

EPPA's response to the claims presented by Zero Waste Europe, Eunomia, and Reloop in the publication: **Unveiling the Complexities: Exploring LCAs of Reusable Packaging in the Take-Away Sector**

EPPA welcomes the interest triggered by both Ramboll Life Cycle Assessment (LCA) in the regulatory debate around the Packaging and Packaging Waste Regulation (PPWR) European legislation but regrets the repeated attempt made by reuse promoters to undermine their results and credibility.

As a reminder, EPPA has made two ISO 14040 and 14044 LCAs publicly available, comparing paper-based packaging with reusable alternatives for in-store consumption (Jan 2021) and takeaway (Nov 2022) in Quick Service Restaurants within the EU.

These LCAs performed by Ramboll, the independent and reputable LCA practitioner expert working for the European Commission, clearly stand out in terms of robustness and reliability since they are the only ones combining a system approach (not a product-to-product comparison) using representative assumptions and primary data for the environmental “hotspots” along with extensive sensitivity analysis (12 for the in-store LCA, 9 for the takeaway LCA) while being third party reviewed.

Both LCAs demonstrate “**very significant benefits**” for paper-based packaging compared to their reusable plastic alternatives, notably in terms of CO₂ emissions, fresh-water consumption, delicate particulate matter, fossil and metal resources depletion, and terrestrial acidification due to the substantial and non-avoidable impact of washing-drying and transporting back to restaurants.

Unfortunately, much of the criticism from proponents of reuse stems from technical misunderstandings and biased comparisons with studies that do not adhere to the proper ISO 14040/14044 standards and use general models for comparison: this is particularly the case of the Eunomia – Zero Waste – Reloop 14-page document pretending to “**unveil the complexity**” and “**determine the credibility**” of different studies in the takeaway sector.

Please note that in Eunomia's comparison, only the Ramboll ISO 14040 / 14044 LCA uses the best-in-class methodology for Life-Cycle-Assessment, and is third-party reviewed by three senior experts that declare: “**The reviewers find the study's level of quality, detail, and transparency to be appropriate considering the goal and scope. In particular, they appreciate the specific data gathering implemented by the study's authors. Subsequently, the reviewers consider the results and conclusions to be a sound and fair reflection of the potential comparative environmental impacts of the studied systems representing the use of single-use and multiple-use tableware for takeaway services in Quick Service Restaurants. The detailed sensitivity analysis provides transparency of the uncertainties and confidence in the overall robustness of the results achieved and conclusions drawn. [...] In conclusion, the review panel believes that the report provides useful and realistic information for stakeholders interested in this topic.**”

On the contrary, Michigan (US) Hitt et al. academic paper championed by Eunomia is not an LCA but a general model that is not compliant with an LCA ISO 14044 standard and **does not include paper-based products at all** but plastic single-use packaging, to

the exception of the clamshell made of bagasse with a high carbon footprint because it mainly comes from China and Thailand with high shares of fossil fuels: this kind of study should **not be used as a basis for any kind of comparison in European context**, or as a comparison of results against EPPA study. We therefore invite you to read our detailed comments below.

EPPA strongly supports a lasting Green Recovery for Europe, but in the environment's best interest, EU ambitions must be science-based. This is why fit-for-purpose, robust, and third-party validated studies must be compared using the methodology supported by the European Commission. **From our perspective, the Ramboll LCAs are the sole updated studies regarding QSRs rooted in scientific facts, enabling sound conclusions.**

<p>Claims presented in the ZW / Eunomia report" and also by other reuse promoters</p>	<p>EPPA's comments</p>
<p><i>"Transparency is crucial in comparative LCAs to ensure scientifically valid results. Peer review and publication of complete studies allow for broader scrutiny and assessment of credibility. For non-LCAs, such as discussion papers, transparent presentation of data and assumptions is imperative. This report highlights key aspects of takeaway reuse studies that influence results and emphasises the need for scrutiny. The studies selected represent the transparency spectrum."</i></p>	<p>Transparency should start by respecting the meaning of words: "LCA" characterizes a defined type of study compliant with ISO standards in which only 14040 / 14044 are the best-in-class, following a thorough process for "goal, scope, and functional unit definition," "inventory analysis," "impact assessment" related to "impact categories" and "interpretation" stages while being third-party reviewed.</p> <p>In the reuse promoter's document, only Ramboll's study can be considered a proper LCA following the ISO 14044 compliant methodology: it is not the case for both the Kearney report and the University of Michigan general model, which can't be called "LCA" and compared as such.</p> <p>Please note that all Ramboll LCAs are publicly available on EPPA's website as another sign of transparency.</p> <p>In this respect, the reuse promoter document is misleading, in EPPA's view.</p>

*“It becomes evident that the EPPA study, despite undergoing peer review, is marred by a critical flaw: **the creation of a baseline scenario that favours a particular outcome. Using pessimistic return rates of 50-70%, decentralised washing and excessive return transport lead to a poor outcome for reuse.***

However, using the same underlying data, opposite conclusions can be reached when these key assumptions are stacked in the favour of reuse.

The EPPA and McDonald's studies focus on suboptimal/poorly designed reuse systems—instead of envisioning what could be achieved and innovating to solve the problem.

The Ramboll takeaway LCA is based on extensive primary data collection among QSRs operators, which lays the basis of a robust study.

The use phase in takeaway systems has been thoroughly investigated during this data gathering, by collecting information regarding distribution channels repartition, type of washing and types of dishwashers, number of reuses of a product, return rates, means of transport and distances covered.

Primary data and information for single-use system have been further obtained from EPPA members', whose market shares cover more than 65% of QSRs in Europe. Also, data from scientific papers published in peer-reviewed international journals have been considered for the modeling of both SU and MU systems.

The LCA has also benefited from the up-to-date implementation of the French in-store reuse legislation for which QSR did implement the best-in-class reusable system, which was completely new for them.

This robust baseline scenario is further challenged in the LCA by an **extensive sensitivity analysis testing all decisive assumptions**: 9 scenarios have been investigated (5 for MU system; 4 for both systems) including:

- **different number of reuses,**
- **different return rate,**
- **different assumptions related to take-back system,**
- **different washing scenarios,**
- **different EoL shares,**
- **different EoL allocation approaches.**

This LCA study can be therefore considered comprehensive and robust. As stated by the panel reviewers, **“The detailed sensitivity analysis provides transparency of the uncertainties and confidence in the overall robustness of the results achieved and conclusions drawn.”**





*Both studies have estimated a **low average return rate for the packaging (70% McDonald's and 50% EPPA),** which means the reusable packaging would undergo reuse only 3 or 2 times, which is not a viable system to aim for."*

*"**decentralised washing and excessive return transport** leads to a poor outcome for reuse."*

*"The EPPA study assumes **the average of several different behaviours when it comes to the washing of reusable containers** instead of indicating what would be the encouraged behaviour for the system to perform optimally. **This averaging exercise makes it incredible and heavily influenced by data outliers.**"*

In this respect, it is to be noted that:

1) Increasing the number or return rates (which is different from the number of reuses) **from 50% to 70% and onward will only result in increasing the environmental impact of the reuse system,** as it is demonstrated in the LCA since a higher return rate means a lower impact for the production and end-of-life phase, but a higher impact for the transport use phase. **Because the transport use phase is the main hotspot of the multiple-use system, increasing the return rate implies more direct impacts than avoided ones.**

2) Decentralized washing (e.g., in-store cleaning) **is considered realistic** and reflects the French dine-in current situation where external washing is exceptional: in-store washing allows restaurants to monitor better **their packaging, control hygiene, and reduce costs,** which will be even more critical for takeaway.

Still, **the LCA sensitivity analysis tests off-site washing with limited impact category changes.**

It is also to be noted that in the case of off-site washing, food safety reasons will request strictly separate clean and dirty packaging, which **will need separate truck** flows (one truck cannot bring clean packaging and then take away dirty packaging) which in turn means that many more greenhouse gas-emitting trucks will be needed. Yet, these constraints has not been considered in the Ramboll LCA.

3) For the baseline scenario, used MU tableware is assumed to be preliminary washed at home (i.e., preliminary washing phase) by customers and then professionally washed in-store by QSRs operators.

For preliminary washing, an average scenario reflects different possible processes. It considers an equal share of handwashing, dishwashing, cold rinsing, and dry wiping and is applied to half of the total items (50%) taken back to QSRs with the exception of those bought by means of drive-through, which are assumed to be returned directly after consuming food and beverages as a conservative assumption. **Preliminary washing is also not considered for MU items not returning to QSR** (i.e., those for which the return rate does not apply).

These hypotheses are not only quite realistic and fair but also **benefited from the results of the Meta-Study conducted by Ramboll in May 2022, which analyzed 26 studies related to takeaway.**

“Determining break-even points is, therefore, more informative than using static figures, particularly for behavioural aspects that are hard to predict. Studies that do not show the potential variation in results and highlight the dependencies are likely to be misleading.”

The key finding of Ramboll LCA is that the “break-even” point way of thinking is not appropriate for takeaway packaging comparisons since the contribution analysis shows that:

- For the paper-based packaging system, **most of the impact is related to the production / converting / distribution phases**, representing **82%** of the Climate change contribution.
- While for the reuse system, **most of the impact is not related to the packaging itself but to the washing/drying and transport back phases**, which represent close to **84%** of the Climate Change contribution.

Increasing for example the number of reuse has very little impact since what matters is the energy and water consumption during the use phase itself, not the ability of the packaging to be reused.

This result was already highlighted in the Ramboll in-store LCA, where 500 reuse times for ceramic and glass and 1000 for metal were tested with very limited changes to the overall environmental impact.

It is to be noted that QSR are using the best-in-class dish-washers of the HORECA sector while managing the highest possible volumes: washing efficiency in other restaurants is expected to achieve a lower level.

“We are confronted with a multitude of studies that primarily focus on existing conditions – a frequently suboptimal or poorly designed reuse system.”

It is to be noted that while proper LCAs are recognized by the European legislation as the appropriate methodology to assess the “best environmental outcome” principle (Waste Directive 2008/98/EC Guidelines), they also have limitations:

- **LCA is by way of methodology not predictive:** evolution of parameters is **tested only through sensitivity analysis, which in Ramboll’s case is extensive. To the opposite, predictive studies are by nature flawed with uncertainty and hypothesis and cannot be a serious and robust tool when assessing the environmental impact. This is why the EU regulation favors proper LCAs.**
- **Quality of data** (“primary” or “secondary”) **can be critical**, as well as the **“system” or “product-to-product” approach** and **number of “sensitivity analysis.”**
- While impact categories such as Climate change and Freshwater consumption are core to LCA, **biodiversity, and littering are still not considered standardized impact categories** due to the lack of scientific consensus and data availability.

On the contrary, Michigan (US) Hitt et al. academic paper championed by Eunomia is not an LCA but a general model that is not compliant with an LCA ISO 14044 standard and **does not include paper-based products at all** but plastic single-use packaging, to the exception of the clamshell made of bagasse with a high carbon footprint because it mainly comes from China and Thailand with high shares of fossil fuels: this kind of study should **not be used as a basis for any kind of comparison in European context**, or as a comparison of results against EPPA study. We therefore invite you to read our detailed comments below.

The resulting conclusions.

However, considering the nature of convenience in fast food consumption, the suggestion that 20% of all individual containers would require a dedicated return journey does not appear highly credible, and 50% as a base case is a bold assumption in light of the lack of data. Also, these assumptions contrast heavily with those of academic paper Hitt et al., where the base case assumes no additional journeys are made, meaning containers are returned when picking up more food. A more transparent approach would be to investigate how pooling and sharing across the whole sector can address the need of dedicated journeys by ensuring drop-off/collection points are optimised among all participant operators."

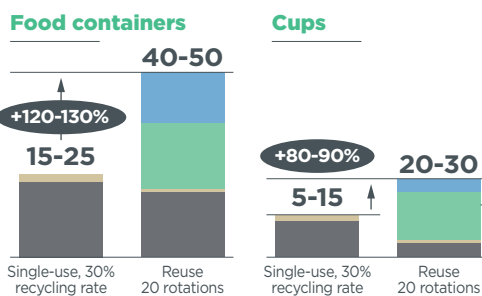
Still, an extreme scenario has indeed been tested in the sensitivity analysis according to which 4/5 of total trips to return MU items are neglected, i.e., 4 out of 5 people returning MU items in case of buying of another menu, whose effect is able to turn the results in favour of MU system for some impact categories while for the 7 other impact categories, including Climate Change and Freshwater consumption, the SU system still presents lower impacts.

On the opposite, considering a 100% return rate for the packaging (every time there is a new purchase the customer comes back with his packaging) **is quite unrealistic**, in EPPA's view, **since takeaway aggregates quite different behavioral situations**, including traveling customers from a location/region/boarder to another and customers choosing not to return the items, etc. Assuming such a 100% return rate as a baseline scenario seems to be only valid from a reuse promoter's point of view.

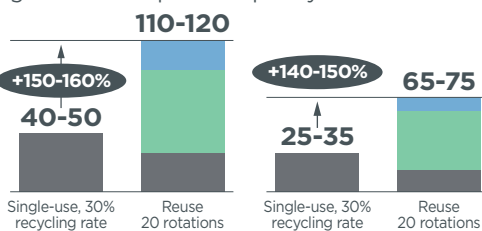
"Pooling and sharing" has been studied by McKinsey in their June 2023 article dedicated to the implementation of reusable cups and containers for takeaway in Belgium: **results show a 140 to 160% CO₂ increase:**

The cost increase for reusable packaging in food service takeaway in Belgium is approximately 100 percent compared to single use

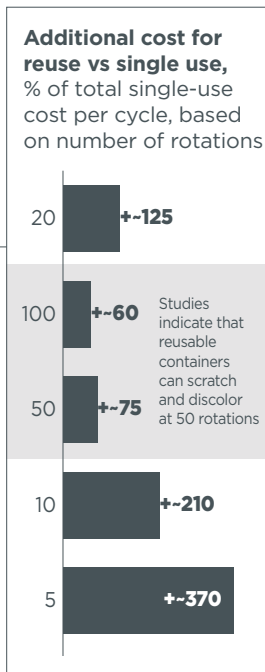
HORECA costs,
euro cents per item per cycle



HORECA emissions,
grams of CO₂ per item per cycle



Material per rotation Transport and logistic handling
End of Life disposal Cleaning (including customer drop-off)



*“While both the EPPA and McDonald's studies analysed **nine** containers in their respective analyses, **they do not provide specific details on how each container performs in the results, highlighting the need for more comprehensive information to assess their performance accurately.***

*The EPPA study appears to have **‘stacked’ the pessimistic reuse assumptions in the baseline scenario, achieving a favourable result for single-use.**”*

Ramboll LCA provides many details on the **24** packaging compared in the In-store LCA and the **17** packaging for the takeaway LCA (not 9!).

It is to be noted that **the system approach offers reliable and robust results** since both LCA demonstrate that the production/converting phase (for paper) and washing/drying/transport back phases (for MU) are contributing to more than 80% of the environmental impact: **to the opposite, product-by-product comparison do not reflect the reality of the environmental impact and forget that a product by itself is never cut-off from the others in terms of use and environmental impact, especially in restaurants where serving includes various drinks and foods.**

Ramboll is a leading independent expert in producing ISO-compliant LCAs and works for the European Commission and many other institutions.

Implying that Ramboll's “stacked” pessimistic assumptions are not in line with the expert reputation and the independent senior panel reviewers.

*“Both the EPPA and McDonald’s studies **fail to provide insights into effectively addressing poor separate collection rates or the food contamination issues with single-use packaging that must be overcome to improve recycling significantly.***

*The Confederation of European Paper Industries (CEPI) indicates that **full saturation of paper with grease is considered unacceptable** (which is often the case with fast-food). In contrast, **it is feasible for a well-designed reuse system to achieve much higher recycling rates and yield better-quality recycled materials, albeit not without the challenges of recycling plastics into food grade applications.**”*

Ramboll LCA provides **four different End-of-Life sensitivity analysis** including different recycling rates and methodology.

In this LCA, the end-of-life (EoL) stage is **not a main environmental hotspot. However, by increasing the recycling rate, the SU system shows higher benefits than the baseline scenario in some categories** (e.g., Acidification, Particulate matter, and Photochemical ozone formation). A hypothetical reduction of environmental emissions associated with the recycling process in the SU system could further reduce the overall impacts and have a beneficial effect on the overall results.

“Full saturation” is an exceptional and extreme situation for food packaging. On the opposite, several certifications confirm that grease and liquid are not an issue for recycling, opposite to debris, but this would be valid with plastic packaging too.

Today, **plastic food packaging is largely not recycled** and raises many questions related to the *“challenges of recycling plastics into food grade applications,”* as per Eunomia’s wording.

*“Simply comparing water consumption (or use) across the entire lifecycle does not provide a sufficient environmental indicator and **unless the two comparative systems are treated the same, the results could be unfairly influenced.** Without conducting fair and robust comparative assessments of water footprint, it is unwarranted to draw conclusive findings in this way.”*

Ramboll LCA takes into account the consumption of water, materials, energy, and any other consumption data associated with any life cycle stage included in the analysis, **both for single-use and multiple-use tableware systems analyzed.**

The study also includes the outputs of all involved processes in terms of products, waste, **wastewater** and emissions to the environment.

Implemented data has been retrieved from different reliable sources such as QSRs operators, EPPA members, and scientific papers published in peer-reviewed international journals. All utilized sources have been appropriately reported as references in the study to allow a transparent and fair evaluation of the study and reproducibility of performed analyses as long as the confidentiality of data allows.

It is important to note that for the *Freshwater consumption* impact category **both direct and indirect impacts have to be taken into account.**

It shall not be confused direct water consumption as Life Cycle Inventory data (i.e., direct consumption data) and impacts on the Freshwater Consumption category, which is instead a Life Cycle Impact Assessment result influenced by all the consumption data used (energy, materials, water) that thus considers the indirect effect associated with upstream processes contributing to the overall water footprint.

Based on the critical interpretation of the results, **indirect impacts are predominant mainly due to upstream processes of electrical energy production.** For example, potential environmental impact in the Freshwater consumption category associated to the European electricity grid mix, are mainly driven by many indirect upstream processes, such as nuclear electricity production in pressure water reactors, or in electricity production by hydro power plants, or in heat and power co-generation power plants.

The Ramboll November 2022 LCA assesses take-away services of foodstuff and beverages with single-use or multiple-use tableware in an average Quick Service Restaurant (QSR) for 365 days in Europe. Takeaway includes 4 selling channels (drive through, on-the-go, click and collect, home delivery). Tableware compared include cups, lids, containers, cutlery, carriers and bags.

For this comparative assessment, two fundamentally distinct systems are taken into consideration implying 17 different products: the current system for take-away services in QSRs based on single-use products made of paperboard, some of them with a polyethylene content lower than 10%, and their multiple-use alternative made of polypropylene.

The LCA model for this study is developed with open LCA software¹, using background data from Ecoinvent² (version 3.8) and scientific literature, primary data from European Paper Packaging Alliance and QSRs operators, and available public or commercial extension databases.

The LCA report is ISO 14040/44 compliant, and it has been subjected to:

1. An internal review conducted by two senior LCA experts.
2. External third-party review panel, composed by the following reviewers:
 - Michael Sturges (lead panellist) - RISE Research Institutes of Sweden / RISE Inventia AB, Sweden - a life cycle assessment practitioner with specific experience of environmental studies relating to the packaging and food service sectors
 - Prof. Umberto Arena - University of Campania "Luigi Vanvitelli", Italy - a chemical engineer with experience of packaging systems, including LCA studies on valorisation of paper and plastic waste streams
 - Frank Wellenreuther, ifeu - Institut für Energie- und Umweltforschung Heidelberg gGmbH, Germany - a life cycle assessment practitioner with specific experience of environmental studies relating to packaging systems.