

LCA most frequently asked questions

Who is Ramboll?

Founded in 1945 in Denmark, Ramboll is an independent expert company ranked as the number two environmental consultancy firm in Western Europe.

Owned by Rambøll Fonden (the Ramboll Foundation), Ramboll supports the European Commission on many regulatory topics such as the recent SUPD guidelines (Directive 2019/904), the Water Framework Directive, and the improvement of European batteries. Ramboll employs around 16,500 experts and is present in 35 countries.

What is the aim of the Ramboll Life Cycle Assessment (“LCA”)?

The aim of this LCA is to compare the environmental performance of single-use and multiple-use tableware used for in-store consumption of foodstuff and beverages in an average Quick Service Restaurant (QSR) over 365 days in Europe (27 EU countries + UK).

The system investigated includes 7 types of food and beverage containers: 10 different single-use products made of paperboard and 14 different multiple-use product items with 2 tableware set options: one set made of polypropylene (PP) as a “baseline scenario,” and one “traditional” set combining PP, ceramic, glass and steel for sensitivity analyses.

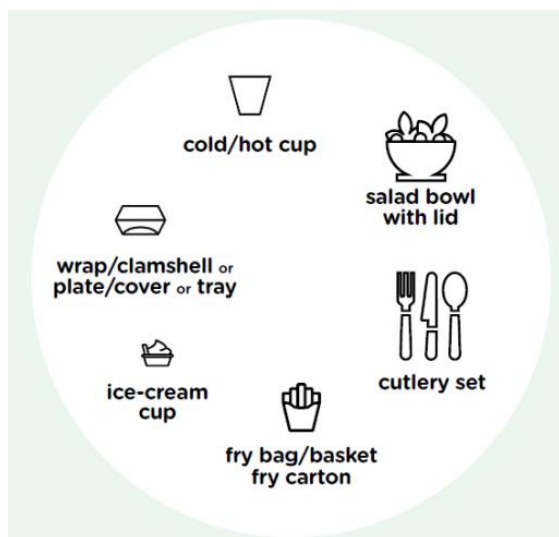


Fig. 1 Example of typical QSR table items used for the LCA

What are the key findings of the study?

The first key finding is that there are “*very significant benefits*” (according to the study) for paper-based single-use packaging in 6 out of 9 impact categories, including climate change and freshwater consumption. Those very significant benefits are mostly related to avoiding the large amount of energy and water needed during the reusable washing and drying phase.

The second finding highlights two key “hotspots” for both systems: the upstream production phase for paper-based packaging, and the washing and drying phase for the multiple-use dishes. For example, in the case of external washing, the impact of logistic activities offsets the advantages of a more efficient dishwashing process.

Thirdly, End-of-Life recycling rates and allocation method have an important role in LCAs and therefore the importance of these assumptions were studied with sensitivity analyses. The efficiency of recycling has key effects on freshwater consumption and metal depletion, rather than climate change. For example, when the recycling rate reaches 70% the advantage of paper-based items in terms of freshwater consumption increases from 3.4 to 228 times.

Has this study been reviewed and verified by an external party?

The Ramboll LCA is made in accordance with ISO 14040 and 14044 standards and has been independently verified by Germany’s TÜV (Technischer Überwachungsverein).

TÜV stated that: “*All significant parameters are available and representative and have been systematically derived and duly assessed. All type approvals have been checked. The assessments and the underlying data collection and calculation procedures are transparent and traceable.*”

The Ramboll LCA was recently audited by the specialized environmental agency In Extenso on behalf of ADEME, the French national agency for Environment, to be part of the ADEME reference bibliography.

Why is this study different in terms of robustness and reliability compared to previous studies?

The robustness and reliability of the study are related to 4 key factors:

1. A system-approach based on the holistic understanding of all the products’ processes.
2. Representative data and assumptions based on industry and QSR inputs.
3. Primary data for all relevant “hotspots” with state-of-the art paper upstream process data and washing/drying process data from producers and operators reflecting real use in QSRs.
4. Extensive sensitivity analysis, with 12 scenarios analyzed: 9 for the multiple-use system, 3 for the single-use system including different recycling rates (0%, 30%, 70%), washing scenarios (in-store or externalized washing), and different End of Life approaches (system expansion and cut-off method).

Why is there such a contrast with other studies showing advantages for multiple-use products?

Other studies are mainly product-focused, not “system-centered”: and prioritize the minimum number of reuses for a product to provide a better environmental benefit than its single-use alternative.

But the most significant difference is because previous studies rely on secondary and out-of-date data for the upstream paper value chain.

In contrast, the Ramboll LCA relies on primary and updated data.

For multiple use, how many number of reuse have been taken into account?

The number of reuse has been considered according to literature standards and tableware suppliers’ data: 100 times for polypropylene (“PP”), 250 and 500 times for ceramic and tableware glass, and 1000 times for metal.

It should be noted that the recent QSR feedback shows much lower figures of reuse: from 30 to 50 reuses maximum for PP, for example.

How is the End-of-Life considered in the study?

Because the LCA results are affected by the End-of-Life assumptions and calculation methods, it was imperative to be very conservative in the approach:

- In order to maximize transparency, recycling and energy credits are disclosed separately in the LCA.
- Although the LCA adheres to ISO 14044 standards using the “system expansion” approach, results have also been tested using the so-called “cut-off” approach in the sensitivity analysis when credits from system expansion are not accounted for. The comparative assertion between both systems is quite stable, despite altering the allocation approach.

For the baseline scenario, it should be noted that generic plastic packaging shows EU average recycling figures (about 40%) lower than paper packaging (about 85%). For data symmetry reasons, 30% material recycling and 70% incineration with energy recovery are assumed for both baseline scenarios, provided that appropriate sorting of post-consumer waste fractions is facilitated at the End-of-Life stage.

Sensitivity analyses were undertaken for 0% recycling and 100% incineration with energy recovery and for 70% material recycling and 30% incineration with energy recovery for both systems. In all these sensitivity analyses, single-use paperboard products still achieve significant benefits for 6 out 9 impact categories than multiple use.

The comparative assertion between both systems is quite stable, despite altering recycling rates or allocation methods, showing benefits to single-use system.

Is it true that tableware glass is not recyclable, ceramic is very rarely recyclable, and plastic reusable tableware is not widely recycled yet?

According to European legislation, 'recycling' means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations."

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A01994L0062-20180704>

Current discussions consider that a recyclable product:

1. Has an existing scalable technology,
2. And is widely available across a country.

In this respect:

- According to the French Trade Union Chamber of Mechanical Glassware: "***Culinary glass and 'tableware glass' often have a different chemical composition from packaging glass that makes it impossible to integrate them with the cullet used in glass furnaces. The 'transparent dishes' (plates, dishes...) is most of the time made from a ceramic that melts at a much higher temperature than the glass of a bottle. This is called an infusible. If it cannot be removed before baking, these pieces are found in the finished objects, which leads to defects in the packaging. It goes to landfill or an incinerator. It is therefore lost forever and unnecessarily 'clutters' landfill or incinerator. In addition, the cost of treatment per ton must be paid.***"
- ***Ceramics*** can't be easily melted down and reused for the same purpose or recycled as part of a new material. Most waste facilities do not accept it and ends up in landfills. Crushed ceramics can be used for very limited uses such as drainage systems and foundation base for driveways (though this is excluded from the European recycling legislation). Existing recycling streams for ceramics are very limited.
- ***Reusable plastic tableware*** can be recycled, but there are very few - if any - currently existing national schemes in the European Union. When assessed in the Ramboll LCA, the 30% and 70% plastic tableware recycling hypothesis do not change the outcome in terms of environmental performance in favor of paper-based single-use packaging. More generally, the recycling rates of plastic in Europe are low and dominated by PET and bottles.

What are the sensitivity analyses?

In total 12 sensitivity analyses were completed:

For the single-use system; different recycling rates of paperboard (0% and 70%).

For the multiple-use system:

- the same different recycling rates of polypropylene (0% and 70%);
- a varied demand for items (30% higher, 30% lower);
- an alternative “traditional” set of items including ceramic, tableware glass and metal;
- an optimized washing scenario;
- and an external washing with band-transport dishwasher.

For both systems, a different allocation of End-of-Life approach using the “cut-off” method. The environmental benefits for the single-use system in terms of Climate Change impact, Freshwater Consumption, Fossil Depletion, Fine Particulate Formation, Metal Depletion and Terrestrial Acidification are consistent throughout all considered sensitivity scenarios.

Have you considered the impact of increasing the level of green energy, following EU green deal goals?

Yes, we have.

The energy mix significantly affects the results for both systems, especially for the multiple-use one.

However, even considering higher shares of carbon neutral sources of up to 70% share of green electricity, the single-use system still outperforms the multiple-use one for climate change. It is to be noted that higher shares than 70% are very hypothetical as there are technological limits for having green electricity available.

Is landfill taken into account?

The baseline scenario comparing single-use paper-based tableware with polypropylene multi-use tableware does not take landfill into account, but 30% recycling and 70% incineration for both systems, although reusable plastic tableware is not widely recycled yet in the E.U.

Other hypotheses of recycling rates are also studied through sensitivity analysis.

For tableware glass and ceramic dishes, landfilling is considered a realistic End-of-Life scenario as ceramic is very rarely recyclable and tableware glass is not recyclable (opposite to bottle glass).

Why are some environmental impact categories are excluded, especially land use?

Some impact categories (ecotoxicity, human toxicity, photochemical oxidant formation, and land use) are excluded from the LCA due to the following reasons:

- The LCA predominantly focus on environmental impacts: categories solely attributable to damaging human health are therefore excluded.
- The assessment of toxicity impacts is not without controversy and would add additional uncertainty to the study.
- For certain categories, especially land use due forest operation, primary LCA data currently used and land use impact assessment methods are not compatible and when the scientific consensus is still missing, this creates challenges in land use modelling and when comparing different systems with different background data with each other. There are also methodological issues inherent to the available LCIA methods when applied to the forest industry.

Have you considered the impact on biodiversity?

Biodiversity is not an impact category referenced in certified LCAs: for methodological and compliance reasons, it simply could not be used for the study.

Consistent with the objective and scope of this LCA, ReCiPe was used as an LCIA method in this study, with the following impact categories: Climate Change; Freshwater Eutrophication; Freshwater Consumption; Metal Depletion; Fossil Depletion; Fine Particulate Matter Formation; Terrestrial Acidification; Stratospheric Ozone Depletion; Ionizing Radiation.

Knowing the differences between countries, is the European scope of the study relevant?

The LCA is indeed relevant at the European level because of the system studied:

- Quick Service Restaurants are highly standardized whether it be in terms of meals and drinks, packaging and operational system.
- The main variables by country are related to the energy mix and the recycling rates: two data that are well known.