Reusable vs. Disposable Service Ware at Events: Which is Best?

When comparing service ware options for your event even the most resource intensive reusables are typically a better environmental choice than disposable service ware.

From coffee cups to cutlery, disposable food service ware products generate a lot of solid waste. But reusable service ware also has impacts, including manufacturing and dish-washing. So, what's the best choice? The purpose of this paper is to provide a lifecycle analysis for various food service ware options in order to compare the environmental impacts in each case, and provide decision-makers with researched information on better and best choices for their events.

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Food Service Ware: What Is It Made Of?

Food service ware can be made of many different types of materials. And the environmental impacts associated with the lifecycle of these products can be complicated. The following table provides a simplified summary of typical service ware materials and considerations for use.

	MATERIAL TYPE	USED FOR	RELATIVE MANUFACTURING IMPACT	RELATIVE LIFESPAN	TYPICAL RECOVERY METHOD AT EVENT VENUES
	CERAMIC	Plates, bowls, mugs, saucers	High	Long	Landfill
	GLASS	Plates, bowls, mugs, saucers	High	Long	Recyclable
	STAINLESS STEEL	Cups, utensils	High	Long	Recyclable
PLASTICS	POLYETHYLENE TEREPHTHALATE (PET #1)	Cold cups, to-go containers, water bottles	Moderate	Short	Landfill[1] May be recycled
PLASTICS	POLYPROPYLENE (PP #5)	Cold cups, to-go containers	Low	Short	Landfill[1] May be recycled
PLASTICS	POLYSTYRENE (PS #6)	Hot cups, to-go containers, utensils	Moderate-Low	Short	Landfill
PLASTICS	REUSABLE PLASTIC (PC #7)	Cups, plates, bowls	Moderate-High	Long	Landfill
PLASTICS	POLYLACTIC ACID (PLA #7)	Plates, bowls, cups, utensils, to-go containers	Moderate-Low	Short	Landfill
	PAPER, WOOD FIBER	Cups, utensils, to-go containers	Moderate-High	Short	Landfill[2] May be recycled
	OTHER PLANT FIBER	Plates, bowls, cups, utensils, to-go containers	Moderate-High	Short	Landfill[2] May be recycled

If the above summary makes the best choice clear as mud don't despair! It is possible to determine which type of service ware is best by using the following decision-making tree.

1 Although PET and PP plastic may be recyclable when clean, plastic food ware is often dirty and unable to be recycled in real-world applications.
2 May be composted if product is certified compostable and a facility exists.

Do guests need to leave the venue with the food and beverages?

NO

People are staying put!

COLD BEVERAGES[3]

✓ Use glass if the cups will be reused at least **15 times.**

✓ Use reusable plastic if the cups will be reused at least **10 times.**

✓ Use stainless steel if the cups will be reused at least **24 times.**

✓ Use ceramic if the cups will be reused at least **50 times**.

✓ = Best option
✓ = Better option

HOT BEVERAGES

✓ Use ceramic mugs. They are the best alternative to polystyrene foam provided they are reused **320 times.**

And better than paper provided they are reused **56 times**.

PLATES, BOWLS, UTENSILS[4]

✓ Use glass plates and bowls if they will be reused at least **15 times.**

✓ Use reusable plastic if items will be reused at least **17 times.**

✓ Use stainless steel if items will be reused at least **24 times.**

✓ Use ceramic if the plates, bowls and utensils will be reused at least **118 times.**

YES

My people are grabbin' and goin'!

COLD BEVERAGES[3]

✓ Use reusable plastic if the cups will be reused at least **10 times.**

✓ Use PET plastic if recycling is available.

✓ Use compostable paper or PLA plastic cups if composting is available.

HOT BEVERAGES

✓ Use compostable paper cups and lids that will be composted.

PLATES, BOWLS, UTENSILS[4]

✓ Use PET plastic if recycling is available.

✓ Use compostable items, such as paper plates and bowls or PLA plastic or wood utensils, that will be composted.

DID YOU KNOW?
Dishware is reused an average of 2,500 times in a restaurant setting!

We hope the above summary provides you with the basics you need to know when making more sustainable food service ware choices. If you'd like more technical background and detail on our research please read on!

3 Cold cup comparisons contrast glass and stainless steel with disposable paper, reusable plastic with disposable PP plastic and ceramic with disposable PET or PLA plastic.
4 Plate and bowl comparisons contrast glass, reusable plastic and ceramic with disposable paper. Utensils comparisons contrast stainless steel with disposable wood.

Ceramic vs. PLA (Plant-based) Service Ware

If comparing a single use, manufacturing ceramics is more resource intensive than PLA across the board. It can be assumed, however, that PLA ware is disposable and, therefore, will only be used once. It can also be assumed that a caterer or business will maximize the number of times each ceramic product is reused. If we look at the environmental impact of manufacturing just one ceramic and PLA plate, it would look like this with ceramic in blue and PLA in green (Broca, 2008):

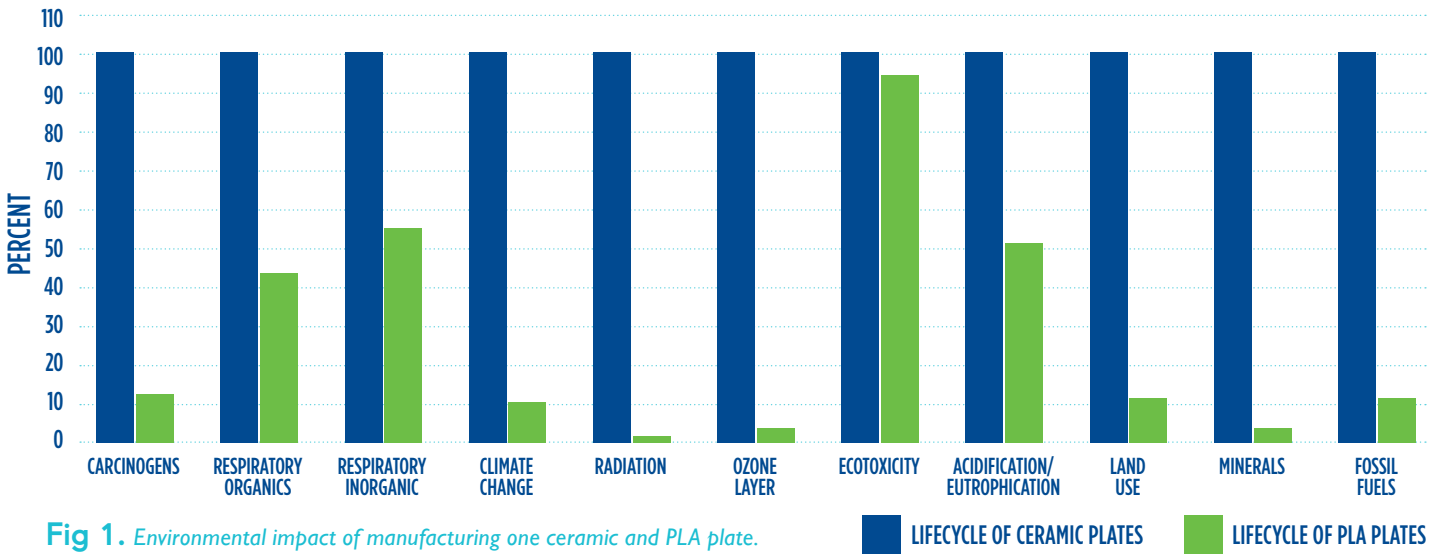

Fig 1. *Environmental impact of manufacturing one ceramic and PLA plate.*

But if we expand these numbers to just a few reuses, ceramics become the preferred option in several categories.

The life cycle of a product must include all factors and take things like transportation and disposal methods into account. PLA ware can be composted at a certified compost facility, however as of 2019 there were only 185 full-scale food waste composting facilities in the United States, of which 50-60 accept PLA (BioCycle, 2019). This fact makes it extremely unlikely that a PLA product is able to be collected and composted in the vast majority of markets.

The analysis by BioCycle, 2019 shows the environmental impact of one ceramic plate reused 50 times, and 50 disposable PLA plates. It is found that after 50 reuses, the impact in each case are equal, or "break-even." The break-even point will be used throughout this analysis to compare the number of times at which reusables and disposables have a similar environmental impact. It is assumed that both use the same transportation methods and are disposed of in a landfill. Research into disposable cups has suggested that the environmental burden of disposable PLA is comparable to that of disposable PET and much higher than that of disposable paper cups (Pladerer et al.,2008).

Ceramic vs. Polystyrene (Styrofoam) and Paper Service Ware

Like PLA manufacturing, ceramics are more resource intensive to produce than polystyrene and paper. Many studies have compared the impact of reusable vs. polystyrene/paper ware over the years, but none more than with hot beverage cups. Given that caterers typically budget for two disposable hot beverage cups/person/day at events (MeetGreen), these items are among the highest volume of waste.

Life cycle studies span the past 25 years, and vary in their results due to technological advances most notably in washing efficiency. In 1994, Hocking found that it would take almost 1,000 reuses for ceramic and disposable polystyrene to break-even. A similar study in 2007 (TNO) noted that dishwashing was responsible for 90-100% of their environmental impact. Since 2007, enhancements in dishwashing energy efficiency and water usage, along with differences in energy sourcing (natural gas and hydroelectric) have contributed to improving those numbers to more directly favor reusables.

The table below (Sheehan, 2017) compares several studies done from 1994-2013 and can be used to find an average break-even point for ceramics vs. polystyrene and paper.

Disposable

Reusable	POLYSTYRENE FOAM (EPS)						PAPER				
CERAMIC	Hocking 1994	Denison 1998	Ziada 2009	Carbon Clear 2012	Woods & Bakshi 2014 Calif 2004BAT	Woods & Bakshi 2014 Calif 2013BAT	Hocking 1994	Denison 1998	Starbucks 2000	Ziada 2009	Carbon Clear 2012
	1000	260	127	354	110	70	39	120	70	18	31

Fig 3. *Ceramic vs. EPS vs. Paper: number of reuses required to break-even.*

AVERAGE NUMBER OF REUSES TO BREAK EVENT ACROSS ALL STUDIES

Ceramic vs. Polystyrene: **320**

Ceramic vs. Paper: **56**

Comparing Ceramics to Other Reusable Materials

Ceramics are the most resource intensive material to manufacture when compared to other typical reusable materials. Glass, metal, and heavy plastics are often used in some combination, and result in a lower break-even number.

Figure 4 compares the number of reuses required to break-even in energy use against disposable paper products. It should be noted that when comparing ceramics to disposables, materials consumption, air/water pollution, and solid waste are reduced after about 60 uses (SAW, 2014). The energy required to produce ceramics is proportionally higher and is reflected in the higher break-even number in Figure 4.

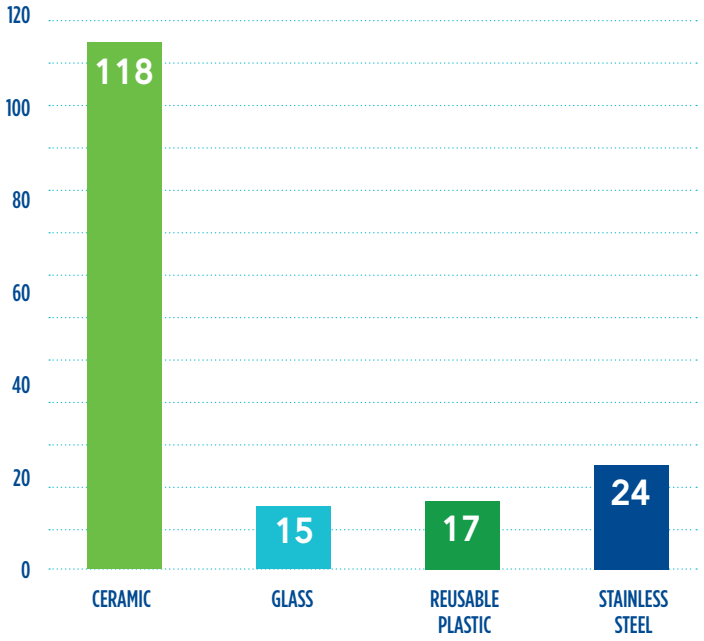

Fig 4. *Number of reuses required to break even in energy use against disposable paper products.*

Number of Reuses

It is the goal of restaurants, caterers, and environmentalists alike to maximize the reuse potential of each product. If the average ceramic plate was being damaged, lost, or broken before the break-even point, it would be beneficial to use disposable products based on their life cycle. Although exact reuse numbers are difficult to quantify, it is estimated that dishware is reused an average of 2,500 times in a restaurant setting (SAW, 2014). Given the travel and increased handling, this number is likely lower for event catering operations. However, MeetGreen found that during a five-day event with 4,502 participants using 100% reusable service ware, less than 0.5% of materials were lost, damaged, or broken (MeetGreen, 2015). It can be assumed that the average number of reuses far exceeds even the highest break-even point shown in the research.

The chart in Figure 5 shows the cumulative environmental impact of ceramic vs. various disposable options based on number of times used or reused. At the far right, a low average of reuses for ceramics has been set at 1,000, at which point disposable options are at a minimum 6x (polystyrene) and a maximum 20x (PLA) more environmentally damaging. It should also be noted that polystyrene, or foam plastic, and paper plates are rarely used at conferences and events due to their durability, so PLA is a more realistic comparison.

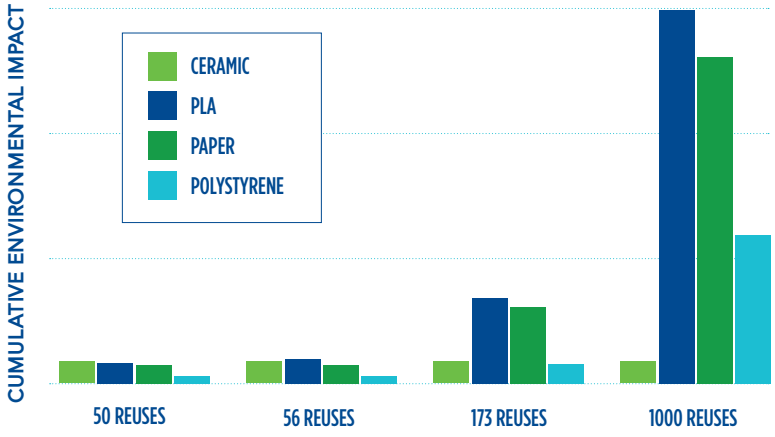

Fig 5. *Cumulative environmental impact of ceramic plate vs. various disposable options over time.*

Reuse vs. Recycle – Plastics

Reduce, Reuse, Recycle. A mantra and an order of preferred action that still rings true four decades after its creation. Although recycling is preferable to landfill, it is almost always better to reuse a product than dispose of it. One of the most commonly recycled products is single-use PET water bottles. Caterers provide 2-3 bottles/person/day at conferences and events which contributes to onsite waste as well as water, energy, and emissions from manufacturing, transportation, and disposal. An extensive study done in 2006 (Franklin Associates) found that even in best-case recycling scenarios, emissions impacts were 98% higher than reusables over time. Further, recycling PET bottles reduces CO2e emissions by only 16% when compared to landfill.

Conclusion

When comparing disposable service ware to even the most resource intensive reusables, in almost all typical cases the reusable service ware has a much lower environmental footprint.

While it's true that if everything is held constant, including the number of uses, reusable products are more resource intensive and have a higher environmental impact than disposable products. But as we've seen, these impacts break-even at a far lower number than the typical durable product is reused. As a larger proportion of our energy comes from renewable sources and appliances become more efficient, the break-even number will continue to decrease and more heavily favor reusables.

Resources

BioCycle, 2019
Broca, 2008
Franklin Associates, 2007
Garrido and Alvarez, 2007
MeetGreen, 2015
Pladerer, Dinkel, Zschokke, Dehoust, Schüler, 2008
SAW, 2014
Sheehan, 2017
Vercalstern, Spirinckx, Geerken, 2010

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