

# Reducing wine bottle weight



---

An assessment of the potential for the reduction  
in wine bottle weight

---

Findings and recommendations

**SWR Report**

Prepared by Dr. Peter Stanbury

June 2023

# TABLE OF CONTENTS

<b>01</b>	Executive Summary	4
<b>02</b>	Introduction	8
<b>03</b>	Approach and methodology	10
<b>04</b>	Why focus on bottle weight?	13
<b>05</b>	The challenges to bottle weight reduction	15

<b>06</b>	Other issues relating to GHG reductions in bottle use	17
<b>07</b>	Market-side factors	18
<b>08</b>	Supply side issues	27
<b>09</b>	Conclusions and recommendations	36
<b>10</b>	Acknowledgements	43



# Executive Summary

## **Practical Bottle Weight "Accord"**

Various life cycle assessment studies have shown that the single biggest source of carbon in the wine industry is the bottle, most significantly the carbon emissions from the manufacturing of the glass bottle also known as the embedded carbon. The members of the Sustainable Wine Roundtable (SWR) have therefore prioritised taking action to reduce the weight of wine bottles.

This paper sets out the findings and recommendations of a research project to explore this issue and proposes the following Bottle Weight Accord that will result in material emissions reductions.

SWR proposes an analogous approach in relation to bottle weight, under which its retail members agree to a shared position to reduce the average weight of the 750ml still wine bottles they sell from the current average of approximately 550 grams to an average bottle weight below 420 grams by the end of 2026.

## **Background to the Bottle Weight Accord**

The aim of this research was to define for SWR members a common position on what weight bottle was desirable and achievable in practice, and so form the basis for a 'Bottle Weight Accord' for collective action. This research was based on an extensive series of interviews with organisations and individuals throughout the wine supply chain, and on review of relevant academic and practitioner literature.

Although much of the focus on sustainability in wine is usually on activities in vineyards and wineries, in fact the single biggest element in wine's carbon footprint – between a third and half – comes from the bottle in which it is packaged. This stems both from the significant amounts of energy required to make glass, and from the emissions from the transport needed to move around the bottle containing the wine. From a carbon perspective, therefore, there is a huge potential win for the wine sector if bottle weights can be reduced. However, despite the apparently self-evident need to act on wine bottle weight, several challenges were raised to the practicality of taking action on this issue.

### **Consumer Perceptions**

On the market side, there is a strong perception that consumers associate heavy bottles with better quality and more expensive wines. Therefore, the argument runs, reductions in its bottle weight would make a wine less attractive to consumers and so negatively affect sales. Further, some brands and appellations, for example wines from Amarone, Napa and Châteuneuf du Pape are traditionally associated with heavy and embossed bottles and will therefore also resist moves to lighter bottles.

The research found that a focus only on bottle weight is overly simplistic. In practice, consumers are influenced by a wide range of factors in their buying decisions, including bottle labels, regional preference, and price. There is, therefore, no convincing evidence that reductions in bottle weight will put consumers off, especially given the myriad other ways in which brands and retailers can communicate with their customers. There is also a growing number of examples of brands which have historically used heavy bottles moving to lighter ones without significant problems with their consumers.

### **Are lightweight glass bottles to fragile?**

On the supply side, there exists a perception that light weight bottles are more fragile, and therefore have a higher risk of failure. As a result, more cardboard packaging will be required, the carbon footprint of which will negate the carbon savings from using lighter glass. Some pointed also to the relatively fewer light weight bottle moulds available by comparison to heavier ones. This, some suggested results from an unwillingness on the part of bottle manufacturers to make bottles on which they would make less money.

The research process explored how these supposed constraints on bottle weight reduction might be addressed, and to define what weight bottle could be used practically within the existing infrastructure of the wine industry. At present, wine bottles average around 550g, with a lightweight equivalent being 420g. It does seem, however, that even lighter bottles – down to around 350g – would be viable. What we also found was that the supposed constraints to reductions in bottle weight are less significant than often believed.

It is also clear that lightweight bottles can be used without significant challenges in most wine filling lines. Certainly, these bottles are less robust than their heavier counterparts, but using them requires only relatively small changes in how these lines are managed. For example, care needs to be taken in depalletizing bottles, in ensuring that the equipment used to handle them is made of materials such as plastic or nylon, and packaging for onward distribution needs to be more robust. It is also appears to be the case that bottle manufacturers are not an obstacle to change. The economics of lighter bottles is similar to that of heavier ones, and the smaller number of light weight moulds available is more a factor of (less) demand than it is of an inability to supply.

## **No convincing arguments against lightweight bottles**

It is clear, therefore, that there are no convincing arguments against the use of light weight bottles for wine. Certainly, some objections will be raised, but this paper provides the evidence to counter those objections. SWR therefore proposes, as its 'Bottle Weight Accord' that its supporting retail members move, over the next three years, to a position where the bulk of their wines – 80% or more – are packaged in 420g bottles.

However, it is important that this 'Accord' is not seen just as a top-down edict from retailers. It needs to be augmented by actions to support those in the rest of the supply chain to make the necessary changes. For example, some wine producing countries struggle to access light weight bottles, and so a process of matching supply and demand needs to be put in place. There is also a need to educate consumers on the importance of wine bottle weight.

These actions need also to be presented within a wider SWR position on these issues, to demonstrate that bottle weight reduction is only one stage in a wider process to address wine packaging as part of the process of developing a truly sustainable wine sector.

## **The benefits of moving to lighter bottles**

The reductions in bottle weight that this report recommends will have significant positive impacts for the wine industry: both in terms of its environmental footprint, and on the financial bottom line.

From an environmental perspective, the benefits of lighter bottles are significant. The bottle in which wine is packaged accounts for as much as half of the total environmental impact of wine as a product. The proposed reduction in bottle weights from a current average of about 550g to the proposed 420g represents a more than 25% saving in carbon emissions.

Financially too, the proposed changes will be a significant benefit, most obviously in light of the upcoming extended producer responsibility regulations being introduced in a number of jurisdictions including the EU and UK. These place significant potential costs on producers, brands, importers, and retailers to share the cost of packaging waste disposal. Reductions in bottle weight will therefore significantly reduce these extra costs. Additionally, lighter bottles will result in lower transport costs, and reduced wear and tear on equipment.

# Introduction

This paper reports on the findings of an action research project undertaken by the Sustainable Wine Roundtable (SWR) between October 2022 and February 2023. This was supported by a number of SWR's key retail members, including Systembolaget (Sweden), Waitrose & Partners (UK), Ahold Delhaize (NL), Alko Oy (Finland), The Wine Society (UK) and Whole Foods Market (USA). The project stemmed from discussions which demonstrated that all these retailers were, in different ways, exploring the issue of wine packaging as a key issue in their sustainability strategies.

In practice, many retailers are exploring wider issues in relation to wine packaging, in particular whether to move to alternative formats such as cans, PET bottles or bag-in-box (BiB). The challenge with these wider discussions is that they raise a number of complex issues ranging from questions about consumer acceptability of alternative formats, through to the impact that alternative materials might have on the wine itself.

In this context, the issue of how to reduce wine bottle weights appeared to SWR members as a relatively easy place to initiate change in relation to wine packaging. In practice, as will become clearer from the remainder of this paper, the question of wine bottle weight proved to be rather more complicated than initially thought. Nor has it proved entirely possible to divorce discussion of potential actions on bottle weight from wider discussions about wine bottles and their manufacture.

Nevertheless, there is a strong rationale for focussing on bottle weight, given that wine bottles, in their manufacture and transport, account for a very high proportion of the entire carbon footprint of the wine industry. As will be discussed later, the exact proportion is a matter of some debate, but most estimates suggest that between a third and half of the total carbon impact of wine results from the use of glass bottles.

Despite this apparently obvious 'easy win' in terms of sustainability, SWR members raised several challenges in effecting reductions in bottle weight. Factors such as the potential for increased breakages, consumer attitudes, resistance from producers and other factors were cited as reasons why change had proven difficult to effect. Moreover, members recognised the value of collective, rather than individual action, both to provide stronger market pressure for change, as well as to provide a clear target for suppliers to aim at. It is for this reason that collective action through SWR was seen as a valuable way to proceed.



The aim of this project, therefore, was to identify a joined-up strategy for a phased reduction in bottle weights over time. This has required detailed examination of all the suggested impediments to change and to explore the evidence-base for each one. This paper concludes with clear recommendations for action by SWR members, in the context of a wider set of interventions to support the proposed changes. Crucially, the recommendations made had to be practicable within the existing wine supply chain. The aim has been to propose a strategy which is evidentially robust, and in which all potential objections that might be raised have either been proven to be false, or are proactively addressed in the course of action proposed.

# Approach and Methodology

## Defining the question

It is important to note at the outset that this paper, and the research undertaken for it, has focussed only on bottles for still wine. Obviously, the pressure under which sparkling wines need to be stored means that bottle weights for these products will be different than from still wine. It is also the case that different methods of producing sparkling wines also have implications for the strength of bottles, in terms of pressure, required in each case. This paper focuses only on still wines, and where specific bottle weights are referred to in this document, they refer (except where stated) specifically to a standard 750ml wine bottle.

### What are lightweight bottles?

The first question to address is precisely what we mean by 'lightweight' wine bottles. Lightweight, in comparison to what? The starting point is to understand what is currently 'normal' in terms of bottle weight. Input from the SWR members supporting this report found 750ml wine bottles in their stores ranging from around 335g at one end, to a massive 2.65kg at the other. These extremes are rare, however, and the average weight for wine bottles appears to be in the mid-500s grammes. Alko's assessment of wine packaging cites a 'traditional glass bottle' uses a figure of 540g[1]; another SWR member stated that the bottle weight of the range of wines sold by them averaged 543g; and the author of this report, through the weighing of the bottles put out for recycling during January 2023, had an average weight roughly the same: 559g. What then is a 'lightweight' bottle? Alko cites 420g [2]; and this number appears, from interviews undertaken, to be widely regarded as a fairly universally agreed definition of a lightweight bottle.

### What is our research aiming at?

But how lightweight is this in practice? How much lighter could bottles become? It is clear that large numbers of bottles are already in use which are lighter – sometimes considerably lighter – than 420g. One producer interviewed uses 390g bottles on their mobile filling line, others were using bottles lighter still. Quoted in a Decanter article, Peter English of Accolade Wines, one of the world's largest wine companies, considers 330g the lowest currently achievable bottle weight for still wines. [3] However, as several interviewees observed, a better way to look at the challenge is to identify the optimal 'right weight' of bottles. What is the 'right' weight for a bottle, which is as light as possible consistent with it being able to do its job effectively? In principle, wine bottles could be ultra-light, but then they would be overly fragile, or need much additional other packaging to enable their use.

1 Alko. *Environmental impacts of alcoholic beverages' supply chain*. [Environmental impacts of alcoholic beverages' supply chain | Alko](#) (accessed 09/02/23)

2 Alko. Ibid

3 Joy R. Wine bottles: A heavy price. Decanter 15/03/22 [Wine bottles: A heavy price - Decanter](#) (accessed 09/02/22)

In the case of this piece of work, 'right weighting' therefore means identifying the lightest possible bottle which is consistent with the infrastructure currently in place for manufacturing, filling, and distributing bottles of wine. Physical capital equipment is expensive and replaced relatively rarely: for this study to make recommendations which would require any significant re-equipping by actors in the wine supply chain would not be realistic.

It does appear that bottles much lighter than 420g could readily be used within the current infrastructure, though questions exist about exactly how light. One leading bottling specialist estimated that bottles as light as 350g could be widely used with only relatively minor changes to bottling lines and supply chain arrangements. On the other hand, others interviewed for this study stated that they had observed greater challenges with bottles less than 400g.

In conclusion, therefore, this action research project has sought to identify the lightest possible bottle which can be used within the wine production and shipping infrastructure as it exists currently.

## **Finding answers**

### **Research approach**

The initial research focused on identifying those issues which participating retailers raised as challenges to implementing reductions in bottle weight. These included concerns that lighter bottles are likely to be more fragile, with consequently higher rates of breakage; that they are less widely available than heavy alternatives; and that consumers have a preference for heavier bottles, associating them with better quality wine.

Each of these issues was then examined in detail. The research was undertaken primarily through a series of interviews, and by an extensive review of literature on relevant topics related to wine bottle weight. Interviewees included representatives from along the wine value chain, including retailers, producers, wine journalists, and bottle manufacturers. Research also included a visit to bottle manufacturer Encirc's combined bottle manufacturing and filling plant in Chester in NW England.

Interviews with representatives of different parts of the wine supply chain also highlighted some wider issues. It is clear from some of those conversations that all too often those at the production end of the wine business feel that retailers issue what are, in effect, edicts with which wine growers and makers have little choice but to abide by.

A strength of SWR as an organisation is precisely that it does encompass the entire supply chain as well as peripheral actors such as academic institutions and NGOs. This report therefore includes recommendations as to how retailers might support producers, bottlers and others to make sure that the proposed changes in bottle weights can be introduced as a collective effort, not a top-down process.

Most, interestingly, the research showed clearly that many of the concerns relating to use of lighter weight wine bottles rest on presumptions and anecdote rather than on hard fact. On some of the key issues, there are assumed truths and 'urban legends' which are held to be serious impediments to a move to lighter weight bottles. In reality, many of these factors are actually much less clear-cut than they are often presented to be.

### **Responding to the wider context**

As far as possible, the initial aim of the research was to focus only on the issue of light-weighting of bottles, and to avoid wider issues relating to wine bottles. However, as the research developed, it became apparent that a coherent position on wine bottle weight would need to include reference to wider issues relating, in particular to sourcing of those bottles.

This paper therefore delivers what was originally intended as the outcome of this action research project: a clear process for reductions in bottle weight with the intent that this process is adopted as corporate policy of participating SWR members. However, it does this in the context of wider discussions about the carbon impact of wine and bottles, so that the proposed approach by SWR members to light-weighting is set within a coherent position on these wider issues.

# Why focus on bottle weight?

## Why address bottle weight?

Glass bottles are the single largest contributor to the carbon footprint of wine as a product. The main driver of this is the manufacturing process, which requires significant amount of energy and fuel. Glass is produced through heating various sands, silicas and other ingredients in large furnaces to around 1,400–1,500°C. The heat is typically provided through two means. The floor of the furnace is heated using electricity. The remainder of the space is then heated through the combustion of natural gas. The resulting glass is then divided into pieces, called 'gobs' which are then put into a two-stage moulding process. The first stage shapes the gob into a bottle shape, and the second stage then blows air in to create the open bottle. Even at this stage, the glass is still at a temperature of around 7,000°C. Newly created bottles are then subject to a number of tests to ensure the quality of their manufacture, and this can involve further reheating and cooling of the bottles.

Unsurprisingly, therefore, bottle manufacture is a highly energy-intensive activity, and thus one with a very significant carbon footprint. One study found that the entirety of the glass packaging industry in the European Union in 2007 was responsible for the emission of 12.4 million tonnes of CO<sub>2</sub>. [4]

However, it is not just in the manufacturing process that wine (and other) bottles have a significant carbon impact. In transportation too, the footprint is significant because bottles are heavy. Moreover, bottles are, in many cases, transported considerable distances from their manufacturing point to where they are filled. Even in Europe, according to the industry trade body, 40% of bottles "travel more than 300 km to reach their destination." Nor is this solely a European phenomenon: one article observed that "industry estimates suggest some two-thirds of glass bottles now used for US wine production are made in China and shipped across the Pacific before even being filled." [5]

However, even though there is agreement that glass bottles are a significant challenge for the wine industry, there is a less agreement about precisely what proportion of wine's total carbon footprint derives from the bottle. In practice, however, this is not overly surprising since different life-cycle analyses do not always look at the same thing – so comparing them is not to compare like with like. In the jargon, studies use differing 'system boundaries.' As a result, as one comparative study concluded "the variability of impacts across different case studies of wine may be strongly influenced by the system boundary identification." [6] As a result, as another similar comparative study found, "the choice of relevant and irrelevant processes to be included or not in the system boundary could represent a problem in the definition of environmental performance of wine." [7]

4 Schmitz A, et al. 'Energy consumption and CO<sub>2</sub> emissions of the European glass industry.' In Energy Policy. 2011;39: pp142-155.

5 Joy R. 'Wine bottles: A heavy price' Decanter. 15/03/22 [Wine bottles: A heavy price - Decanter](#) (accessed 31/01/22)

6 Rugani B et al. 'A comprehensive review of carbon footprint analysis as an extended environmental indicator of the wine sector.' In Journal of Cleaner Production. Vol 54 pp61-77 2013

7 Notarnicola B, G Tassielli & GM Nicoletti. 'LCA of wine production'. In Mattson B & U Sonesson (eds) Environmentally friendly food production. Woodhead Publishing, Cambridge. 2003

As a result, as another similar comparative study found, “the choice of relevant and irrelevant processes to be included or not in the system boundary could represent a problem in the definition of environmental performance of wine.”

Even if a precise number is hard to define, it is nonetheless important to establish at least some idea of the quantum of the proportion of wine’s carbon footprint which results from the use of glass bottles. It is clear that there is considerable variability in the figures arrived at. One study, for example, found that “on average, the contribution [of packaging in] the life cycle could be considered in the order of 20–22% of the total carbon footprint of a wine bottle.” [8] However, a study of the Italian wine sector found that packaging of a particular DOC wine contributed 0.599kgCO<sub>2</sub> to a total for the whole production process of 1.068kgCO<sub>2</sub>. [9] In this case, therefore, the bottle contributed 56% of that carbon footprint of that 75cl of wine. Petti et al report on the collective findings of several contribution analyses, which seek to understand the relative impacts of different phases of wine production to the overall carbon impact of the product. The figures provided in this study fall somewhere between those cited above, indicating that the most significant “impacts are typically generated by packaging production (31%)...followed by the agricultural phase (19%) and transport for distribution to consumers (14%). [10]

**Fig: Contributions of life cycle stages to carbon footprint of one 0.75l bottle of wine.[11]**

WINERY PHASE	Bottling and packaging	Glass residue	0.7%
		Cardboard production	3.1%
		Plastic production	0.4%
		Glass production	45.6%
	Wine making	Solid Waste	1.7%
		Diesel extraction and production	0.8%
		Wine-making chemicals	2.3%
		Fugitive emissions	5.3%
		Wastewater	0.001%
		Diesel combustion	3.8%
		Electricity production	9.2%
VINEYARD PHASE	Vineyard	Diesel extraction and production	1.2%
		Electricity production	0.9%
		Phytosanitaries production	6.1%
		Organic fertilizer production	0.0%
		Synthetic nitrogen fertilizer production	1.5%
		Synthetic phosphorous fertilizer production	2.6%
		N <sub>2</sub> O (from synthetic fertilizers)	2.0%
		N <sub>2</sub> O (from organic fertilizers)	2.7%
		Emissions from diesel combustion	10.1%

However, in appreciating the relative importance of glass bottle use in comparison to other carbon impacts of wine production, a paper by Novarro et al makes extremely interesting reading: its findings are set out in the table above.

8 Scrucca F, E Bonamente & S Rinaldi. ‘Carbon Footprint in the Wine Industry’ In Muthu SS (ed) *Environmental Carbon Footprints: Industrial Case Studies*. Butterworth-Heinemann, Oxford. 2018

9 Bonamente E, et al. ‘Environmental impact of an Italian wine bottle: carbon and water footprint assessment.’ In *The Science of the Total Environment* Vol 560-561, pp274-283 2016

10 Petti L et al. ‘Lifecycle assessment in the wine sector.’ In Notarnicola B. *Life cycle assessments in the agri-food sector: case studies. Methodological issues and best practices*. Springer International Publishing 2015.

11 Novarro A et al. ‘Econ-innovation and benchmarking carbon footprint data for vineyards and wineries in Spain and France.’ In *Journal of Cleaner Production*. Vol 142 pp1661-1671. 2017

This study looks only at the carbon impacts at vineyard and winery levels. It therefore ignores the onward supply chain and the carbon footprint of factors such as shipping, road transport and storage. Nevertheless, this analysis demonstrates very clearly comments made by one winemaker interviewed for this SWR report, “we do our best to manage our viti- and viniculture as carefully as possible to reduce carbon impacts. However, anything we do on our estate pales into insignificance in comparison with our choice of packaging materials.” [12]

However, there are also other, non-carbon, reasons to seek to use lighter bottles. One issue is that of worker welfare: that a case of 12 lighter-weight bottles is noticeable easier to lift, and leads to fewer sprains and strains. Similarly, lighter-weight bottles put less strain on vehicles and lifting equipment, so reducing the need for on-going repairs. As the Quebecois alcohol monopoly, SAQ observed as part of the publicity surrounding its new policy requirements for lightweight packaging, in addition to the environmental drivers for the change “lighter bottles decrease the risk of injury for our employees.” [13]

## **The challenges to bottle weight reduction**

Despite the evident benefit to wine’s carbon footprint which would stem from the use of lighter bottles, it is clear that there are a number of actual, and perceived impediments to making these changes. Interviews were undertaken with all those SWR members supporting this research, as well as with several other relevant organisations and individuals. In these interviews a few factors were raised which were seen as being reasons why moving to lighter weight bottles might be problematic. These were as follows:

### **Consumer perception**

Probably the most significant issue sited as a reason for not moving to lighter weight bottles is a widespread perception that consumers associate heavier bottles with better quality, and more expensive wine. Thus, the argument proceeds, lightweighting of bottles would impact on sales levels and so be undesirable. For many of those interviewed, this link was seen as almost immutable, and therefore a severe impediment to changes in bottle weight.

### **Branding**

Another key challenge is the attitude of brand owners of some wine makers. Some producers – for example in origins such as Napa, Chateaufneuf and Amarone see a heavier bottle, perhaps with mouldings, as a key part of their brand identity. Lighter, more standardised bottles may be seen as an affront to their ‘brand values’, and therefore resisted.

12 Interview with Italian wine maker, 02/12/22

13 SAQ. *Why are we big on lightweight glass* 16/01/22 [All about lightweight glass | SAQ.COM](https://www.saq.com/en/All-about-lightweight-glass) (accessed 03/02/23)

### **Internal resistance in retailers**

Interestingly, it was apparent that in some cases, retailers' sustainability staff fear that these issues of branding and consumer perception are also embedded within the sales and merchandising teams of those retailers. Thus, a move to lighter weight bottles might also be resisted internally without strong evidence to justify such moves.

### **Pricing and margins on bottles by producers**

There is a widespread perception that bottle manufacturers make lower margins on lower weight bottles. Lighter weight bottles means less glass, and therefore bottle manufacturers will make less money than from heavier-weight alternatives. As a result, those manufacturers resist change towards lighter weight bottles. Until a means can be found to address the financial situation it will be difficult to source sufficient numbers of lighter bottles.

### **Bottle weight vs other packaging requirements**

Lighter weight bottles are, self-evidently, more fragile than heavier ones. They therefore require more protection in the form of other packaging materials, usually cardboard boxes. There will, therefore, be a play off between how far a bottle weight can be reduced without there being an adverse impact on the amount of other packaging required. Moreover, the additional packaging will normally be cardboard.

### **How bottling lines work**

Many producers use automated bottling lines, which provides a number of potential constraints. First, although machinery can be re-calibrated to some degree, there will be a limit to reductions in the thickness of glass which will still allow the line to operate. Second, many of these lines build the box around the bottles being filled, which provides limits to the gauge of cardboard used, and the ability to insert dividers between bottles.

### **Use of automated delivery lines**

Distributors and couriers like DHL use automated lines to process and separate packages for delivery. These lines consist of a number of conveyor belts which sometimes have small drops between them. This can sometimes cause wine bottles to break, a problem which would be more prevalent with lighter bottles. Furthermore, as the conveyor reaches the van, it decelerates rapidly, which can cause bottles to break as well.

### **Other issues relating to GHG reductions in bottle use**

A number of other issues were raised which, whilst not directly related to bottle weight may nonetheless have implications for decisions about this.

### **Where bottling takes place**

Some producers, for example from New Zealand and Australia, ship wine in bulk, and then bottle it closer to the consumer market. This obviously greatly reduces the overall carbon impact of these wines.



### **Sustainability of other packaging used**

Because glass bottles require other packaging, the carbon impact of that other packaging needs also to be considered. Is cardboard made, for example, from post-consumer waste, and are cardboard boxes recycled after use?

### **Energy source used for glass manufacture**

Glass production is highly energy intensive. Therefore, if the energy used comes from clean, or renewable sources, the carbon 'embedded' in each bottle will be lower.

### **Role of recycling**

The carbon impact of bottles is also reduced if they are recycled after use. The proportion of glass that is recycled varies considerably from country to country. Re-use of bottles is another important area, but not in the scope of this study, though it will be addressed by future SWR activities.

### **Key factors for this study**

The objections to the use of lighter weight bottles cited above can be summarised under two headings:

- Market-side factors:
  - Consumer perception
  - Resistance from brands and from some non-sustainability teams in retailers.
  
- Supply side factors:
  - Fragility of lighter weight bottles, and their management within supply chains
  - Economics of bottle production

The following two chapters explore the evidence on each of these issues and provide clear conclusions about how each affects any decision to use lighter weight bottles.

## Market-side factors

### The perception of consumer perception

#### Factors influencing consumer choice

During interviews for this study, a key factor raised by a number of people as an impediment to reductions in bottle weight was the assertion that wine consumers associate heavier bottles with wine of higher price and better quality. Thus, the argument runs, reductions in bottle weight will potentially impact on sales as consumers will assume that a lighter bottle equates to an inferior wine. Quoted in a Decanter article in 2017 [14], Tatiana Fokina, CEO of London-based wine retailer Hedonism argued that some consumers liked a bottle “with presence” on the table. “With so many wines available, the strength of a good bottle and label is often a winning formula. Wine is quite a tactile product and people like nice thick glass; it has a feel of history and heritage.”

#### Bottle weight

There certainly is evidence that, to some degree, the association between bottle weight and consumer perception is true. For example, a study, commissioned by Aldi in the UK, asked consumers to rate wines in terms of preference when associated with a heavy bottle (1,514g including content) and the same wines when associated with a light bottle (1,155g). Respondents scored the wines from the heavier bottle higher than the light one (6.28 vs. 5.98) and when asked how much they would expect to pay for the wines, the figure was almost 40% higher for the wine from the heavy bottle rather than the light bottle (£14.50 vs. £10.50, respectively) [15]. An article in The Washington Post suggests a similar situation in the USA: “the biggest obstacle to making the switch [to lighter bottles] remains the perception among U.S. consumers that a heavier bottle indicates better wine inside of it.” [16]

By contrast, other evidence suggests that the link between bottle weight and wine quality is less marked than often claimed. For example, an article published on the US website, *SevenFiftyDaily* in July 2022 [17] reported on the experiences of Crimson Wine Group and Jackson Family Wines, both of which have been moving to lighter weight bottles over the past few years. The article quotes Fintan du Fresne, the winemaker at Crimson’s Chamisal Vineyards, saying “There’s that assumption there’s going to be consumer pushback, [but] even at the highest level of wine price, there’s been zero pushback.”

14 Mercer C. *What is the point of heavy bottles?* – Ask Decanter. 04/03/17. [What is the point of heavy wine bottles? Ask Decanter - Decanter](#) (accessed 06/02/23)

15 Reported in Burchett A. *Carry that weight*. 01/12/21 [Carry That Weight – Tim Atkin – Master of Wine](#) (accessed 01/03/23)

16 McIntyre D. The weight of that wine bottle doesn’t indicate quality, and it’s hurting the planet. Washington Post 04/11/21. [The weight of that wine bottle doesn’t indicate quality, and it’s hurting the planet - The Washington Post](#) (accessed 01/03/23)

17 Andrews B. ‘The Shrinking Footprint of Glass Wine Bottles.’ *SevenFiftyDaily* 21/07/22 [The Shrinking Carbon Footprint of Glass Wine Bottles | SevenFifty Daily](#) (accessed 31/01/23)

Moreover, various studies demonstrate that an association between wine quality and bottle weight varies across different groups of consumers. A 2012 study in the UK used a questionnaire which first asked the participants about their subjective categorization of their own wine expertise (giving them three options: naïve, amateur, or expert), their familiarity with wine, their frequency of consumption, and their preferred variety of wine. The results of the questionnaire found that “the ratings from the three cohorts of respondents varied significantly, with those from the naïve cohort more strongly relating the weight of the bottle to the price and quality of the wine, this relationship decreased with the increasing wine expertise of the respondents. The respondents who considered themselves wine experts did not manifest any inclination to relate the weight of the wine bottle to its quality.” [18] This idea, that those more- and less-familiar with wine use different cues in making choices of wine is borne out also by a 1999 paper, which concluded that “Different segments of wine buyers probably use different purchasing strategies. More knowledgeable wine buyers...use more cues and a wider range of resources when making a wine purchase than less knowledgeable consumers.” [19]

### **Bottle labels**

A deeper examination of the evidence about consumer behaviour in relation to wine choice suggests strongly that, although bottle weight is a factor, there are a wide range of other factors which need also to be considered. Of these, bottle labels are also seen as a key consideration. In 2012, Lockshin and Corsi [20] undertook a study to review the literature on consumer behaviour in relation to wine which had been published in the previous decade. This review highlights “the importance label design and bottle closure have in consumers’ choices.” However, there is no one type of label which is universally applicable. Different types/ ages of consumers valued different things in bottle labels, for example, “low self-confidence consumers [tend] to prefer modern colours and classic label information.” In a study of young (18-30) wine consumers in Australia [21] were offered wines with labels ranging from “classic to more modern images.” The study concluded that “in general, images and statements are considered more important than the traditional cues of grape variety and region. In addition, images and words that describe a product perform better than metaphorical expressions.” By contrast, a survey of 640 consumers in Europe found that “information on place of origin was considered the most important information sought on bottles.” [22]

18 Piqueras-Fiszman B & C Spence. ‘The weight of the bottle as a possible extrinsic cue with which to estimate the price (and quality) of the wine? Observed correlations.’ In *Food Quality and Preference*. Vol 25. Pp41-45 2012

19 Rasmussen M & L Lockshin. ‘Wine choice behaviour: preliminary research on the effects of regional branding,’ In *The Australian and New Zealand Wine Industry Journal*. 1999

20 Lockshin L & AM Corsi. ‘Consumer behaviour for wine 2.0: A review since 2003 and future directions.’ In *Wine Economics and Policy* 1 2012. pp2-23

21 Jarvis W, S Mueller & K Chiong, ‘A latent analysis of images and words in wine choice.’ In *Australasian Marketing Journal (AMJ)* Vol18, pp138-144. 2010

22 Dimara E & D Skuras, D. ‘Consumer demand for informative labelling of quality food and drink products: a European Union case study’ In *Journal of Consumer Marketing* Vol 22, pp90-100. 2005

A study conducted by West Virginia University in 2015 with US consumers came to a similar conclusion about the role played by labels. "In the wine market, bottle labels are particularly relevant to the decision-making process, especially for infrequent wine drinkers, who have been shown to rely heavily on labelling information." [23] 2019 research from US market research firm Nielsen makes a similar point: that about 62% of the time, "consumers are considering multiple options leaving huge opportunities for labels to make an impact." [24]

However, it is not just front labels which are of importance in consumer decision-making. A study in Australia and New Zealand looked also at the role that back labels have. This concluded that "that consumers do utilise back labels as an important part of their purchasing choice strategy. More than half of the respondents (in the survey for the study) thus mentioned that they used them when making purchasing decisions." [25] The same conclusion was reached by another study (also in Australia) published in 2010. This went further than the previous work, and explored exactly what information on the label was used by consumers in taking a purchasing decision. "Wine back label information was found to have a positive effect on consumer choice, except for chemical wine ingredients which caused strong adverse reactions for some consumers. On average, winery history combined with a quality statement, elaborate taste descriptions and food pairing have the strongest influence..."[26]

The importance of labels rather than bottle weight was tested in 2007 in a study by packaging group, WRAP. They used in-store observations of shopper in supermarkets (in the UK) "to discover if they compare the weight of products when making purchasing decisions." Using infra-red equipment, they were able to see how customers' eyes were drawn to different bottles (in this case, beer):



23 Marhcant S. Message on a bottle: the wine label's influence. West Virginia University, 2015

24 Reported in Talbot P. Why wine label design matters so much. Forbes Magazine 21/08/19. [Why Wine Label Design Matters So Much \(forbes.com\)](https://www.forbes.com/sites/patricktalbot/2019/08/21/why-wine-label-design-matters-so-much/) (accessed 06/02/23)

25 Charters S, L Lockshin & T Unwin. 'Consumer responses to wine bottle back labels.' In Wine Industry Journal. Vol 15, No 3, May-June 2000.

26 Mueller S et al. Message on a bottle: 'The relative influence of wine back label information on wine choice.' In Food Quality and Preference. Vol 21, pp22-32. 2010.

This study also tested shoppers' ability actually to discern the difference in their hand between bottles of different weights. The research found that "participants struggled to detect a 5-10% difference in glass container weight, even when expecting a weight difference." Indeed, weight differences of up to 40% (for an empty container) and 20% (for a full container) went undetected among a sizeable number of participants." If one applies this to wine bottles, it is entirely possible that most consumers would be unable to feel the difference at the point of purchase between a 550g bottle (weight when full, 1,300g) and a 420g bottle as the latter's weight when full is 1,170g, 10% less than the full 550g bottle.

### ***Geographic factors***

There is also good evidence that consumers' choices on a range of consumer goods, including wine, is driven also by what is known as 'Consumer Ethnocentrism' (CE), defined as "a customer's tendency to buy a locally-made good over a foreign product...This cultural phenomenon leads to making purchasing decisions that do not depend on price/ quality but also depend on the criterion of where the product comes from." [27] For example, in a study of American consumers, it was found "that ethnocentric tendencies are significantly negatively correlated with attitudes toward foreign products, and significantly positively correlated with attitudes toward domestic products." [28] A study of the Slovenian market found that this phenomenon also influences the market for wine buyers. In a survey undertaken in 2021, "Participants were asked if they would be more likely to choose foreign or domestic wines. A total of ...91.9% answered that they would choose a domestic origin of wine, and only ...8.1% would choose a foreign origin of wine. [29] As this article concludes, the evident preference of at least some consumers for domestically produced wine means that winemakers ought to "highlight the area of the vineyard and the origin, and therefore be more successful in selling..." [30]

### ***Utility value***

It is also important to remember, as stated in a number of studies, that consumers buy wine for its utility value. They want to drink wine. As a result, we should not forget that perhaps paramount in many consumers minds when they choose wines is the taste and experience they get from consuming the product, rather than external cues such as packaging. A study of wine consumers in Spain, for example, found that "the designation of origin and wine aging attributes are of great importance in the consumer buying decision. The grape variety variable, although it has lower utility values, was also found to be significant." [31]

27 Ma Q, HM Abdeljelil & L Hu. 'The Influence of the Consumer Ethnocentrism and Cultural Familiarity on Brand Preference.' In *Frontiers in Human Neuroscience* Vol 13, 2019.

28 Shimp, TA & S Sharma. 'Consumer ethnocentrism: Construction and validation of the CETSCALE'. In the *Journal of Market Research* Vol24, pp280-289 1987..

29 Petem V, C Rozman & JP Topler. 'When the Customer and the Wine Shelf Meet: Factors of Ethnocentrism When Selecting a Bottle of Wine.' In *Sustainability* 13 (12098) Nov 2021.

30 Ibid

31 Mtlmet N & LM Alblsu. 'Spanish Wine Consumer Behaviour: A Choice Experiment Approach.' In *Agribusiness* Vol 22 (3) pp343-362 2006

A study undertaken in the USA and Canada identified three 'mindsets' of consumers in relation to what they sought in wine. "'Classics' (who want their wine to be traditional, 'Imaginers' (who want to get into the drinking experience through knowing details about their wines), 'Elaborates' (who want their wines to produce many sensations and flavours). A fourth group (No Frills) were interested in simple and safe wines without any detail of flavour or origin." [32] Self-evidently, these categories would be useful to those creating brands, but the description of each type reminds us that the main reason most people buy wine is to enjoy the sensation of drinking it.

### ***Multi-variate choice-making***

In practice, when they are taking a decision about which wine to buy, consumers are driven by the balance between a number of factors affecting that choice. Moreover, as demonstrated by a 2009 study [33], the factors which consumers consider varies considerably by age group, experience in wine, and geography. This study, which explored wine buying behaviours in 12 countries demonstrates how consumers' decisions are influenced by different factors in different places. The same survey was used in each place, and respondents were asked to "remember the last time you bought a bottle of wine in a shop to have dinner with friends." In each case, those surveyed were asked to rank those factors which most, and least influenced their choice of wine. The list of potential choice influencers included wine origin, having tasted the wine before, food matching and the brand name. The survey results demonstrate quite considerable differences between markets in terms of which factors predominate. In Italy and France, for example, being able to match the wine with food was the most significant influencing factor. In Israel, "we see the importance of relying on previous experience, with previous tasting being the most important influencer." In the UK, "having tasted the wine previously is the most influential [factor], more than twice that of any other attribute, whilst someone's recommendation is nearly twice as important as the origin of the wine or the information on the back label." By contrast, in Italy, the grape variety was the most influential factor.

### **Data challenges**

As has been stressed by a number of those interviewed for this study, a major gap in our understanding of the influencers on consumers in relation to their wine selections is that no comprehensive work has been done on this topic for the last half decade or so. The studies reported in this paper are mostly from the end of the first decade of this century, and the first part of the second. Whilst some pieces of work are more recent than this, there is a need for a comprehensive multi-country study to provide up-to-date insights into consumer perceptions and behaviours.

32 Hughson A, V de la Hueriga & H Moskowitz. 'Mindsets of the wine consumer.' In Journal of Sensory Studies. Vol 19, pp85-105. May 2004

33 Goodman S. 'An international comparison of retail consumer wine choice.' In International Journal of Wine Business Research. Vol. 21 No. 1, 2009 pp 41-49

As was pointed out by a number of interviewees, in the past few years awareness of sustainability generally, and in wine in particular has grown considerably. In this light, a survey of consumer preferences may very well be much favourable to the use of lighter weight bottles.

However, as a number of the existing studies observe, the design of any study would also be a critical factor. As Lockshin and Corsi observed in their review of the literature on this topic to 2012, how questions are asked of consumers can significantly influence findings. Key here is the importance to consumer behaviour of conscious and sub-conscious drivers.

The majority of the papers reviewed in the Lockshin and Corsi study had used 'stated preference surveys' in which consumers were asked to rank the most, and least important factors influencing their decision. In this type of study, consumers think consciously about the different factors, and this can be seen to bias outcomes. As the study says, "attitudinal measures often tend to provide biased estimates of true preferences, as consumers tend to overstate the importance of product characteristics when they are not evaluated in a competitive set."

A smaller number of the papers covered by the study used an approach known as 'discrete choice surveys'. In this type of study, respondents are not asked to balance different factors against each other, but to select a product as they might in the real world, in which their decision is driven by an often sub-conscious balancing of a range of different factors. As the authors say, "choice experiments provide a methodological tool for a holistic product evaluation and force respondents to trade-off several attributes against another."

### **The need for consumer education**

A number of interviewees observed that a central challenge across all aspects of sustainability in wine is consumer education about what actions they can best take if they want to buy more, more sustainable wine. Essentially, there is seen to be confusion in the minds of many consumers as to what to look for if they want to buy sustainable wine. This is borne out by a 2014 study [34] which assessed the factors which Canadian consumers in Ontario and Quebec viewed as important in a decision to buy an environmentally friendly wine. This research seems to indicate that the evaluation and purchase process of environmentally friendly wines is identical to conventional ones. The evaluation and choice of environmentally friendly wines by Canadian wine drinkers are primarily driven by the price followed by other printed cues such as: label information, alcohol level, country of origin, grape variety, region of origin and brand name. Visual cues such as closure, eco-claims, bottle weight and shape, and label were considered least important and therefore deemed

34 Lopes P, R Sagala & T Dood. Extrinsic wine attributes importance on Canadian consumers purchase decisions for environmentally sustainable wines. Academy of Wine Business. 2014.

supporting, rather than dominant, product cues. As the report observes “Surprisingly, respondents didn’t consider bottle weight an important attribute in their assessment and choice of environment friendly wines.” There is clearly a need to do much more to work with consumers to help them understand the importance of reductions in bottle weight to the environmental impact of the wine they buy. Developing analysis and tools for consumer education is an area, therefore, for SWR to consider as it develops its work on wine packaging.

## Conclusions

To argue for the maintenance of heavy bottles simply because of an assertion that this is what consumers want is extremely simplistic. A more detailed and nuanced understanding of consumer drivers is needed, and this demonstrates that there are a range of other ways in which brands can communicate with their buyers than just through the weight of their bottle. As is demonstrated by the following diagram:



As is clear from the above discussion, consumers’ decisions about the wines they buy are driven by a wide range of factors. As Charters, Lockshin and Unwin say, “there is no one over-riding source of information which all consumers use when buying wine, and most adopt a multi-stranded information seeking strategy in reaching their decisions.” [35] Most studies conclude that price remains a key driver, but other factors such as bottle labels, how a wine matches with food, previous experience of a given wine, and even national pride all play a role in the choices consumers make.

It is also clear that the exact balance of factors informing a decision varies considerably country-by-country, between younger and older buyers, and between those more experienced with wine and those newer to it. Moreover, defining the relative importance of different drivers for choice is complicated further by the fact that many of these cues are sub-conscious. If asked about the importance of a particular facet of a wine, consumers may often respond in a way which is not borne out in decisions in the real world, when those consumers balance a range of different factors in making their purchasing decision.



Given the complexity of this situation, the analysis that bottle weight is a key driving factor in consumers' decisions, and that heavier bottles persuade consumers that they are buying better quality wine seems hard to support. Yes, bottle weight is a factor in driving consumer behaviour, and may be one which, if asked about in isolation, consumers would agree with this thesis. However, in the real world, the weight of a bottle is but one of a wide range of factors which consumers – often at least partially sub-consciously – are balancing in the decisions they take.

Furthermore, as the Lopes et al study makes clear, there is work to be done on educating consumers about the importance of bottle weight reduction. As noted earlier, there are no recent studies on this topic and, given the rise in environmental awareness in recent years, and were a process to be undertaken of alerting consumers to the importance of lighter bottles, the perception of weight=quality may well prove to be illusory. In this situation, an insistence on sticking with heavy bottles, especially given the significant environmental benefit to be had through light-weighting, would be illogical.

## **Bottle weight and brand**

Clearly some wine brands and regions are associated with heavy and/ or embossed bottles. This is bound up with issues of heritage, with most of the heaviest bottles coming from regions like Châteauneuf du Pape, Amarone and Napa where there is a strong history and tradition. By contrast, other wine regions are not so worried about this. For example, as one interviewee observed, "Australian wines are bound less by heritage and so don't seem to worry much about heavy bottles."

However, it is notable that despite this association between bottle weight and brand, that some manufacturers are nevertheless shifting to lighter weight bottles. For example, at the end of January 2023, Remy Cointreau [36] announced that it would be reducing the weights of the bottles used for its 'St Remy' brandy. Although the numbers appear quite small – the 70cl bottle will reduce in weight by 15g, and the one-litre bottle by 25g. The company has committed itself to a reduce carbon emissions per bottle by 50% by 2030.

There are also examples of change in regions which traditionally have used heavy bottles. For example, Napa Valley grower Spottswoode has recently reduced the weight of their Estate Cabernet Sauvignon bottle by 30%. According to the company's sustainability manager, Molly Sheppard, "They [the bottles] used to weigh 798 grams, and we reduced them to 564 grams. This resulted in a reduced emissions rate of 25 metric tons of carbon." This reduction has had no effect on sales.

36 Badham R. 'St-Rémy opts for lighter bottles in sustainability push.' Drinks Retailing 31.01.23. [St-Rémy opts for lighter bottles in sustainability push - Drinks Retailing News - The Voice of Drinks Retailing](#) (accessed 06/02/23)

## The experience of the Canadian alcohol monopolies

It is highly relevant at this point to observe the experience of the Canadian alcohol monopolies, the Société des alcools du Québec (SAQ), and the Liquor Control Board of Ontario (LCBO). As long ago as 2011, LCBO introduced guidelines “stipulating that wine priced below \$15 per bottle should be packaged in bottles weighing no more than 420 grams.”[37] Makers of wines retailing at more than C\$15 were encouraged to use lighter packaging. From 1st January 2013, this guideline became mandatory, with the LCBO stating that it “would not stock” wines under C\$15 in bottles heavier than 420g. The position on wines over that price point remained the same, but it was made clear that “favourable consideration will be given to product offers that are lower in weight.”[38] SAQ took a similar position.

In the past two years, both monopolies have significantly tightened their positions, and both now require almost all wines in the general list to be packaged in 420g bottles. There are some minor exceptions: vintage wines already bottled; ‘hock neck’ bottles (which can be a maximum of 460g); and wines above C\$30 for SAQ, and C\$18.95 for LCBO. In practice this means that the bottle weight stipulation applies to more than 80% of the wines sold. Both organisations also permitted a short-term derogation for what they termed ‘iconic bottles’ (for example, Chateauneuf du Pape). These wines could be listed but were charged a penalty fee and allowed longer to conform to the new regulations.

Given that SAQ and LCBO have already put into place the sort of requirements which SWR is considering, their experience in making their policy work is very informative. They report no pushback at all from customers, indeed, “if anything, it’s been the other way around, with some people asking why some bottles are so heavy.”[39] Similarly, their experience with producers has been easier than might be expected. “Some pushed back to begin with, but actually came into line pretty easily.” Even those using ‘iconic’ bottles moved relatively quickly to lighter weight. Interestingly, arguments which worked well in convincing producers were practical ones: for example, that using lighter bottles reduces transport costs.

37 Mitham P. Ontario boosts lightweight wine bottles. Wines Vines Analytics. 22/04/11. [Ontario Boosts Lightweight Wine Bottles - Wines Vines Analytics](#) (accessed 09/02/23)

38 Gibb R. Ontario sets maximum bottle weight limit. Decanter, 08/06/11. [Ontario sets maximum bottle weight limit - Decanter](#) (accessed 09/02/23)

39 Interview with SAQ Feb 2023

# Supply side issues

## Bottles in the supply chain

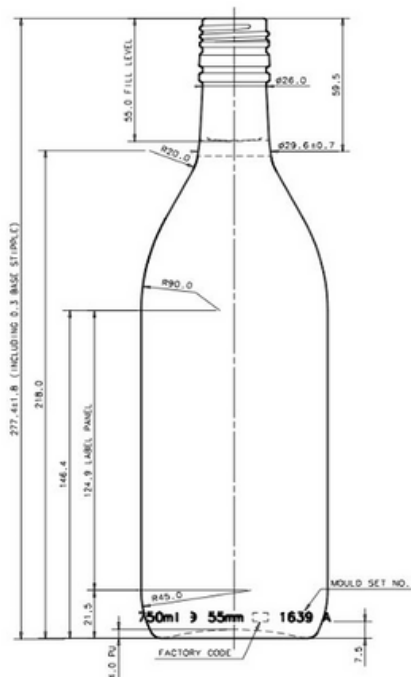
A key perceived challenge to the use of lighter weight bottles is the higher risk of damage or breakage during use. Bottles need to go from their point of manufacture, to a filling line, then onwards to their destination market, and then onto a customer's dining table. The belief is that the use of lighter weight bottles increases the chances of bottles failing at any point in this lifecycle.

That this opinion may be misinformed is suggested by the fact that, according to figures from the bottle industry [40], in the UK, around 250 million bottles are produced annually which weigh 350 grams each, or less. The breakage rate for these bottles appears not to be significantly different than for regular bottles. As one interviewee put it, "if lightweight bottle failure were a problem, then you can bet we would hear about it in the media."

The reality is, as with the issue of consumer perception addressed earlier, the question of fragility of light weight bottles is rather more nuanced than is often perceived to be the case. Lighter weight bottles are, in principle at least [41], more fragile than their heavier counterparts. However, this can be addressed in two ways, through:

- proper engineering of lighter weight bottles
- more sensitive management of bottling lines and the logistics supply chain.

## Bottle engineering



Lighter weight bottles cannot be made simply by using less glass in existing moulds: they need to be specifically designed and engineered to work effectively. As WRAP pointed out in a key report, "the weight of a glass container is not necessarily a good indicator as to its strength. Good glass distribution and producing a container that has few surface defects are more important strength determinants. Glass is an inherently strong material but being brittle is susceptible to failure when subjected to high tensile stresses. Improvements in modern manufacturing methods permit container manufacturers to produce containers that are significantly lighter than was previously possible, without compromising safety." [42]

40 Data from British Glass

41 If they are properly engineered, then this issue is mitigated to some extent.

42 Kirk N & A Hartley. Delivering Wine Bottle Optimisation and Increased Bulk Importation. WRAP 2008

- In 'traditional' bottles, the side walls can vary in thickness down their length. However, even where the glass is at its thinnest, there is still enough glass to be robust. By contrast, lightweight bottle moulds need to ensure that there is an even distribution of glass down the sidewall.
- At the so called 'contact points', there is an extra thickness of glass. Contact points are those parts of the bottle which may encounter other bottles, or filling line equipment. The three most important are at the shoulder and foot, and underneath the bottle. In the case of the first two, lightweight bottles will have marginally thicker glass to provide robustness. And in the case of the third – underneath the bottle – small nodules will ensure that the bottle sits flat on a bottling line or supermarket shelf.
- The nodules underneath also compensate for the much-reduced punt to be found in lightweight bottles.
- Lightweight bottles will also tend to have smoother lines and curves. Burgundy-style bottles, for example can be light-weighted more straightforwardly than Bordeaux style ones, since the latter have pronounced shoulders. Representatives of the bottle manufacturing industry, interviewed for this study, said, however, it is only at very light weights that this need to soften the shape leads to a loss in the iconic shape of some wine bottles. The bottle shown above, for example, is for a 300g bottle. Therefore, it is clear that for 350g or 420g bottles there would be little or no impact on a bottle's shape.

The quality of the cullet used in bottle manufacture can have an impact on the structural strength of a new bottle. Cullet is recycled glass, and if this contains too many impurities, then this may compromise the structure of a new bottle and lead to breakage. In practice, bottles with these flaws will generally be identified during testing at the manufacturing site and will be re-melted rather than enter the onward supply chain. At present, bottle made in the UK and Europe contain typically 52% recycled content, although a higher proportion is possible without problem.

### **Management of the bottle supply chain**

The other key factor in ensuring that lightweight bottles can be used in practice without increases in breakages lies in the need for careful management of bottling lines and the supply chain on either side of that. As a WRAP report put it, "with the improvements made in glass manufacturing process control, many glass containers are now much heavier than they need be to safely contain the intended liquid product (wine)...It is both technically and economically possible to design and manufacture lightweight wine bottles that are fit for propose and will survive the typical life including filling, logistics, use and disposal." [43]

The challenge is that making this happen requires some changes in how bottling lines are managed. It is clear from a number of interviews with representatives from the bottle-making industry that this challenge can be readily managed without the need for any major alterations to the supply chain. The aim is, at all stages of a bottle's life, from manufacture, to filling, to storage, to manage the materials handling processes in a more considered way.

The risk in bottle supply chains is not just immediate failure of a bottle after it has come into contact with a hard object. Damage can be done invisibly, and at different stages of the production and filling process. Contact between one bottle and another, or between a bottle and a substance harder than glass (in reality on filling lines, this will be metal) can create what are known as micro-fractures. These are tiny cracks in the glass which would be invisible to the naked eye, but which cause a weakness in the bottle. If micro-fractures like this accumulate, for example through repeated collisions on a filling line, then the bottle can fail. "The strength of a glass bottle can be reduced by flaws generated during its manufacture and by surface damage sustained in subsequent use." [44] In the case of 'regular', heavy bottles, the larger amount of glass they are made from means that these micro-fractures rarely lead to a bottle breaking completely. In lighter weight bottles, the risk from these is a greater challenge, and requires attention at various stages of the supply chain:

### ***Packing after manufacture***

The first point of potential damage to wine bottles is when they are packed onto a pallet after manufacture. The pallet needs to be stacked and packed in such a way as to minimise vibration, and the risk of bottles coming into contact with each other. The design of the pallet, and the packing arrangement will vary depending on how far that pallet is being taken, and the means of transportation. Road, rail and sea transport all require different packing for bottles in transit. When visiting the Encirc manufacturing plant, we observed pallets of bottles being taken to the bottling plant next door, and so had a minimum of additional packaging to protect them. By contrast, pallets of bottles for onward transport elsewhere had much more protective packaging around them. The picture here shows bottle being packed for long-distance transportation.



### ***Depalletizing***

The next challenge occurs when bottles are taken off their pallets when they arrive at a bottling line. Care is needed in the handling of bottles, especially if this is done manually, for example in the case of a mobile filling line, where particular care is needed. It is important to note, at this point, that one producer interviewed for this research, who uses a mobile filling line in his winery, uses 390g bottles without any major problems. This begins with how the strapping is taken off. In the case of automated lines: in this case the pallets will be automatically unloaded. Usual practice is that bottles go initially to a washer.



It is important, in the case of lighter bottles to ensure that the material used in the machine for the implements to guide bottles are not made of metal. Hard plastics, or nylon should be used instead as contact between bottles and metal can cause micro-fractures which could cause the bottle to fail later in its lifecycle.

### ***Operation of the filling line***

Filling lines operate through the means of a series of conveyer belts. If these belts are stopped and started abruptly, the risk of damage to bottles is much higher as it increases the risk that bottles will collide with one another, or with hard surfaces in the line. Ideally, any halts and re-starts to a line should be done with gradual acceleration and deceleration.



The stop-start issue is more of a problem when a filling line starts a new job – for example when it is changing from bottling beer to wine. As with any new task, problems will occur which technicians will need to fix, and this requires the line to be stopped to facilitate this work. It is likely, therefore, that where bottling lines are regularly changing between bottling different products, that stopping and starting will be more frequent, and therefore the risk of bottle damage higher.

One means to address this is by changing jobs between bottles which require little or no alteration in the way the line is set up. From the perspective of a bottling line, the only two parameters of bottles which matter are the height and diameter. If these two factors are the same, then other particularities of the bottle design, for example mould shape, do not matter. Therefore, if filling jobs are run sequentially which require bottles of the same height/ diameter then the need to stop and re-start the line will be less.



There is also a need for more care when bottles have been filled when, self-evidently, they are heavier with the liquid inside. In addition, as this is the part of the line where bottles move fastest, care is needed to avoid damage.

### ***Capping and labelling***

One means to address this is by changing jobs between bottles which require little or no alteration in the way the line is set up. From the perspective of a bottling line, the only two parameters of bottles which matter are the height and diameter. If these two factors are the same, then other particularities of the bottle design, for example mould shape, do not matter. Therefore, if filling jobs are run sequentially which require bottles of the same height/ diameter then the need to stop and re-start the line will be less.



There is also a need for more care when bottles have been filled when, self-evidently, they are heavier with the liquid inside. In addition, as this is the part of the line where bottles move fastest, care is needed to avoid damage.

### ***Dispatch for onward delivery***

As with transport of empty bottles to a bottling plant, so the onward delivery from that facility needs to be addressed carefully. Where bottles are packed into 6-bottle boxes without cardboard dividers, there is a risk of damage to those bottles unless they have been properly engineered to have managed contact points to avoid damage and marking.



If bottles have not been so designed, there may need to be some additional cardboard packaging. This is borne out by one SWR member interviewed, who observed that the highest breakage rate they experienced was with wines from New Zealand, which generally use lighter bottles. In the view of this member, additional cardboard to protect these lighter bottles would be advisable.

On this point, it is relevant to return to one of the issues raised by SWR members in the initial phase of this research – that the carbon saved in using light weight bottles might be offset by the carbon created by using more cardboard packaging. No work has been done to examine this point precisely, however the evidence presented earlier in this report strongly suggests that even quite a substantial increase in cardboard would be more than offset by carbon savings from lighter bottles.

Novarro et al. [45] calculate the contribution to the total carbon footprint of a bottle of wine of the bottle manufacturing process to be 45.6%; the contribution of cardboard production to be 3.1%. Presuming that this calculation was made on a current average bottle weight of around 550g, a lighter weight bottle of 420g would have a carbon footprint around 24% lower, reducing the carbon footprint of bottle manufacture to 34.8%. Even if there was a corresponding need for an increase of the same proportion in cardboard use, that would increase the carbon footprint of cardboard production to only 3.8%. [46]

Once again, however, the design and loading of each pallet will be crucial to ensuring that no breakages occur. As with the transport of empty bottles, the packaging of pallets of full bottles will need to take account of the distance which will need to be covered, and the means of transport to be used. Wines shipped, for example from South Africa or Latin America to Europe, and then onward freighted by road, will need more additional and careful packaging than those travelling locally.



### ***Implications of lighter bottles for the onward supply chain***

At the point at which wine bottles have been packed for dispatch, the carbon footprint of their onward movements then becomes the responsibility of freight forwarders, transport and logistics companies and retailers in that forward supply chain. The carbon emissions are the scope 1 and scope 2 of those companies, and therefore the scope 3 of the producer and bottler. Use of lighter weight bottles therefore allow producers and bottlers to reduce their scope 3 emissions.

It is also the case that different modes of transport result in different carbon emissions for the same unit (or per unit weight) transported. This means that the lifecycle carbon footprint of the same bottle (of wine) may vary. Reducing bottle weight WILL make a positive impact whatever the transport type, but the impact will be greatest in the higher carbon transport lines.

### **Reported practice**

The research for this report involved a great number of interviews, including with several suppliers and bottlers. Anecdotal evidence from those interviews clearly suggests that what is argued above – that lightweight bottles can be used in most bottling lines without problems if handled properly – is borne out in practice. The following are quotes taken from interviewees in different origins:

- “Bottles as light as 350g can be used on most filling lines with only relatively slight tweaks needed in those lines’ operation.” (UK)
- “I’ve been using 390g bottles on my mobile filling line for several years with no real problems.” (France)
- “We’ve moved from 750g to 600g, and now to 417g, and we’ve not seen any significant increase in breakage rates. We’re now looking at a 380g bottle.” (New Zealand)

### **Other supply side issues**

Several interviewees raised a number of other supply side issues in relation to light-weighting of wine bottles. The following statements summarise the point being made in each case.

- Bottle manufacturers do not want to move to lighter-weight bottles because they will make less money.
- There is less availability of light weight bottle moulds because bottle manufacturers do not really want to make them.
- The current challenges in glass and bottle availability at present is the result of manufacturers withholding supply to keep prices high.

46 These calculations are given only to demonstrate the point about the relative impacts of bottle making and cardboard use. Obviously the proportions would differ from the figures given since the reduction in bottle weight would greatly reduce the overall carbon footprint, so all the percentages listed in this work would differ

Each of these assertions was tested through interviews with representatives of the glass- and bottle-manufacturing industry. As with many of the other issues, the responses received suggested that none of these issues, as stated, is correct, and certainly none presents a fundamental challenge to a process to move, over time, to lighter weight bottles. Sceptics may argue that representatives of the bottle manufacturing sector would deny these comments. However, interviews were undertaken with more than one manufacturer, and manufacturers from different locations, which provides confidence that the basic assessment set out below is broadly correct.

### **The economics of bottle production**

The pricing of wine bottles is, generally, based on a per unit cost. Therefore, in principle, bottle manufacturers will make the same amount of money from selling lighter bottles as heavier ones. There are a couple of complicating factors, however. Although the price is based on a unit cost, that unit cost is, itself, driven in part by the weight of the bottles produced. However, lighter bottle manufacture uses less glass, with consequent savings in raw materials and energy. Furthermore, the bottle manufacturing line can be run more quickly with lighter weight bottles, so production numbers are higher. The view of those interviewed from bottle manufacturers was that these two factors more-or-less cancel each other out. As a result, from an economic perspective, manufacturers do not appear to have an in-built preference for lighter or heavier bottles.

A further point worth noting is that from the perspective of bottle makers, the key economic factor is one of capital expenditure. Glass plants and the furnaces in them are phenomenally expensive to build, and the furnaces need to be replaced around every 15 years. Tiny margin differences which may or may not exist in relation to the sale of bottles of different weight pale into insignificance compared with the core need of keeping the furnace operating seven days a week, 365 days a year.

### **Availability of lightweight bottle moulds**

The issue of the slightly increased complexity involved in the engineering of lighter-weight bottles is addressed elsewhere in this report, and the technical capability required to do this effectively probably does have some bearing on the wider availability of lighter bottle moulds.

However, the overwhelming response from bottle manufacturers on this issue is this is that fewer lightweight bottle moulds are available because there is insufficient demand for them. Those interviewed said that, were there to be more demand from wine makers for lighter bottles, then they would produce a greater range of models.

### **Current shortages of glass bottles**

There is a perception that, at present, bottle availability is tighter than would normally be the case. However, this does not seem to be the result of manufacturers deliberately withholding supply. Rather, it has more to do with wider challenges to international trade. Global shipping markets have yet to fully return to normal following Covid-19, and things have been further complicated by the energy and trade impacts from the war in Ukraine .

Further, it is reported that there have been supply issues in some of the raw materials needed to make glass. In particular, it appears that relatively low levels of bottle recycling has affected availability of cullet in North America. Some bottlenecks have also been reported in availability of some specialist sands and silicas required.

# Conclusions and recommendations

## Conclusions

### 'The facts'

It is clear from the evidence set out in this document that there is no practical reason why all wines should not be presented in bottles around 420g or lighter. At the supply side end, lightweight bottles are already in widespread use, and there seem to be no binding constraints in the current production, bottling and transport processes which would make it difficult to significantly expand their use. Certainly, bottling lines and freight processes need to be approached with a little more care and attention than is the case for heavier bottles, but the evidence shows that this can be done through some relatively minor and simple tweaks, and will not require major reengineering or retooling of current infrastructure.

Likewise, on the demand side, there seems to be no overwhelming reason not to move to lighter bottles. The perception that consumers perceive heavier bottles to contain better wine is just that: a perception. Yes, bottle weight is one factor which influences consumers, but it is one amongst many; and in practice, consumers may not actually, when handling a wine be able to tell the difference between a normal bottle (c550g) and a lighter one (420g). Other factors, such as the design of and information provided on bottle labels are at least as, if not more influential on consumer choice, and leveraging these provides a huge opportunity to communicate with consumers. Moreover, there is a huge opportunity to convey the message to consumers of the environmental benefit of lighter bottles.

### Addressing resistance

Notwithstanding the fairly conclusive evidence about the rationale for and viability of moving to lighter weight bottles, it is clear from many interviews for this study that any changes SWR recommends may meet some resistance in certain quarters, particularly from brand owners in those origins which have historically used heavy bottles, and from some in sales and merchandising teams in retailers.

However, the evidence from this study suggests that this opposition can successfully be overcome. In particular, the testimony from SAQ, the Quebecois alcohol monopoly shows that whilst some brands make a fuss when change is first suggested, many fall into line fairly rapidly.

### The challenge of public awareness

As one commentator observed, writing on the website of wine writer, Tim Atkin MW[47], consumers need to begin to boycott “absurdly heavy bottles”, but to do this they need “help and information, help and information that supermarkets and wine retailers are best placed to offer at the point of purchase and on their websites.”

The reality, however, seems to be that many consumers are unaware of the huge carbon footprint of wine bottles. A study in Canada [48] asked a group of consumers to rate the different factors they would take into account in deciding whether or not a wine was sustainable. Label information, and eco-labelling both rated highly, but the bottle weight was one of the bottom three factors taken into account. Clearly therefore, there is an urgent need for greater education of consumers about the carbon impact of heavy wine bottles.

## **How to proceed?**

It appears that bottles as light as 350g can plausibly be used within the majority of existing infrastructure for bottle filling and distribution. At this stage, however, it is not clear how that feasibility might vary in different origins, and moving quickly to bottles of that weight is highly likely to cause greater resistance from those who might object to any change. For the next few years at least, the aim should be to get as high-a proportion of wines sold by SWR retailers as possible into 420g bottles.

It also seems sensible to proceed on a gradualist basis, with alterations in requirements for bottle weight evolving over time. This will allow time for producers and bottlers to adjust to new requirements and will provide time to demonstrate to those likely to oppose the moves that change can be made without serious adverse impacts on sales. SWR proposes the following course of action:

### **Start with the worst offenders**

The most obvious and simple way to start, as SAQ did, is to begin by excluding from sale those wines in the heaviest bottles. Given that wine can be delivered in 350g bottles without significant apparent challenges, there is no reason at all why bottles more than twice as heavy as that should be permitted. As SAQ did, we recommend that SWR's position would be to fairly rapidly exclude bottles heavier than 740g, then 650g, and then 550g.

### **Then focus on own brands**

There is no reason at all why SWR's retail members cannot move relatively rapidly to 420g bottles. Already most of The Wine Society's 'Society' brand wines are in bottles around this weight, and Waitrose has demonstrated a desire to change by introducing the use of metal cans for 187ml wine servings.

### **Work with the brands which members have in common**

It is highly likely that SWR's retail members have a high degree of commonality of the branded wines which they sell. Large producers like Treasury Wine Estates, Gallo and Concha y Toro are likely to be significant suppliers to all the retailers participating in this initiative.

Moreover, some have already taken significant steps in bottle light-weighting, and many are also members of SWR. A further step therefore will be to map where those retail members buy from and then establish how to work collaboratively to address outstanding issues relating to bottle weight.

### **Are exceptions permitted?**

The experience of SAQ and LCBO suggests that a policy of allowing 'iconic' bottles to remain, but with a hefty fee attached leads gradually to owners of those brands moving to lighter weight bottles. A similar approach can be used by SWR. Obviously, vintages already bottled will not have to be re-bottled.

Both SAQ and LCBO have an upper price point to their light weighting policy—C\$18.95 in the case of LCBO and C\$30 in the case of SAQ. This means that 'premium brands' are, in effect, not subject to these monopolies' bottle weight policies. From a logical perspective, there is no rationale to exclude 'premium brands' from any policy approach proposed by SWR. Even for wine to be laid down this remains the case. A light weight bottle will do the job of aging as well as a heavy one, by contrast with packaging formats, for example cans or BiB. That said, these wines will represent only a relatively small proportion of the wines sold, and so excluding them will not have a material impact on the carbon footprint reduction of a collective approach by SWR.

### **Working with the supply chain**

Whilst this project was initiated and funded by some of SWR's retail members, a significant number of interviews have been undertaken with members and non-members in other parts of the supply chain, including producers, bottlers and trade bodies. In none of these other parts of the wine industry (with the exception of the areas of opposition noted above) has any real opposition been identified to the idea that lighter bottles ought to be the norm. There is a strong rationale, therefore, for any approach on changes in bottle weight to be done in a joined-up way across the supply chain, rather than be seen as a top-down 'edict' from the retail end.

### **Sourcing lightweight bottles**

Information from this project suggests that light weight bottles may not be readily available in all origins. Interviewees in South Africa for example stated that they struggled to source domestically-produced bottles of 420g for cork closure. It will be important, therefore, to work with all origins to establish what bottle weights/ moulds are available where. It would be unfair in the extreme to exclude producers from being listed based on bottle weight if those producers cannot readily access light bottles. Having identified what is currently available, it would be useful to then work with bottle manufacturers to address gaps. For example, the main South African bottle maker has recently been taken over by an international company, which may have an impact on the range of lighter bottles which will be available. The local producer will also be able to draw on the wider, international experience of its new parent.

### ***Line management***

As was made clear in the previous section, it seems that most bottling lines can be readily used with light weight bottles, but that there may need to be some changes made to make this happen. It would be valuable, therefore, for SWR to produce a 'how to' guide which could be distributed to producers and bottlers to support them in identifying and addressing potential challenges. This could be done, for example, in collaboration with organisations such as British Glass, or FEVE.

### ***Supporting small producers***

Interviews for this study have included conversations with several small producers. A number of these have commented that they struggle to access lighter bottles because the big producers buy up the available supply. There will be a need, therefore, for SWR to work with smaller suppliers to ensure that they are able to get access to lighter bottles.

## **Recommendations**

Based on these conclusions, SWR makes the following recommendations for action:

### **The SWR 'Bottle weight accord'**

In 2018 the packaging NGO WRAP launched a UK Plastics Pact which "brings together businesses from across the entire plastics value chain with the UK government and NGOs to tackle the scourge of plastic waste." As part of this, participants commit to a common pathway on the use of plastics in their supply chains.

SWR proposes an analogous approach in relation to bottle weight, under which its retail members agree to a shared position to reduce the average weight of the 750ml still wine bottles they sell from the current average of approximately 550 grams to an average bottle weight below 420 grams by the end of 2026

By working together, SWR members will each have more influence than they would if they were to move unilaterally. Moreover, by having a group of retailers all asking for the same thing, pressure is reduced on producers to meet a range of different bottle weight requirements.

### **Support activities to the accord**

It is important that these proposed changes are not seen as a top-down edict by the retailers. SWR, therefore, needs to work also with other parts of the wine supply chain. Key actions will be:

### ***Ensuring bottle availability***

It would be grossly unfair to exclude suppliers from being listed by retailers if those suppliers' ability to move to lighter bottles is hindered by availability of those bottles. Research has identified, for example, that South African producers cannot currently access 420g bottles for cork closure, and other shortages may well exist elsewhere. SWR therefore needs to work with all its producer members to help map where gaps in bottle availability may exist, and how they may be addressed.

### ***Tools for consumer education***

There is clearly a huge gap in consumer understanding about the carbon footprint of wine bottles and the consequent need to move to lighter ones. SWR is not a consumer-facing organisation, but it would be valuable for us to create key messages about bottle weight which the marketing teams of retail members can then use.

### ***Leveraging the SWR network***

There is other activity which SWR could engineer in support of moves to lighter weight wine bottles. Most obviously, SWR can work with wine journalists to continually focus on the issue of wine bottle weight. One journalism member of SWR, Jancis Robinson, has already highlighted this issue. A number of other journalists interviewed from this process also expressed willingness to do the same. One approach might be to make a wine's bottle weight part of the matrix in deciding whether to recommend it. A number of high-profile journalists taking the line that 'this is a fine wine, but I cannot recommend it because it comes in too-heavy a bottle' may well succeed in raising this issue both to wine makers and to end consumers.

### ***A new study for consumer perceptions***

A key challenge in understanding consumer perceptions in relation to bottle weight and other factors in making wine choices is simply that no substantive studies of this topic have been undertaken for about half a decade. In that period, the profile of sustainability issues generally, and in wine in particular, have grown immensely. There are indications from other sources that wine buyers are more environmentally-conscious, and therefore it is quite likely that the environmental impact (and indeed other sustainability impacts) of the wines they buy is likely to be much more significant than five or six years ago. Certainly, anecdotal evidence from the Canadian monopolies suggests that in some cases, consumers are actually asking why some bottles are so heavy. SWR will explore the potential for new consumer surveys in this area.

### ***Positions on other relevant issues***

The intention of this study had been to address bottle weight as a specific issue, with a view to expanding SWR's work over time into other areas of wine packaging. However, in practice SWR needs to make clear statements on a number of other issues so that the steps proposed above form a coherent position on the part of SWR.



### ***Bulk shipping and reduction of 'bottle miles'***

Aside from reducing the weight of wine bottles, the most obvious way of reducing the carbon footprint of wine packaging is to make greater use of bulk shipping of wine. Wine exported in bulk, and then bottled in the consumer country has a much lighter carbon impact than those bottled at source and then shipped. SWR therefore needs to advocate for greater use of bulk shipping. Likewise, the carbon footprint of wine is reduced by the use of land transport which uses electricity (in particular from renewables).

There is, however, a caveat to this. In at least two origins, South Africa and Argentina, local bottling creates significant employment in areas where otherwise jobs would be hard to come by. Moving entirely to bulk shipping would therefore create unacceptably increased levels of unemployment. It is important that these 'balancing acts' in sustainability priorities are highlighted, particularly as SWR seeks to push forward its own agenda on human and labour rights issues in the wine supply chain.

### ***Bottle origin***

It is not just the distance travelled by wine bottles when they are full which is of concern, it is the number of bottles which travel huge distances while they are still empty which also needs to be addressed. For example, US trade data from 2021 estimates that 70% of wine bottles filled in the US are manufactured in China.[1] As an article reporting on this observed, this is tantamount to "shipping air across the Pacific."

However, it is not simply where bottles come from which is of concern, also highly relevant is the energy source used to make them. Bottles made in China, for example, may well be manufactured using electricity from coal fired power plants. By contrast, other producers use hydro-electric power. Encirc, in the UK, currently uses renewable electricity to heat the floors of its furnaces, but burns gas to heat the chamber. They aim to build a hydrogen-powered furnace by 2027.

SWR needs therefore to advocate both for the use, as far as is possible, for bottles manufactured locally to where bottling takes place; and over time for bottle manufacturers to improve the environmental impact of the energy sources used in their furnaces.

### ***Reuse, recycling and alternative formats***

These are all huge topics for discussion, but were not the focus of this piece of research. Nonetheless, it is important that SWR expresses a position on each, given their importance in wider discussions around wine packaging.

Glass is more-or-less infinitely recyclable and, as noted above more than half the content of most bottles used in Europe is recycled material – in some cases much more. At present, low recycling rates in the USA appears to be causing some challenges to glass manufacturers who are sometimes finding it hard to source cullet.

During the research for this paper, a number of organisations were interviewed who are engaged in reuse programmes for wine bottles. Mostly these are quite local arrangements, in cities like New York and London. Some vineyards also operate bottle return systems for local sales. However, at present, it is hard to see how these arrangements can be scaled to something on a regional or national basis in most countries. A great deal of infrastructure would be required which at present, is largely not in place. This is not to say that bottle reuse would not be a desirable option, but this seems to be a longer-term play, not something we might expect to see widely in place in the next 5-10 years.

Wine has been sold in glass bottles for centuries. However, a number of alternative formats for wine packaging are available, for example paper and PET bottles, bag-in-box (BiB) and cans. There are opportunities and challenges associated with all of these. This piece of research was intended, in part, as a means for SWR to enter debates on wine packaging. It is likely that further work by us over the coming months will begin to explore some of these wider issues.

## Acknowledgements

SWR is extremely grateful to those members who funded this research and provided access to their own work on these topics. The project supporters were:

- Alko (Finland)
- Lidl GB (UK)
- Systembolaget (Sweden)
- The Wine Society (UK)
- Whole Foods Market (USA)

This research included interviews with a great many other SWR members, drawn from all parts of the wine supply chain, and also from many non-members. Thanks are due to all these people for generously giving of their time. As part of the research process, the author of this paper, and two SWR members were hosted by Encirc UK at their bottle making and filling facility in Chester, UK. Thank you to the team there for a fascinating visit, and for allowing use of the photographs contained in this report.

## Bibliography

Alko. Environmental impacts of alcoholic beverages' supply chain. [Environmental impacts of alcoholic beverages' supply chain | Alko](#)

Andrews B. 'The Shrinking Footprint of Glass Wine Bottles.' SevenFiftyDaily 21/07/22 [The Shrinking Carbon Footprint of Glass Wine Bottles | SevenFifty Daily](#)

Badham R. 'St-Rémy opts for lighter bottles in sustainability push.' Drinks Retailing 31.01.23. [St-Rémy opts for lighter bottles in sustainability push - Drinks Retailing News - The Voice of Drinks Retailing](#)

Bonamente E, et al. 'Environmental impact of an Italian wine bottle: carbon and water footprint assessment.' In The Science of the Total Environment Vol 560-561, pp274-283 2016

Burchett A. Carry that weight.01/12/21 [Carry That Weight – Tim Atkin – Master of Wine](#)

Charters S, L Lockshin & T Unwin. 'Consumer responses to wine bottle back labels.' In Wine Industry Journal. Vol 15, No 3, May-June 2000.

Dimara E & D Skuras, D. 'Consumer demand for informative labelling of quality food and drink products: a European Union case study' In . Journal of Consumer Marketing Vol 22, pp90-100. 2005

Gibb R. Ontario sets maximum bottle weight limit. Decanter, 08/06/11. [Ontario sets maximum bottle weight limit - Decanter](#)

Goodman S. 'An international comparison of retail consumer wine choice.' In International Journal of Wine

Hartley A. Lightweight wine bottles. WRAP 2008

Hughson A, V de la Huerga & H Moskowitz. 'Mindsets of the wine consumer.' In Journal of Sensory Studies. Vol 19, pp85-105. May 2004

Jarvis W, S Mueller & K Chiong, 'A latent analysis of images and words in wine choice.' In Australasian Marketing Journal (AMJ) Vol18, pp138-144. 2010

Joy R. Wine bottles: A heavy price. Decanter 15/03/22 [Wine bottles: A heavy price - Decanter](#)

Kirk N & A Hartley. Delivering Wine Bottle Optimisation and Increased Bulk Importation. WRAP 2008

Lockshin L & AM Corsi. 'Consumer behaviour for wine 2.0: A review since 2003 and future directions.' In Wine Economics and Policy 1 2012. pp2–23

Lopes P, R Sagala & T Dood. Extrinsic wine attributes importance on Canadian consumers purchase decisions for environmentally sustainable wines. Academy of Wine Business. 2014.

Ma Q, HM Abdeljelil & L Hu. 'The Influence of the Consumer Ethnocentrism and Cultural Familiarity on Brand Preference.' In Frontiers in Human Neuroscience Vol 13, 2019.

Marhcant S. Message on a bottle: the wine label's influence. West Virginia University, 2015

Reported in Talbot P. Why wine label design matters so much. Forbes Magazine 21/08/19. [Why Wine Label Design Matters So Much \(forbes.com\)](https://www.forbes.com/2019/08/21/why-wine-label-design-matters-so-much/)

McIntyre D. The weight of that wine bottle doesn't indicate quality, and it's hurting the planet. Washington Post 04/11/21. [The weight of that wine bottle doesn't indicate quality, and it's hurting the planet – The Washington Post](https://www.washingtonpost.com/news/energy-environment/wp/2021/11/04/the-weight-of-that-wine-bottle-doesnt-indicate-quality-and-its-hurting-the-planet-the-washington-post/)

Mercer C. What is the point of heavy bottles? – Ask Decanter. 04/03/17. [What is the point of heavy wine bottles? Ask Decanter – Decanter](https://www.decanter.com/ask-decanter/what-is-the-point-of-heavy-wine-bottles-ask-decanter/)

Mitham P. Ontario boosts lightweight wine bottles. Wines Vines Analytics. 22/04/11. [Ontario Boosts Lightweight Wine Bottles – Wines Vines Analytics](https://www.winesvines.com/ontario-boosts-lightweight-wine-bottles/)

MtImet N & LM Alblsu. 'Spanish Wine Consumer Behaviour: A Choice Experiment Approach.' In Agribusiness Vol 22 (3) pp343–362 2006

Mueller S et al. Message on a bottle: 'The relative influence of wine back label information on wine choice.' In Food Quality and Preference. Vol 21, pp22–32. 2010.

Notarnicola B, G Tassielli & GM Nicoletti. 'LCA of wine production'. In Mattson B & U Sonesson (eds) Environmentally friendly food production. Woodhead Publishing, Cambridge. 2003

Novarro A et al. 'Econ-innovation and benchmarking carbon footprint data for vineyards and wineries in Spain and France.' In Journal of Cleaner Production. Vol 142 pp1661–1671. 2017

Petem V, C Rozman & JP Topler. 'When the Customer and the Wine Shelf Meet: Factors of Ethnocentrism When Selecting a Bottle of Wine.' In Sustainability 13 (12098) Nov 2021.

Petti L et al. 'Lifecycle assessment in the wine sector.' In Notarnicola B. Life cycle assessments in the agri-food sector: case studies. Methodological issues and best practices. Springer International Publishing 2015.

Piqueras-Fizman B & C Spence. 'The weight of the bottle as a possible extrinsic cue with which to estimate the price (and quality) of the wine? Observed correlations.' In Food Quality and Preference. Vol 25. Pp41-45 2012

Rasmussen M & L Lockshin. 'Wine choice behaviour: preliminary research on the effects of regional branding,' In The Australian and New Zealand Wine Industry Journal.1999

Robinson J. Shipping air across the Pacific. 03/07/21 [Shipping air across the Pacific | JancisRobinson.com](https://www.jancisrobinson.com/articles/shipping-air-across-the-pacific)

Rugani B et al. 'A comprehensive review of carbon footprint analysis as an extended environmental indicator of the wine sector.' In Journal of Cleaner Production. Vol 54 pp61-77 2013

SAQ. Why are we big on lightweight glass 16/01/22 [All about lightweight glass | SAQ.COM](https://www.saq.com/news/why-are-we-big-on-lightweight-glass)

Schmitz A, et al. 'Energy consumption and CO2 emissions of the European glass industry.' In Energy Policy. 2011;39: pp142-155.

Scrucca F, E Bonamente & S Rinaldi. 'Carbon Footprint in the Wine Industry' In Muthu SS (ed) Environmental Carbon Footprints: Industrial Case Studies. Butterworth-Heinemann, Oxford. 2018

Shimp, TA & S Sharma. 'Consumer ethnocentrism: Construction and validation of the CETSCALE'. In the Journal of Market Research Vol24, pp280-289 1987.



# Join the SWR membership

---

A global platform to  
advance sustainability  
across the wine industry  
from production to retail

Get in touch

Tom Owtram

Operations and Partnerships Manager

[tom@swroundtable.org](mailto:tom@swroundtable.org)

[www.swroundtable.org](http://www.swroundtable.org)