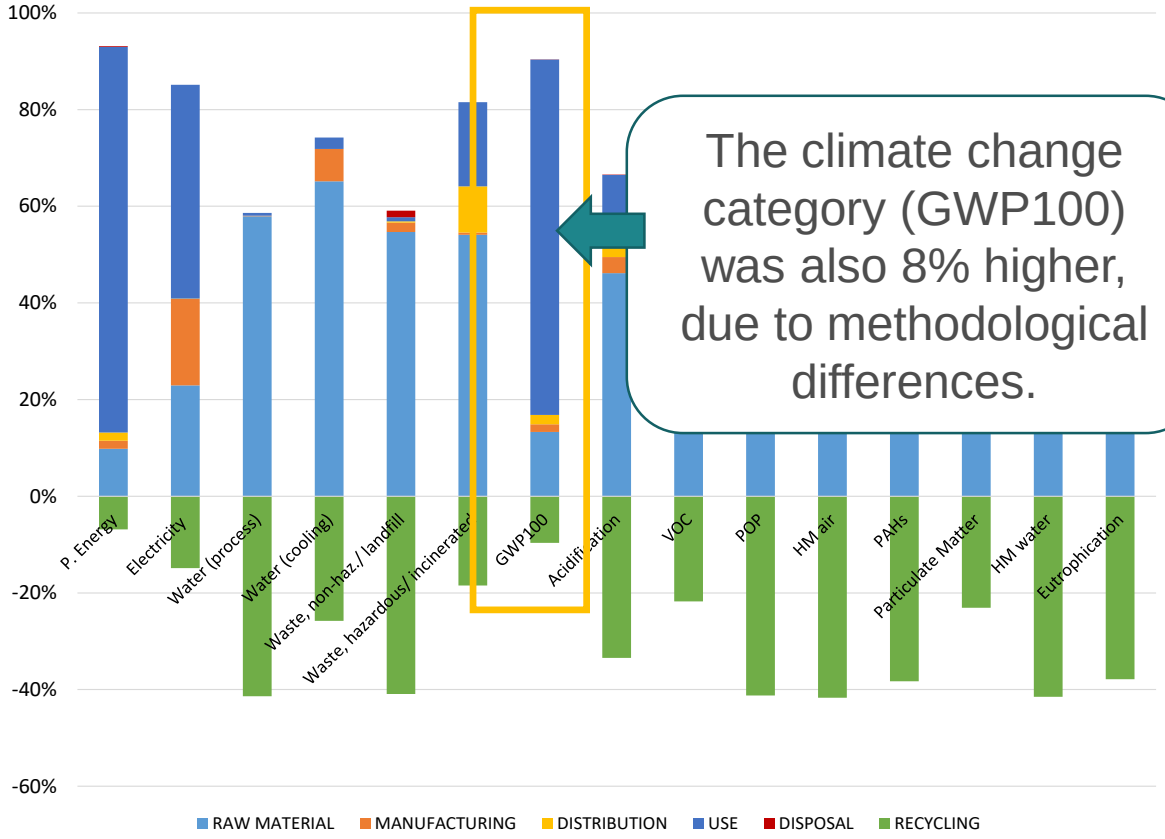
Results and discussion

Case study

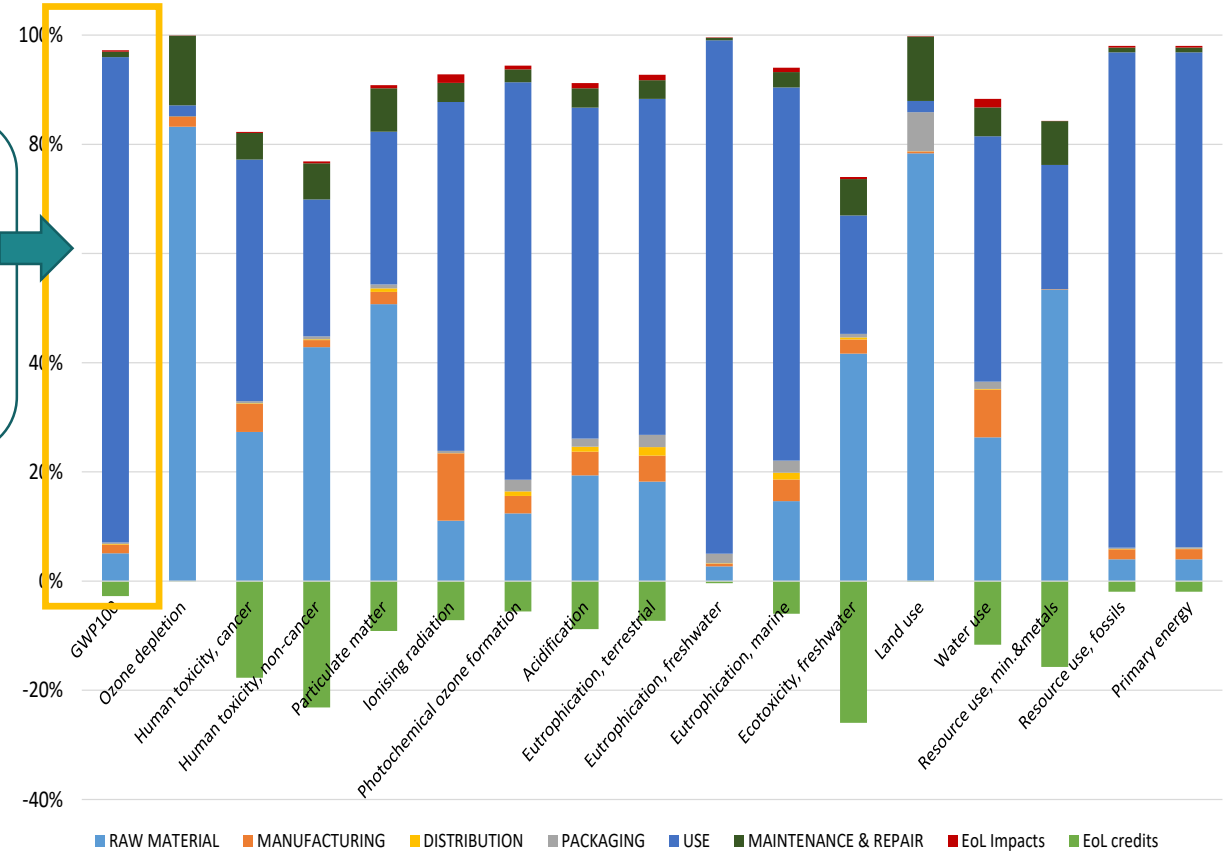
The results cannot be compared in absolute terms since they do not report the same variables with few exceptions

Old version



The climate change category (GWP100) was also 8% higher, due to methodological differences.

New version



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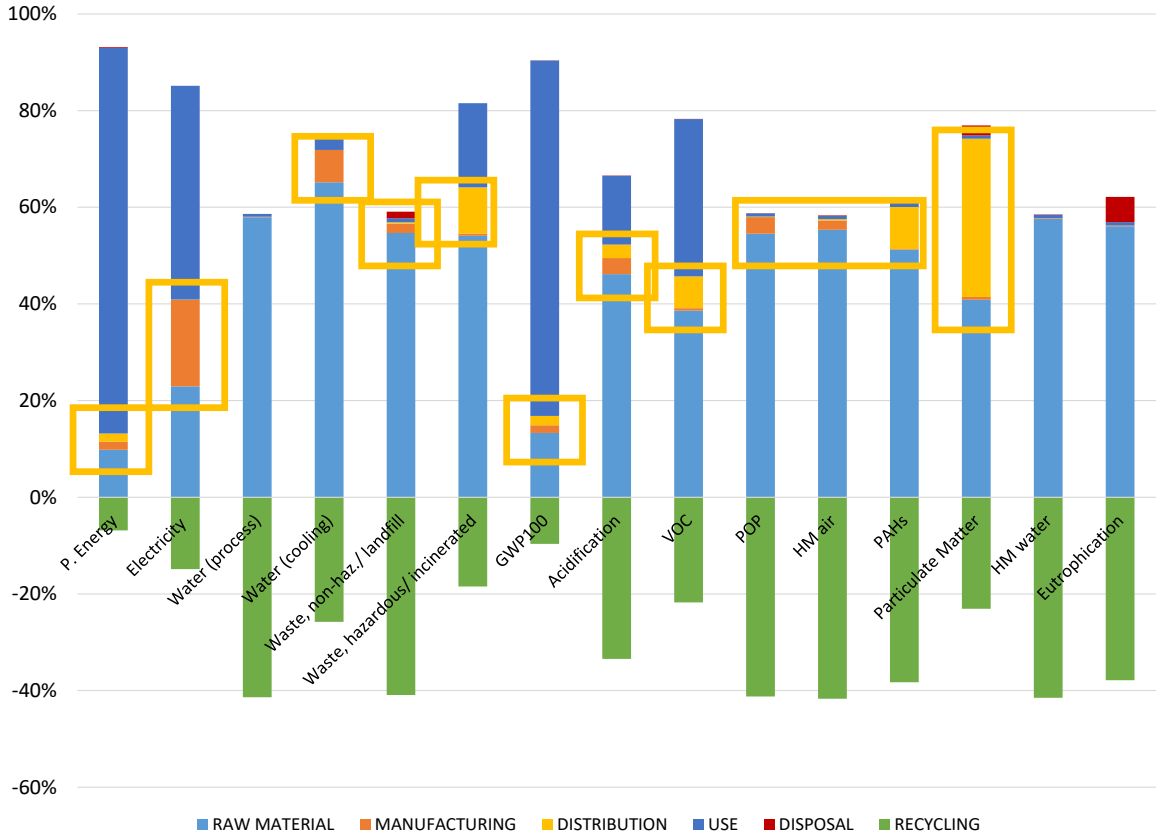
Results and discussion

Case study

Minor contributions from **manufacturing** and **distribution**, the revised tool should prevail, based on actual input information and not on assumptions of general processes.

Old version



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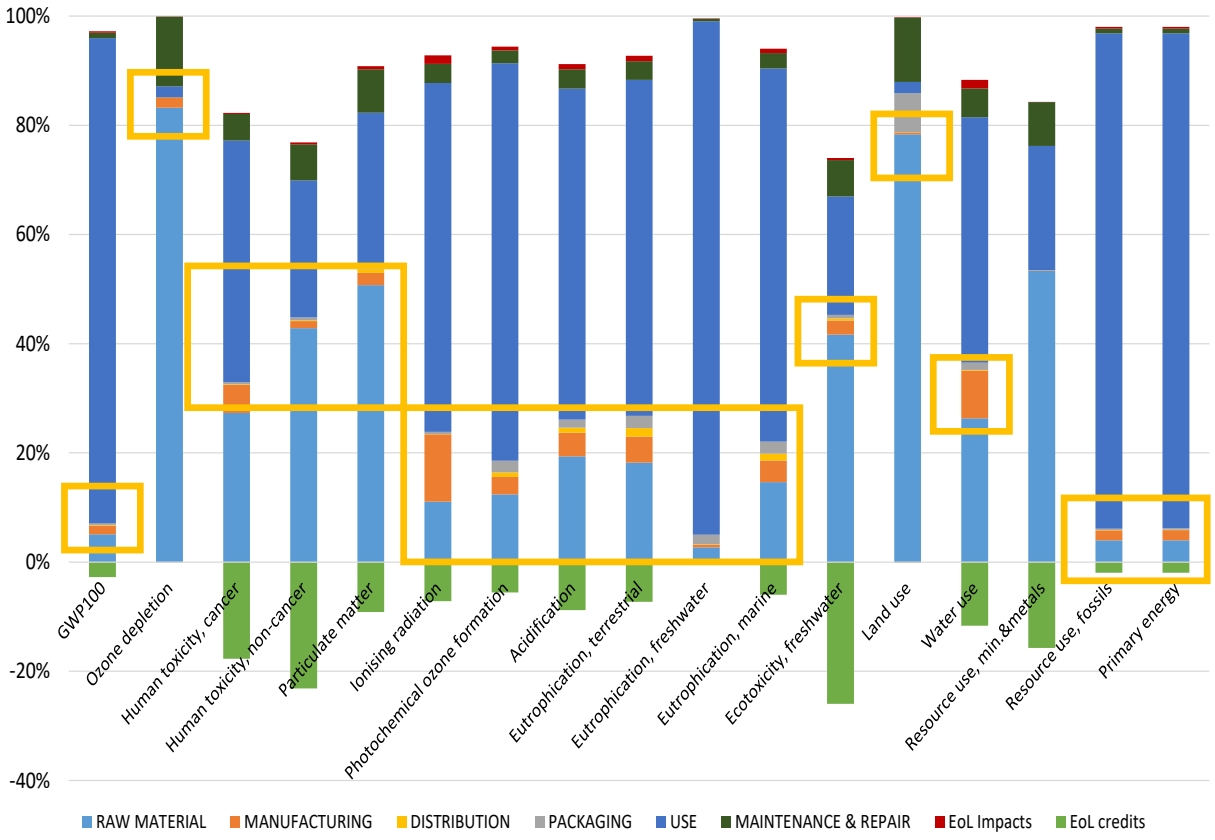

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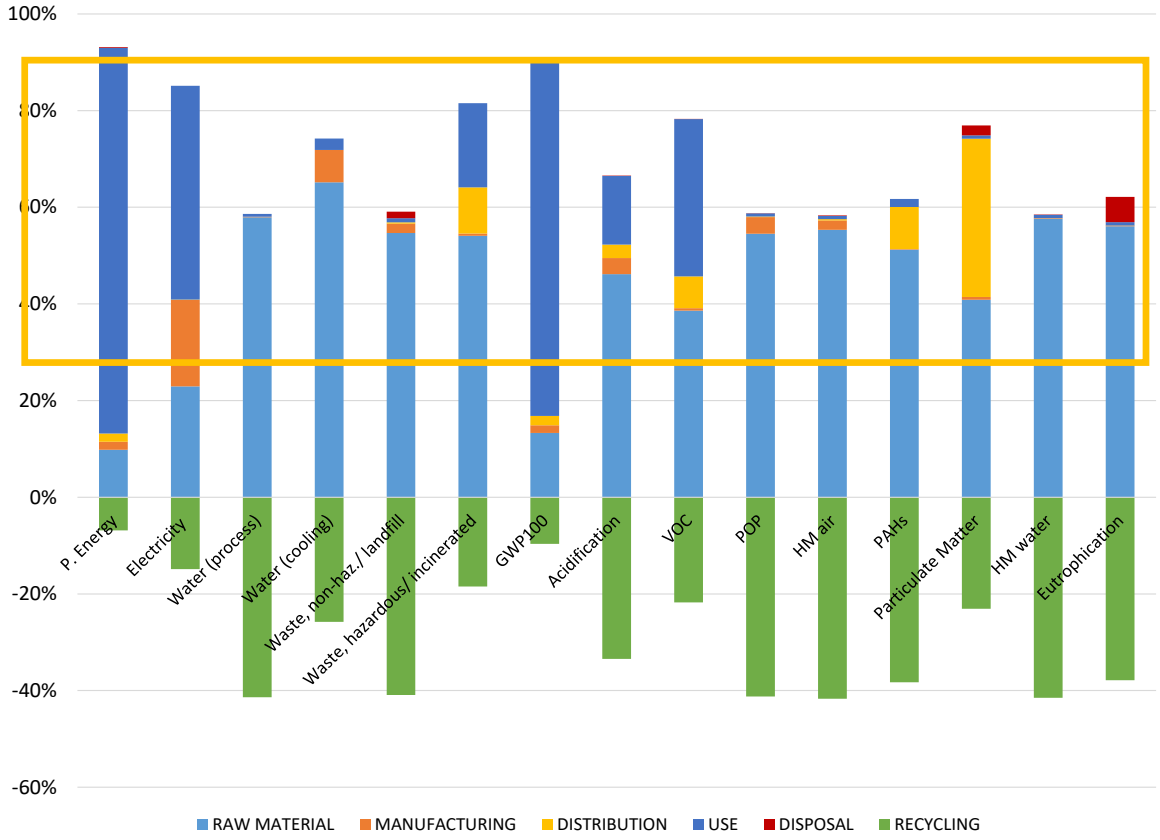
Results and discussion

Case study

The significant contribution of the **use stage** is well captured in both versions of the tool → **Hotspot**

Old version



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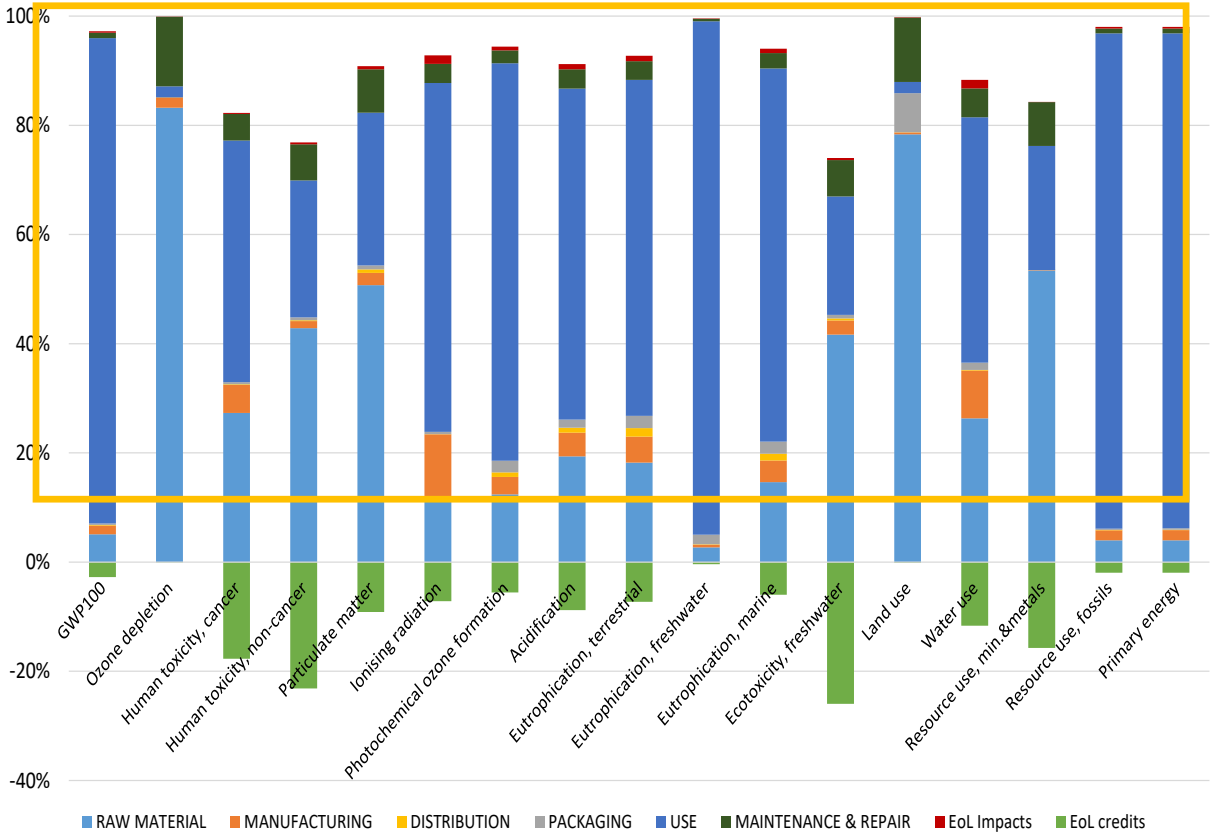

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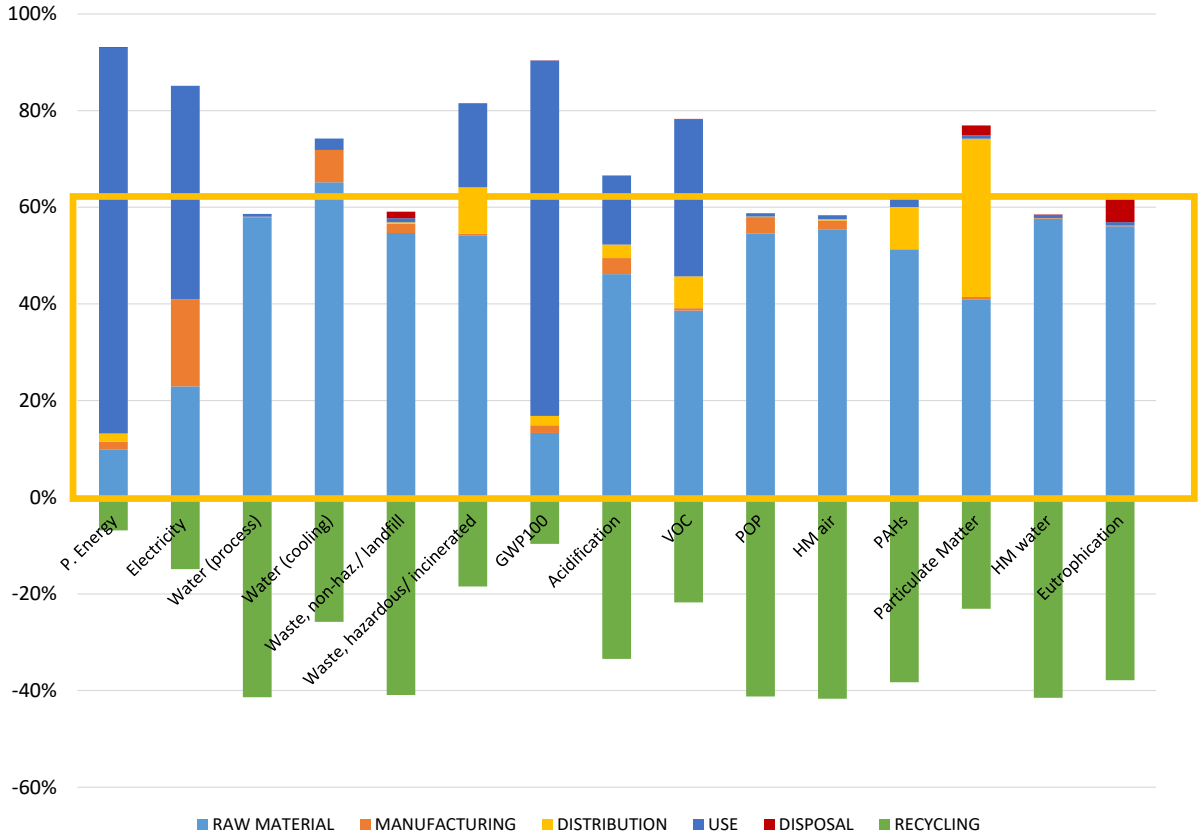
Results and discussion

Case study

The high impact of the **raw materials** is well captured in both versions of the tool → **Hotspot**

Old version



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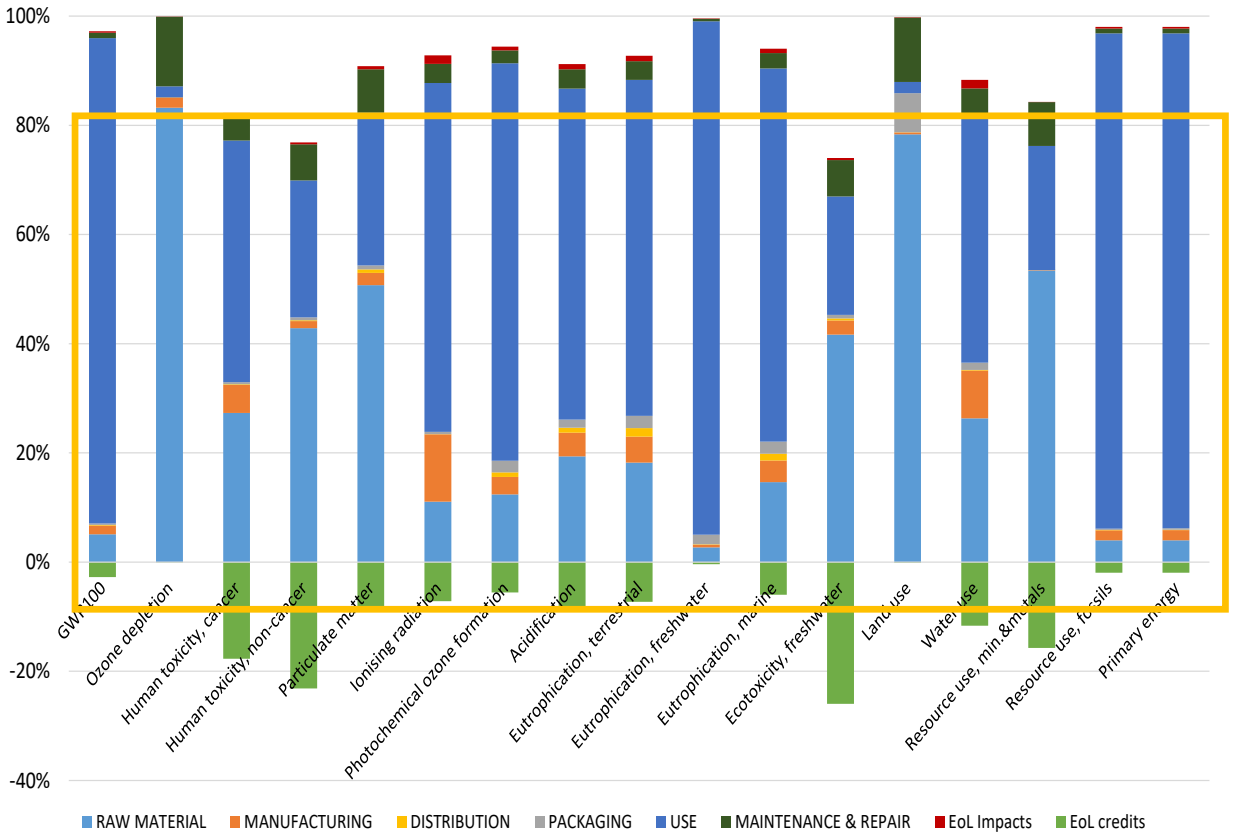

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Content

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Moving towards a better circularity assessment

Circularity strategies	Assessed	To be assessed
Slowing resource loops	**Reliability, repairability, maintenance and upgrading.** Burdens: inserting additional material, transportation and processes Benefits: extending the lifetime and reducing sales	Similar for other slowing resource loops strategies, such as **refurbishment**.
Closing resource loops	**Recycling and recycled content.** Simplified CFF	**Downcycling and energy recovery.** Full CFF **Reusability (products)** As slowing resource loops strategies **Reusability (components), remanufacturing** Adaptation of the CFF
Narrowing resource flows	**Resource efficiency** Reducing inputs of energy, water or material in any of the lifecycle stages.	-

Content

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Conclusions

- As circularity gains relevance, its integration in policy agendas and the **development of methods** for assessing its environmental, social, and economic impacts become imperative.
- In the EU, the **Ecodesign framework** has been identified as one of the key legislative tools.
- Substantial changes to integrate circularity in the EcoReport tool only in 2024.
- **More detailed and time consuming process** for data collection, more robust results.
- While more **systematic consideration of circularity strategies** facilitates the assessment and translation into policies, **limiting the complexity** contribute to the development of policies in duly time.
- Future work on assessing additional aspects of circularity without prejudice to the **feasibility of the study and simplicity** of the tool.
- Efforts in EU's transition are notable, and could be **applied and/or adapted** to policy frameworks across other regions and countries around the world.

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Thank you

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