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Disposable cups in the Japanese Café Industry



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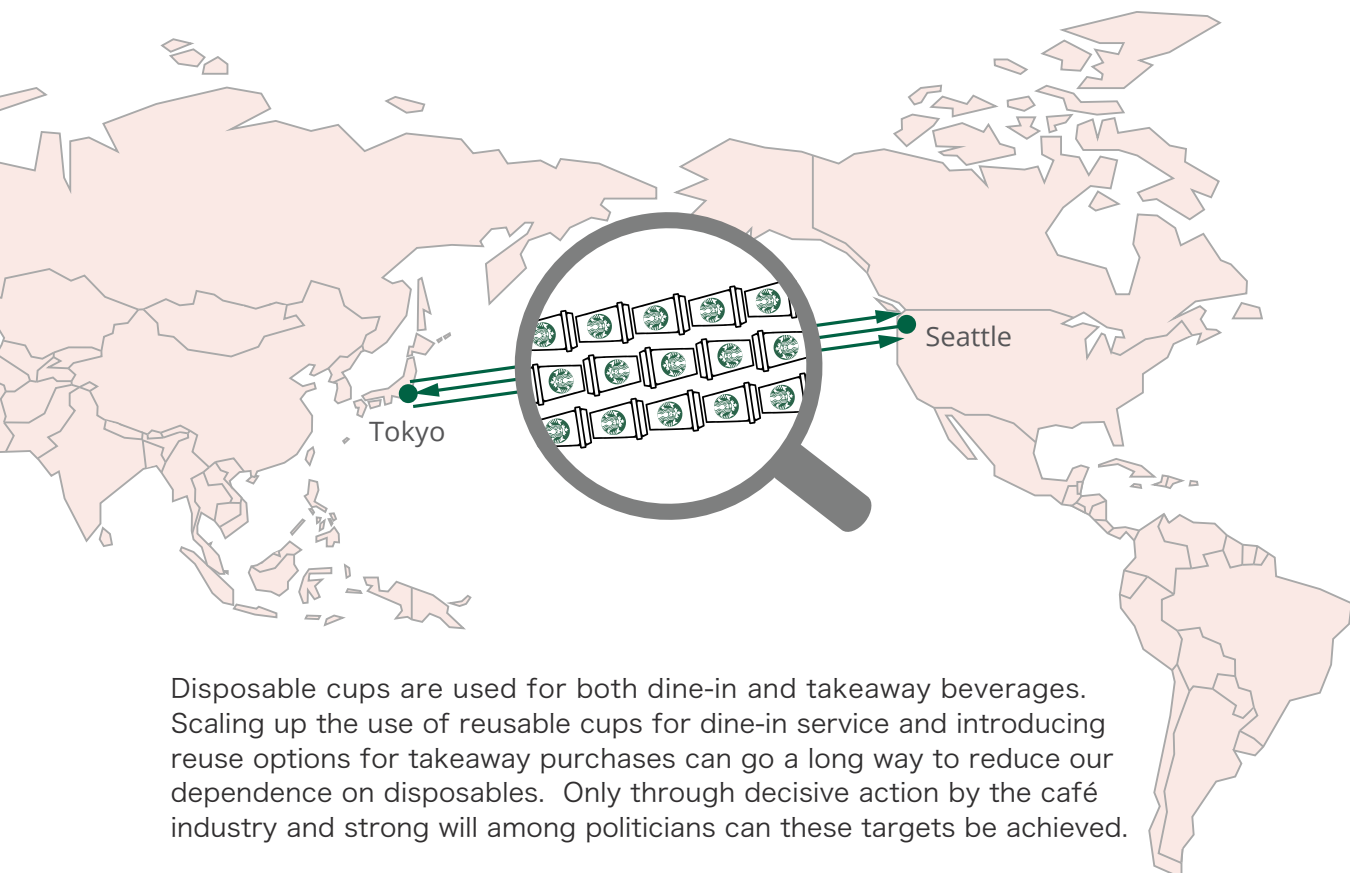
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Abstract

Disposable cups are one of the most common single-use items that we come across in our daily lives. The use of disposable cups is particularly commonplace in the Japanese café industry. However, despite their prevalence, the exact expenditure of disposable cups in the Japanese café industry remains unclear and thus, the scale of the problem is not fully understood. This report provides a quantitative assessment on the use of disposable cups by some of the key players in the Japanese café industry.

Nine major Japanese coffee chains - *Starbucks*, *Tully's Coffee*, *Pronto*, *Doutor*, *Caffé Veloce*, *Excelsior Caffé*, *Ueshima Coffee House*, *Café de Crié*, and *Komeda* - expended an estimated 369.5 million disposable cups in 2020. That is equivalent to over a million disposable cups every day. These nine chains accounted for nearly 50% of all the disposable cups that were used by the Japanese coffee chain sector and contributed 2808.8 metric tons of waste to incinerators and other disposal sites from disposable cups alone. To put it in perspective, the number of disposable cups that these nine chains expended in just one year had, when stacked up, a combined height of over 60,000 Tokyo Skytrees.

Starbucks is the biggest source of disposable cups within the Japanese café industry and accounts for more disposable cups than all the other eight chains in this study combined. **The amount of disposable cups that *Starbucks* used in 2020 has a combined length that reaches from Tokyo to Seattle, the headquarters of *Starbucks*, more than three times.** *Tully's Coffee* and *Pronto* are two other big sources of disposable cups. These three chains combined used 339.5 million cups in 2020, equivalent to an excess of 900,000 cups daily.



Disposable cups are used for both dine-in and takeaway beverages. Scaling up the use of reusable cups for dine-in service and introducing reuse options for takeaway purchases can go a long way to reduce our dependence on disposables. Only through decisive action by the café industry and strong will among politicians can these targets be achieved.

Introduction

Plastics

Within a couple of generations, plastics have become one of the world's most pressing environmental challenges. Although they have only existed for little over 70 years, it is now hard to imagine our convenient lives without them.

Since 1950 the world has produced more than 9,200 million metric tons (Mt) of plastic with an additional 400 million Mt being added each year^{1,2}. Under the business-as-usual scenario this number is projected to rise to a harrowing 34 billion Mt by 2050^{1,3}, or to put it into perspective, more than 100 times the weight of the entire human population.

From all the plastics generated so far, approximately **7,000 million Mt** have been turned into waste. The question then becomes: where did all that plastic end up?

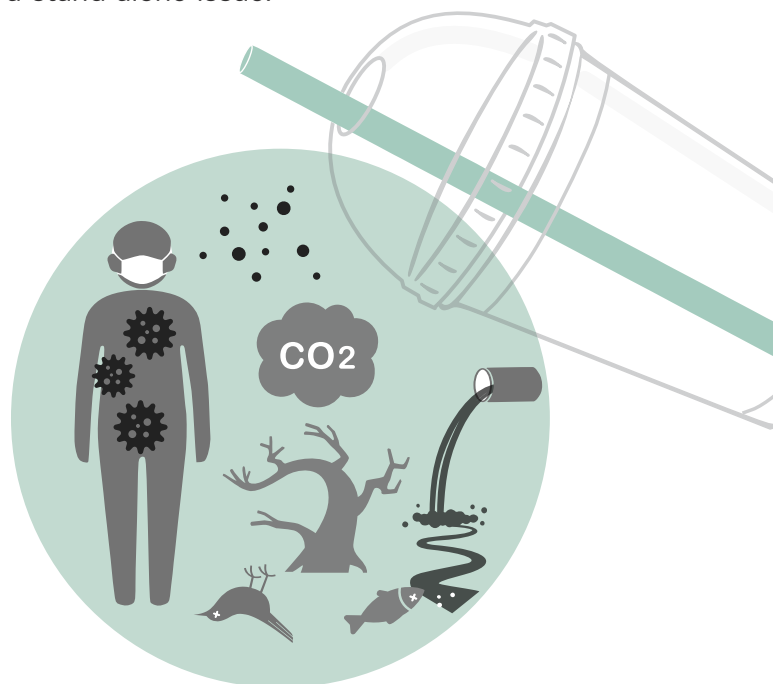
Approximately 10% has been recycled, 14% has been incinerated and the vast majority, more than 75%, has piled up in landfills or, through mismanagement, has ended up in the environment¹. This steady stream of plastic waste has detrimental effects on all living beings.

One ecosystem in which the plastic pollution crisis has been well documented is the Earth's oceans⁴. Some 150 million Mt of plastic are currently floating in the oceans, a number expected to rise continually until even surpassing the total amount of fish (in mass) by mid-century^{5,6}. The negative impacts on wildlife are numerous, from entanglement⁷ and ingestion⁸ to exposure to toxic compounds⁹.

As plastics are very durable by design, they hardly decompose entirely, but instead break down into smaller pieces light enough to float around in the air we breathe¹⁰, and small enough to enter and accumulate in our organs, tissues and blood with ease¹¹. As research is still in its infancy, the health effects on humans have yet to

be elucidated, but are clearly reasons for concern.

Unfortunately, the detrimental nature of plastics is not limited to the material itself, but rather spans its entire lifecycle, from the extraction of fossil fuels, transport, manufacturing, and consumption of the product up to end-of-life processes. Seeing that each stage is linked to CO₂ emissions, air and waterway pollution, ecosystem degradation, and human health impacts such as cancer, leukaemia, reproductive and developmental impairment, among others¹², and that it is intrinsically linked to climate change and other socioeconomic challenges¹³, plastic pollution is clearly not a stand-alone issue.



The café industry

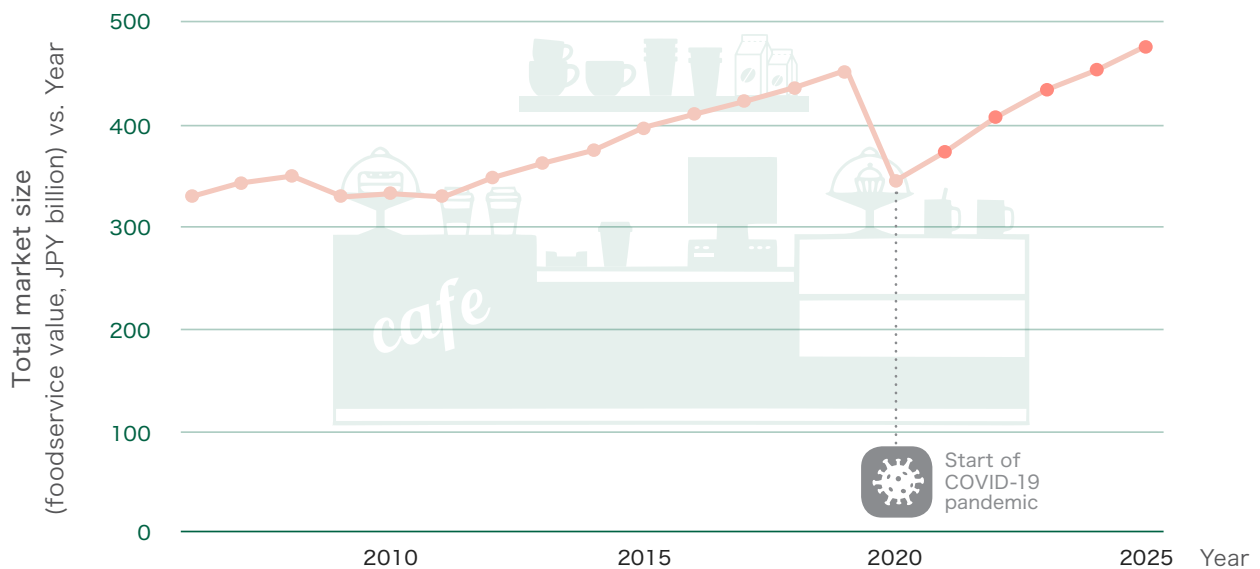
Single-use products that end up being discarded after just a few minutes of usage constitute a major crisis. Coffee cups are one element of this throwaway culture that has become a problem on a global scale. According to the 2020 International coastal cleanup report, plastic lids, cups, and plates are among the top-ten most-found items along the world's coastlines¹⁴.

Japan alone is throwing away more than 3.9 billion cups every year, out of which coffee chains are responsible for 440 million plastic cups and 360 million paper cups. The majority of these cups will be incinerated¹⁵.

The popularisation of disposable cups, often adorned with chain logos and appealing images, is in and of itself a cultural phenomenon that has homogenised the way in which beverages are served across large parts of the café industry. Although some chains limit the use of disposable cups for takeaway service only and serve beverages for dine-in in reusable cups,

many chains have chosen to handing out disposable cups indiscriminately of where the beverage will be consumed.

In 2020, the COVID-19 pandemic caused a temporary slump in the café industry (Graph 1), but as the economy gradually recovers, branded cups as a popular marketing strategy, coupled with ambitious plans of major coffee chains like *Starbucks* to further expand businesses within Japan, the number of disposable cups is expected to increase, thereby increasing carbon emissions and environmental pollution. That is, if café chains continue to operate under the business-as-usual scenario.



Graph 1
Historic (2006-2020) and forecasted (2021-2025) performance of the Japanese café sector

False solutions

How to solve this problem? With the rise in public awareness, companies are attempting to solve the plastic crisis by shifting to alternative materials, such as paper. Most café chains are already using paper cups for their hot beverages, and *Starbucks*, *Doutor*,

and *Pronto* even use Forest Stewardship Council (FSC) certified paper cups. In February 2022, *Excelsior Caffé* also joined their ranks by announcing the shift towards FSC paper cups for their cold beverages.

While at first glance, paper may seem like a more sustainable alternative, paper-cup production on a large scale causes

deforestation and the consequent loss of habitat, loss of biodiversity, reduction in carbon sequestration, and the release of already stored carbon into the atmosphere, further exacerbating the climate crisis.

Even paper cups made from third-party certified paper, such as by the FSC, are not necessarily the environmentally better choice¹⁶. Not only is clear and comprehensive evidence that forest certifications have long-term positive effects on biodiversity, or the climate in general, still lacking¹⁷, but they also do not address the underlying problem of logging and the accompanying negative effects on the integrity of local ecosystems.

Although paper itself is technically recyclable, in reality, recycling rates of paper cups are as low as 0.25% in the UK¹⁸, below 1% in the US¹⁹, and according to a report by the Tokyo Metropolitan Government Bureau of Environment, “[cups are] mostly not recycled” in Japan¹⁵.

One reason for this reality is that intermediate treatment is necessary to assure a high quality of the later recycled material. This includes collecting, sorting, washing, and shredding, making the process cost intensive and logistically challenging¹⁵. In addition, paper cups are laminated with a thin layer of plastic on the inside for hot beverages and on both sides for cold beverages to make them waterproof. For recycling, this layer must be separated, itself a complex and cost intensive process.

With millions of trees cut down annually for single-use paper cup production and further human health and climate impacts during the production, consumption, and waste management stages, it becomes clear that shifting from one type of disposable cup to another cannot be the answer.

Towards real solutions

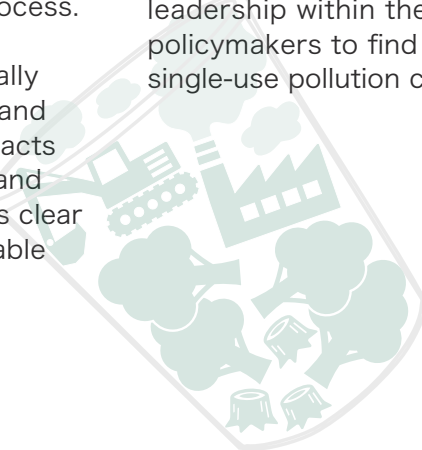
Instead of trying to grapple with the flood of plastic pollution and their short-lived substitutes, the focus should be on the mantra of “reduce, reuse, and refill”. Reducing the production and consumption of disposable single-use cups in the first place and shifting towards, or scaling up, circular business models.

Recent studies have shown that reusable alternatives are more environmentally friendly in every aspect compared to their single-use counterparts. Reusable cups, if being used until after their break-even-point, not only emit less CO₂, require less water, less energy, and less fossil fuel, but also have been shown to be economically beneficial^{20,21}.

Aim of this report

Far from the only industry that is structured around disposables, the café industry has nonetheless perpetuated and intensified the modern throwaway culture and turned the disposable coffee cup into a status symbol. However, there is a noticeable lack of transparency about the amount of waste each of the major coffee chains produces.

This report aims to expose the amount of plastic and paper cup waste that the major coffee chains in Japan are responsible for, and hopes to ignite change and innovative leadership within the industry and from policymakers to find real solutions to the single-use pollution crisis.



Research scope

Selection criteria

The Japanese café sector is diverse and includes both small-scale boutique establishments serving only specialty beverages to restaurant-style establishments with a comprehensive range of food, beverage, and merchandise items. Moreover, even in colloquial speech, the consensus on the types of establishments that classify as a “café” is far from unanimous. Some cafés in Japan offer table service while others are takeout only. Some cafés predominantly serve coffee whilst others also specialise in comestibles. In this study, the establishments that are within the scope of the research fulfil the following three criteria:

1. The establishment is “chained”, as defined by a minimum of ten branded outlets across Japan in the year 2020
2. Coffee- or tea-based beverages are the primary items on the menu and the primary products of the establishment
3. The establishment derives approximately 50% or more of its total income from the sales of beverages

These three criteria are formulated in order to address cafés that are first and foremost beverage-focused establishments in which coffee- and tea-based beverages are the primary items, and the sale of food and merchandise is secondary. The focus of the study is beverage establishments that broadly fall under the category of “coffee shops” popularised in the last two decades and epitomised by the retail style of the likes of global chains such as *Starbucks*, *Costa Coffee*, and *Tim Hortons*.

Establishments










Nine major food and beverage establishments are included in the study, as shown in Table 1. They have been selected on the basis of their market shares and are therefore among the biggest chains in the Japanese café sector. Only establishments for which market share can be assessed are included within the scope of the study. The market share data are extracted from Euromonitor International²².

Name of the establishment (Table 1) refers to the local brand name as the establishment is referred to in Japan (on a country-product level), which may differ from the name of the national (in Japan) or global brand owner in other variant levels. For example, both the chains *Excelsior Caffé* and *Doutor* are owned by *Doutor Coffee Co Ltd* in Japan, but they will be referred to by their respective local names.

Market share (in Table 1) refers to the percentage of total foodservice value or the total number of transactions that the chain captured in 2020 within the scope of establishments defined by the three criteria outlined above. Foodservice value is defined as the total price, including Value Added Tax, paid by consumers at food and beverage outlets in a non-captive market. While the rankings of the biggest food and beverage establishments by the two measures of market shares largely align, there are noticeable differences for high volume and low cost chains that appear higher when ranked by number of transactions rather than foodservice value, reflecting different business models within the Japanese café industry.

Table 1

Lists the nine large coffee chains investigated in this study and their respective market shares (%), either as foodservice value or number of transactions.

Name of Establishment (English)	Name of Establishment (Japanese)	Market share in 2020 (%)	
		Foodservice	Transactions
 Starbucks	スターバックスコーヒージャパン	14.1	16.4
 Komeda	コメダ珈琲店	6.0	9.1
 Doutor	ドトールコーヒーショップ	5.4	10.7
 Tully's Coffee	タリーズコーヒー	5.0	6.9
 Pronto	プロント	4.3	1.6
 Excelsior Caffé	エクセルシオールカフェ	0.8	1.3
 Caffé Veloce	カフェベローチェ	0.6	1.4
 Ueshima Coffee House	上島珈琲店	0.5	0.7
 Café de Crié	カフェドクリエ	0.4	0.7

Transactions and receipts

The terms transaction and receipts are used interchangeably, with both referring to single purchases made by a customer encompassed within a single physical receipt. One payment by a customer to an establishment equates to one transaction or one receipt, irrespective of the number of foodstuff or merchandise items purchased in the transaction. A single purchase of one cup of coffee and a single purchase of multiple beverage and food items both constitute one transaction or one receipt.

Timeframe

This study assesses the Japanese café sector's expenditure of disposable cups in the year 2020. The pandemic has undoubtedly taken a toll on the Japanese food and beverage industry and figures show that both the total foodservice value and the number of transactions of the café sector in Japan hit an all-time low in 2020 compared to the period 2007 to 2020. The restrictions on dine-in service and group gatherings likely contributed to a higher proportion of takeaway purchases, and hence, a comparatively higher rate of disposable tableware usage.

Methodology

Data sources

Data were obtained from multiple sources. Processed data from databases and data companies are used whenever possible, which are then supplemented with field data from Greenpeace Japan investigations. The calculations of the study are made using four sets of data:

1 Japanese café sector market share and performance (Source: Euromonitor International)

The market share data obtained from Euromonitor International contain information about the size, sales performance, and consumption trends of the Japanese café sector on an industry level.

2 Japanese consumer behaviour and consumption patterns (Source: WED 株式会社 - receipt purchase app ONE)

The data on the behaviour and consumption patterns of Japanese consumers from the receipt purchase app ONE shine a light through empirical data on the when, where, and how of Japanese consumers' spending habits, with emphasis on modes of consumption (dine-in, takeaway, drive-through, online orders) and types of beverages (hot coffee, iced coffee etc.). Takeaway, drive-through and online orders are grouped together into the takeaway category as all three necessitate the use of disposable cups.

3 Chain-specific cup material pattern and average weight of disposable cups (Source: Greenpeace Japan)

The type of cup material used for different types of beverages and the general company policy on the usage of reusable tableware were observed in-store by Greenpeace Japan. The information on the chain-specific cup material patterns was then used to calculate the overall reuse rate and the total number of plastic and paper cups for dine-in and takeaway customers.

For all the surveyed coffee chains, observations were conducted during the months of February and April 2022 in three randomly-selected stores for one continuous hour. Times of observation were also selected at random. Customers' beverage orders were documented and roughly divided into two categories, namely disposable tableware (paper, plastic) or reusable tableware.

In addition, disposable paper and plastic cups from each coffee chain were obtained, washed, dried, and weighed to convert the total number of cups into their weight equivalent.

Here it must be mentioned that as observations were conducted during the colder months, it is notable that more hot beverages were consumed. Thus, in chains in which cold drinks are commonly served in plastic cups and hot drinks either in paper or reusable cups, the reuse ratio calculated from in-store observations might include a bias towards a higher reuse rate than can be assumed as the annual average. This seasonal bias does not affect the overall store-specific cup material pattern or the ratio between plastic and paper cups later calculated from the customer receipt data on the basis of the observed material pattern.

4 Material analysis of disposable cups and lids (Source: Greenpeace International Science Unit (Research Laboratories in Exeter, UK))

Disposable cups from all nine coffee chains were collected and sent to the Greenpeace International Science Unit for Fourier-transform infrared spectroscopy (FT-IR) where the materials of the disposable cups and their polymer compositions were ascertained.



Cup weighting at the calculation stage of the data analysis.

Calculations

The quantitative analysis of the data is split into three successive stages.

1

Stage One uses the **Japanese café sector market share and performance** data to calculate the total volume of transactions of the major chains through the following steps:

- 1.1 Determine the total number of transactions of the industry
- 1.2 Determine the market share of each chain within the industry
- 1.3 Calculate the total number of transactions for each chain in 2020

$$\begin{aligned} & \text{Number of transactions of industry (1.1)} \times \text{Market share of chain (1.2)} \\ & = \text{Number of transactions of chain} \end{aligned}$$



2

Stage Two uses the **Japanese consumer behaviour and consumption patterns** data to estimate the total proportion between dine-in and takeaway, and between beverages and non-beverages in consumer purchases of each chain. The analysis relies on at least 400 randomly selected (gender, age, household composition, area) single receipts from Japanese consumers for each establishment in 2021 for a confidence level of at least 95% and a maximum 5% margin of error. Stage two is chain-specific and consists of the following steps:

- 2.1 Determine the average spending per transaction (SPT) for each café chain
- 2.2 Determine the foodservice value ratio between beverage and non-beverage purchases for each café chain
- 2.3 Determine the foodservice value ratio between takeaway and dine-in purchases for each café chain
- 2.4 Calculate the average SPT attributed to takeaway beverages and dine-in beverages for each café chain

$$\begin{aligned} & \text{Average SPT of chain (2.1)} \times \text{Ratio of beverages of chain (2.2)} \\ & \times \text{Ratio of takeaway or dine-in beverages of chain (2.3)} \\ & = \text{Average SPT for takeaway or dine-in beverages} \end{aligned}$$

- 2.5 Estimate the total foodservice value from takeaway beverages and dine-in beverages purchases for each café chain

$$\begin{aligned} & \text{Number of transactions of chain (1.3)} \\ & \times \text{Average SPT for takeaway or dine-in beverages (2.4)} \\ & = \text{Total foodservice value for takeaway or dine-in beverages} \end{aligned}$$

- 2.6 Calculate the average spending for a single beverage for each café chain
- 2.7 Estimate the total number of takeaway beverages and dine-in beverages consumed for each café chain

$$\begin{aligned} & \text{Total foodservice value for takeaway or dine-in beverages (2.5)} \\ & \div \text{Average beverage spending (2.6)} \\ & = \text{Total number of takeaway and dine-in beverages per chain} \end{aligned}$$

3

Stage Three calculates the total number of disposable cups sold for takeaway and dine-in using the information on **chain-specific cup material patterns** obtained during the in-store observations. The total number of disposable cups was further converted into their respective weight equivalents.

Here it must be noted that contrary to their reuse-focused cup material pattern, one *Excelsior Caffé* store was identified to be serving cold beverages solely in FSC paper cups. Upon request, *Excelsior Caffé* affirmed that this was an isolated incidence and this outlier was thus not included in the calculations.

- 3.1 Ascertain the chain-specific pattern for cup material (reuse, plastic, paper) used for takeaway and dine-in beverages

(No occurrence of use of tumblers brought by customers was recorded during the in-store observations and the rate is assumed to be negligible, and thus it is not included in the calculations)

- 3.2 Determine the chain specific reuse rate and disposable rate for takeaway and dine-in beverages
- 3.3 Estimate the total number of disposable plastic and paper cups for each chain

*Total number of takeaway/dine-in beverages for chain (2.7)
x Reuse/disposable rate for chain (3.2)
= Total number of disposable plastic and paper cups for takeaway/dine-in*

- 3.4 Determine the average weight of one plastic and paper cup through empirical analysis (Appendix, Table 6) and estimate the total weight of disposable plastic and paper cups sold by each chain

*Number of disposable plastic and paper cups (3.3)
x Average weight of plastic/paper cup
= Total weight of disposable plastic and paper cups*

- 3.5 Send survey to all chains to request data on their consumption of disposable cups and disposable use rate for dine-in and takeaway service for 2020





4

Stage Four determines the material composition through **material analysis of disposable cups and lids** from each of the nine chains via FT-IR. The materials in the structure of the disposable cup and of the inner and outer coating, if present, were determined separately. Two representative disposable cups were analysed for each chain – a plastic-based cup used for serving cold beverages and a paper-based cup used for serving hot beverages. In the case of Excelsior Caffé, a third cup, the newly-introduced FSC paper cup for cold beverages, was analysed in addition.

- 4.1 Analyse the materials of the core component, the outer coating, and the inner coating of the disposable cups using FT-IR
- 4.2 Analyse the materials of the lids using FT-IR



Identification of plastic and paper cup material for nine of Japan's major coffee chains through Fourier-transform infrared spectroscopy (FT-IR).

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Findings

Total number of disposable cups










The estimated total number of disposable plastic and paper cups in millions (M) and the equivalent weight in metric ton (Mt) sold by the nine big café chains in 2020 are summarised in Table 2. In addition, Greenpeace reached out to the nine coffee chains investigated in this study and asked them to provide information on the number

of disposable cups they sold in 2020. This information can also be found in Table 2.

Noticeably, the consumer behaviour and consumption patterns analysis in stage two of the calculations did not observe any takeaway purchases for *Komeda* among the 400 receipts sampled. This is rooted in the fact that *Komeda*'s business model focuses predominantly on dine-in consumption.

Table 2

Shows the total number in million (M) and total amount in metric tons (Mt) of disposable cups sold by nine of Japan's major coffee chains in 2020. The total number of disposable cups is broken down into the number of paper and plastic cups for both dine-in and takeaway services. In addition, Greenpeace reached out to all nine coffee chains investigated and asked them to provide information on their expenditure of disposable cups. If provided, they are also added in this table (in light gray).

Name of Establishment	Takeaway		Dine-in		Total number of disposable cups (M)		Total amount of disposable cups (Mt)
	Plastic (M)	Paper (M)	Plastic (M)	Paper (M)	Greenpeace calculations	Café chain self-reported data	
 Starbucks	97.8	50.4	44.3	39.3	231.7	-	1626.7
 Tully's Coffee	16.9	11.8	22.8	21.0	72.5	-	544.0
 Pronto	4.3	2.6	28.3	0.0*	35.3	-	320.4
 Doutor	13.5	8.6	0.0*	0.0*	22.2	~15.3	239.1
 Caffé Veloce	0.8	0.6	1.3	0.9	3.7	-	32.5
 Excelsior Caffé	1.2	0.5	0.4	0.3	2.4	-	28.4
 Ueshima Coffee House	0.6	0.4	0.0*	0.0*	1.0	0.4	10.7
 Café de Crié	0.5	0.3	0.0*	0.0*	0.8	-	6.9
 Komeda	0.0*	0.0*	0.0*	0.0*	0.0*	1.7	0.0*

* Categories in which no disposable cups (paper or plastic) were observed, within the limits of reporting. Does not necessarily equal the value of absolute zero.

Response to Questionnaire: self-reported data

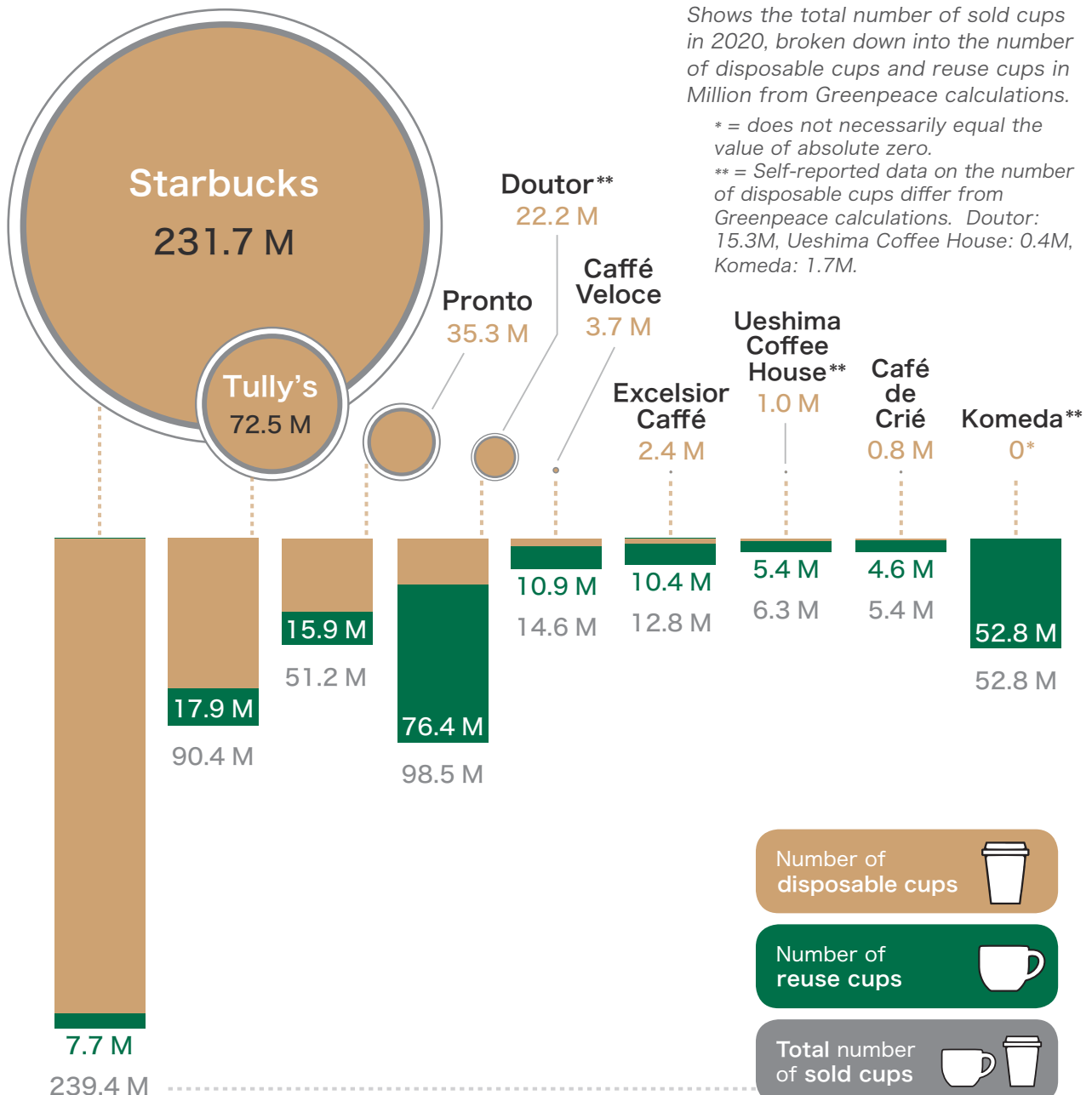
Greenpeace reached out to the nine coffee chains investigated in this study and asked them to provide information on the number of disposable cups they sold in 2020, their overall reuse rate for both dine-in and takeaway customers, and other general survey questions regarding their reuse policies. *Doutor*, *Ueshima Coffee House*, and *Komeda* answered the general survey questions and provided all other necessary information. *Tully's Coffee* filled in the general survey questions and provided information on their overall disposable rate, while *Pronto* only answered the general survey questions. The remaining four chains, *Starbucks*, *Caffé Veloce*, *Excelsior Caffé*, and *Café de Crié* failed to answer.

Likewise, our independent survey observed no use of disposable cups for dine-in beverages for *Ueshima Coffee House*, *Café de Crié*, *Dotour* and *Komeda*, in line with the reuse-focused model for dine-in services among these four chains. However, this does not preclude any use of disposable cups in the aforementioned chains.

In absolute numbers, *Starbucks* is the biggest emitter of disposable cups with a total of 231.7 million cups. This is more than

the expenditure of the other eight chains combined and more than ¼ of the whole Japanese coffee chain sector¹⁵.

With a business model similar to that of *Starbucks*, *Tully's Coffee* is also heavily reliant on disposable cups for dine-in customers and thus ends up being responsible for a total of 72.5 million disposable cups, the second biggest emitter among the nine coffee chains.



Pronto ranks third among the nine coffee chains with an expenditure of 35.3 million disposable cups, of which the largest proportion comes from their use of disposable plastic cups for dine-in services.

Disposable cups for takeaway and dine-in










All nine coffee chains sell takeaway beverages in disposable plastic or paper cups in line with industry standards. The rate of disposable cup use for takeaway beverages is 100% for all chains and there is no widespread reuse system for takeaway

purchases for any of the nine coffee chains. Despite their ubiquity, takeaway beverages are not the sole source of disposable cups. The use of disposable cups for dine-in services is widespread, and disposable cups in dine-in services might in fact be the culprit hiding in plain sight.

The rate of reuse cup usage for dine-in beverages (Table 3) differs significantly within the industry. Four chains *Doutor*, *Ueshima Coffee House*, *Café de Crié*, and *Komeda* – stand out for their tableware policies that make nearly exclusive use of reusable cups for dine-in services as a standard practice.

Table 3

Shows the reuse rate for dine-in services only and the overall reuse rate for both dine-in and takeaway services for Japan's major coffee chains calculated by Greenpeace (light pink). If information on the overall reuse rate was provided by the companies themselves, they were included in this table (in light gray). Data are shown in percentages (%).

Name of Establishment	Dine-in reuse rate (%)	Overall reuse rate (%)	
		Greenpeace calculations	Café chain self-reported data
 Doutor	100	77	~86
 Ueshima Coffee House		84	87
 Café de Crié		85	-
 Komeda		100	98
 Excelsior Caffé	94	81	-
 Caffé Veloce	83	75	-
 Pronto	36	31	-
 Tully's Coffee	29	20	20
 Starbucks	8	3	-










Their counterparts - *Excelsior Caffé*, *Caffé Veloce*, *Pronto*, *Tully's Coffee*, and *Starbucks* - stand in contrast as all use disposable cups for dine-in services to various degrees. At 94% and 84% respectively, both *Excelsior Caffé* and *Caffé Veloce* extensively use reusable cups for their dine-in beverages. According to the in-store observations, customers were handed out disposable cups only when specifically requested.

Pronto and *Tully's Coffee* trail behind with a reuse rate at 36% and 29% respectively. *Starbucks* has the lowest reuse rate of the nine chains for dine-in beverages, at 8.4%.

The use of disposable cups for dine-in beverages is a significant factor to consider. While *Starbucks* and *Tully's Coffee* derive a significant portion of their revenue from takeaway sales at 62% and 32% respectively, all of the other chains are predominantly focused on dine-in (Table 4).

Table 4

Shows the foodservice value for dine-in and takeaway purchases for nine of Japan's major coffee chains (in %).

Name of Establishment	Foodservice value (%)	
	Dine-in	Take-away
 Starbucks	38	62
 Tully's Coffee	68	32
 Pronto	86	14
 Doutor	77	23
 Caffé Veloce	90	10
 Excelsior Caffé	86	14
 Ueshima Coffee House	85	15
 Café de Crié	85	15
 Komeda	>99	<1



Materials in disposable cups

Plastic cups are the disposable cups of choice for cold beverages among the nine chains. The use of polypropylene, polyethylene terephthalate, and polyethylene plastic cups was identified. These cups came with polyethylene terephthalate lids.

For hot beverages, all chains, excluding *Komeda*, use paper cups with an inner polyethylene coating. *Komeda*'s paper cups are encased with a water-resistant layer. *Starbucks* uses additional plastic coating by encasing both the inside and the outside of the cup with a











polyethylene-based polymer mixture that includes chlorinated rubber film and silicone rubber film. The lid material for all hot beverage cups was identified to be polystyrene.

Excelsior Caffé introduced a FSC certified paper cup for cold beverages in February 2022 which was included in the material analysis. *Excelsior Caffé*'s newly introduced paper cup is structurally made out of paper but coated on the inside and outside with a layer of polyethylene. Thus, this paper cup alternative cannot be considered as plastic-free.

Table 5

Identification of plastic and paper cup material for nine of Japan's major coffee chains through Fourier-transform infrared spectroscopy (FT-IR).

PE = Polyethylene, PET = Polyethylene terephthalate, PP = Polypropylene, PS = Polystyrene

Name of Establishment	Plastic cups (cold beverages)			Paper cups (hot beverages)		
	Cup (inside)	Cup (outside)	Lid	Cup (inside)	Cup (outside)	Lid
 Starbucks	PP	PP	PET	PE	PE *** copolymer	PS
 Tully's Coffee	PP	PP	PET	PE	cellulose	PS
 Pronto	PP	PP	PET	PE	cellulose	PS
 Doutor	PET	PET	PET	PE	cellulose	PS
 Caffé Veloce	PP	PP	PET	PE	cellulose	PS
 Excelsior Caffé	PET	PET	PET	PE	cellulose	PS
 Excelsior Caffé *	PE	PE **	PET			
 Ueshima Coffee House	PET	PET	PET	PE	cellulose	PS
 Café de Crié	PP	PP	PET	PE	cellulose	PS
 Komeda	PET	PET	PET	cellulose	cellulose	PS

* Newly introduced FSC certified paper cup for cold beverages (as of February 2022) was not included in the calculations, but examined for its material within the framework of this spectroscopic analysis




** Cup labelled as FSC certified, but paper layers are encased in PE

*** Cup labelled as FSC certified but best match for outer surface is for mix of PE, chlorinated rubber film and Silopren (silicone rubber) film

Conclusion

The nine big café chains in Japan contributed 369.5 million disposable cups, equivalent to an estimated 2808.8 Mt, to incinerators, and other disposal sites in 2020. Or, to put that in perspective, the equivalent of the height of over 10,000 Mount Fujis.

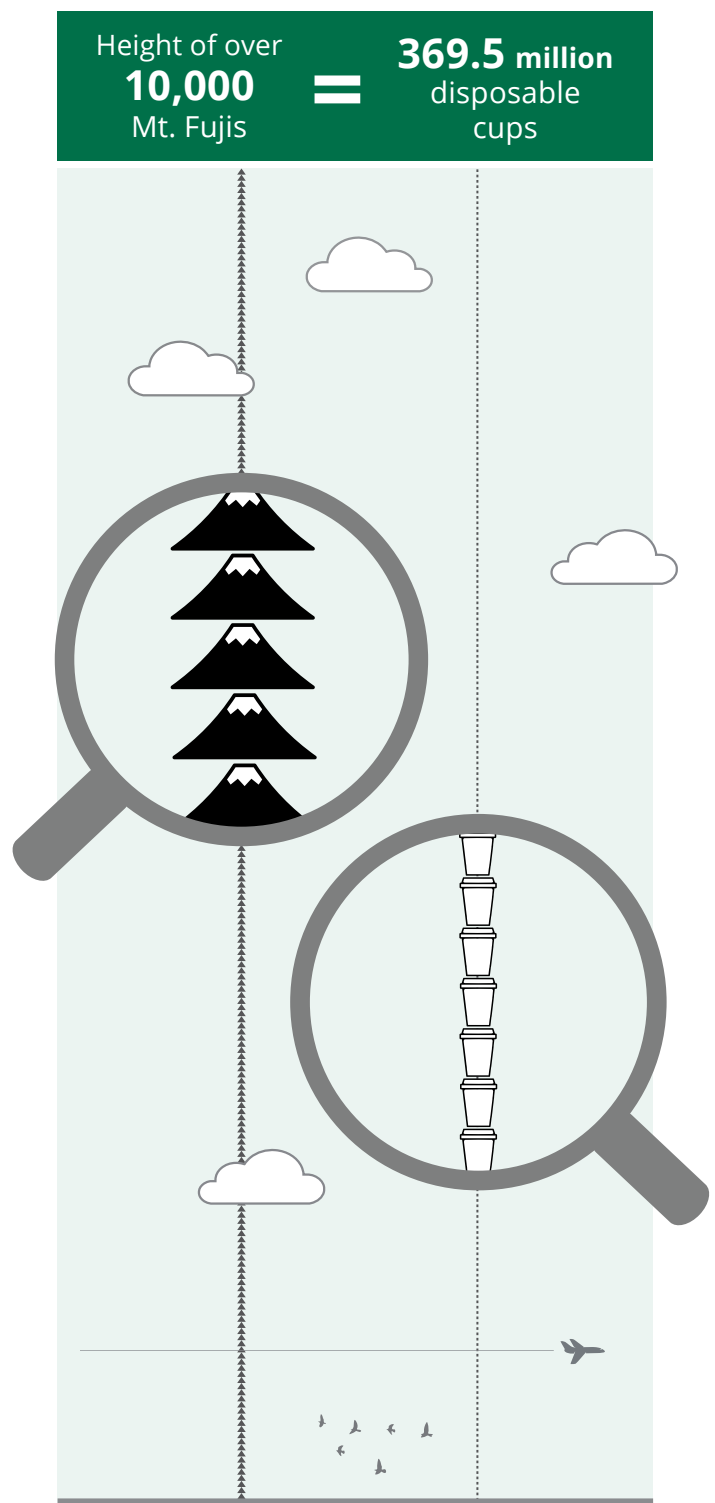
The 369.5 million disposable cups comprised both plastic and paper cups. Although often marketed as the more environmentally friendly alternative, 8 out of 9 of the major chains used paper cups coated with a layer of plastic on the inside. Starbucks' hot beverage paper cup and Excelsior's newly-introduced cold beverage paper cup were coated with plastic on both the inside and the outside.

-  Starbucks was the largest consumer of disposable cups in 2020 with 231.7 million and generated 1626.7 Mt of waste from disposable cups alone.
-  Tully's Coffee was the second largest consumer of disposable cups in 2020 with 72.5 million and generated 544.0 Mt of waste from disposable cups alone.
-  Pronto was the third largest consumer of disposable cups in 2020 with 35.3 million and generated 320.4 Mt of waste from disposable cups alone.

The use of disposable cups for dine-in beverages is prevalent among Pronto, Tully's Coffee and Starbucks, of which more than 6 out of 10 cups in Pronto, 7 out of 10 cups in Tully's Coffee, and 9 out of 10 cups in Starbucks were sold unnecessarily in disposable cups.

Despite reuse options being readily available, the reuse rate for dine-in beverages is low for these specific coffee chains and major strides can be made by investing in reuse systems. A 100% reuse rate for dine-in for the nine surveyed chains would avoid an estimated 158.6 million cups or 1220.1 Mt from becoming waste.

None of the large coffee chains in Japan has a widespread reuse system for takeaway beverages despite many years' spotlighting on the unsustainability and wasteful nature of disposable tableware.



Greenpeace recommends

In the Japanese café sector alone, every hour about 91,000 single-use disposable cups are thrown away. With most of them being incinerated, or, in the worst case, improperly disposed into the environment, combined action from the café sector and the government is urgently needed to end the flood of single-use cups and transition towards a system based on the mantra of “reduce, reuse, and refill”.



The café industry

Greenpeace is calling on the café industry to take bold and innovative steps to reduce and ultimately eliminate harmful single-use packaging in any form and further implement circular systems by prioritising reuse and refill alternatives.

Specifically in the case of single-use disposable cups, the following steps should be implemented:

1. Increase data transparency on the amount of waste generated throughout the whole supply chain from production to end-of-life waste management. Including, but not limited to, common single-use items seen in stores such as cups, lids, straws, serviettes etc.
2. Develop and publish ambitious reduction targets for disposable paper and plastic cups, with 2025 and 2030 as target years.
3. Reduce with the intent to eradicate all single-use disposable cups and transition to reusables for all dine-in beverages.
4. Incentivise customers to bring their own tumbler by offering a discount to those who do and charging a small fee to those who do not²³. If already in place, consider increasing the incentives.
5. Embrace and scale up new reuse models for takeaway customers, by introducing refundable hire schemes for reusable cups or start collaborating with reuse operators, other coffee chains, and other industries (convenience stores, etc.).
6. Refrain from exchanging one type of disposable cup for another type of disposable cup.



Government

Greenpeace is urging the government to set ambitious targets and implement binding, comprehensive, and timely policies to reduce the amount of single-use disposable cup waste. Specifically:

1. Accelerate the development and implementation of reuse-based systems by mandating a beverage reuse quota of 50% by 2030, for businesses that produce large quantities of disposable cups (e.g. cafés, convenience stores, fast food chains). Similar reuse targets should be developed for disposable containers and packaging in general.
2. Provide incentives (including tax incentives) for businesses that offer reuse alternatives.
3. Implement Extended Producer Responsibility schemes to hold manufacturers/producers fully accountable for the financial and environmental costs associated with their product.





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Appendix

Table 6

Shows the average weight (in g) of paper and plastic cups from each of the nine coffee chains. The smallest plastic and paper cup options for beverages in the regular size range - this excludes espresso-size cups - were weighed. These are either the small size or the chain-specific equivalent to small. It can be assumed that the later calculated total weights, derived from the average weight of small sized cups, are a conservative estimate. A minimum of two cups were purchased and weighted three times consecutively to derive an average.

	Weight of paper cup (g)	Weight of plastic cup (g)
 Starbucks	8.45	6.12
 Tully's Coffee	8.13	6.98
 Pronto	8.10	9.17
 Doutor	9.78	11.43
 Caffé Veloce	9.86	8.18
 Excelsior Caffé	10.64	12.36
 Ueshima Coffee House	10.80	11.34
 Café de Crié	11.88	6.89
 Komeda	9.81	11.35

Methodology of the FT-IR

All cups (internal and external surfaces) and lids (external surfaces) were subjected to analysis by FT-IR spectrometry, using a PerkinElmer Spectrum™ 2 spectrometer equipped with a universal diamond Attenuated Total Reflectance (ATR) attachment. In the case of the cups, small (2cm x 2cm) sections were cut from close to the rim of the cup using scissors pre-cleaned with ethanol and handled with forceps that had been similarly pre-cleaned. These sections were then used for FT-IR analysis to ensure good contact of both internal and external surfaces with the ATR crystal surface. In the case of the lids, the physical form enabled them to be analysed without the need to cut a section first, thereby minimising sample handling.

Each cut section or lid was manipulated using pre-cleaned forceps and carefully placed onto the centre of the crystal surface (after pre-cleaning the surface with analytical grade ethanol), before applying a consistent force using the sample clamp. FT-IR spectra (mid-infrared) were obtained for each candidate microplastic piece by scanning in the wave number range 4000 – 650 cm⁻¹, at a resolution of 4 cm⁻¹, and acquiring a minimum of 4 scans per item (up to a maximum of 16 scans per item for some samples in order to obtain clearer spectra). All spectra obtained were processed

using PerkinElmer's Spectrum™ 10 software (version 10.5.4.738), enabling post-acquisition background subtraction and normalisation of the data and subsequent comparison against a number of commercially available spectral libraries covering polymers, polymer additives, and adhesives (adhes.dlb, Atrpolym.dlb, ATRSPE~1.DLB, fibres.dlb, IntPoly.spl, poly1.dlb, polyadd1.dlb and POLYMER.DLB), as used by D'Souza *et al.* (2020).

Only readings with a confidence level of 70% or greater and for which identification could be further verified through careful visual inspection of the spectrum (Wilson *et al.* 2021), were accepted as being reliably identified. In the case of all the lids analysed in this study, all of the cold drinks cups and for both surfaces of all but three of the hot drinks cups, the spectra obtained yielded match qualities against library spectra of greater than 80%. In the case of three of the hot drinks cups, the FT-IR spectrum for the outer surfaces of the cups were obscured as a result of the strongly coloured dye (black, brown, or red) used in the paper layer.



Greenpeace is a network of independent organisations, which uses peaceful, creative confrontation to expose global environmental problems, and develop solutions for a green and peaceful future.

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