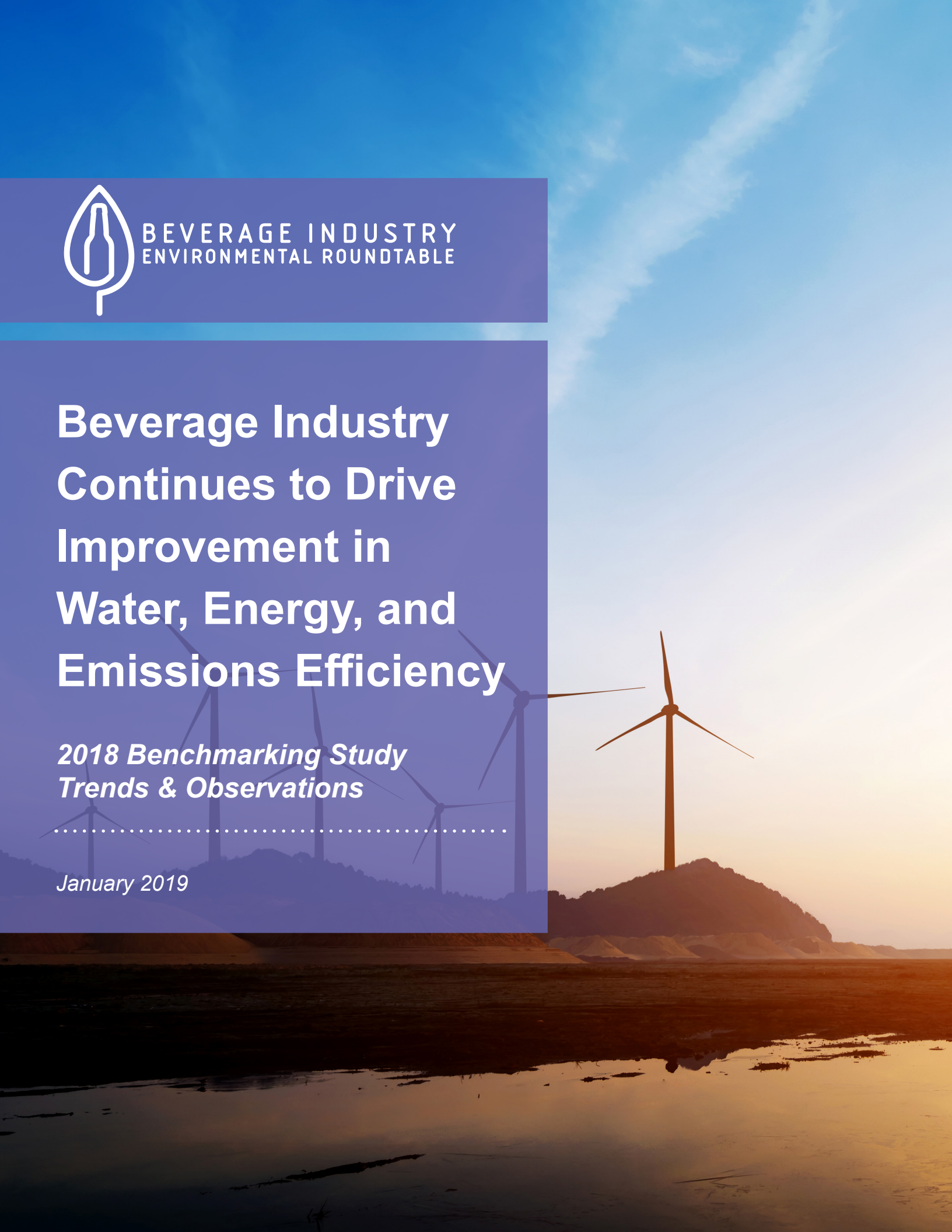
BEVERAGE INDUSTRY
ENVIRONMENTAL ROUNDTABLE

Beverage Industry Continues to Drive Improvement in Water, Energy, and Emissions Efficiency

2018 Benchmarking Study
Trends & Observations

January 2019



Acknowledgements

Participants at the October 2018 BIER Meeting in Purchase, NY.

BIER would like to extend our sincerest appreciation to the individual BIER member companies for their participation and contribution, without which this report would not be possible:

BIER would also like to thank the following benchmarking partner contributors for their voluntary participation and support, all of whom provided facility data for this Benchmarking Study:

Dutch Brewers Association

Kentucky Distillers Association

European Fruit Juice Association

Nestlé Waters North America

Contents

1 | Continuing to Drive Improvement in Water, Energy, and Emissions Efficiency.....1
Performance at a Glance

2 | Key Study Findings 3

3 | Bottling Facilities 7

4 | Carbonated Soft Drinks 8

5 | Bottled Water 9

6 | Breweries 10

7 | Distilleries 12

8 | Wineries 14

9 | Water Availability Analysis 16

10 | Future Benchmarking Study Recommendations & Conclusion 18

11 | Benchmarking Definitions & Methodology 19

Continuing to Drive Improvement in Water, Energy, and Emissions Efficiency

In December 2018, the Beverage Industry Environmental Roundtable (BIER) completed its tenth Benchmarking Study – the most comprehensive quantitative and qualitative benchmark of water, energy, and emissions efficiency in the beverage industry. In its ten benchmarking studies, BIER has evaluated thirteen years of industry performance for nearly 2,000 facilities worldwide. Final results represent a comprehensive set of production, water, energy, and emissions metrics which are normalized, categorized by facility and beverage type, and analyzed. The 2018 Benchmarking Study is the second study to follow the updated biennial reporting structure, including facility-level data for 2013, 2015, and 2017 from 15 BIER members and 4 external partner contributors. Our continued progress is represented through a diverse variety of facility types, production volumes, and geographic locations - a clear illustration of the proactive approach the beverage industry is taking to improve business performance while mitigating environmental impacts worldwide.

Commitment to Collaboration

The 2018 study included participation from 19 global beverage companies, including 15 BIER members and 4 external partner contributors. The final dataset included over 1,600 facilities from 6 continents.

Growth in Productivity

Industry production volume increased 4% from 2013 to 2017, equivalent to an additional 12 billion liters of global beverages produced worldwide. Of facilities reporting three years of data, 51% reported an increase in production.

Resource Conservation

Despite the prominent increase in production volume, the industry continues to demonstrate its dedication to stewardship and efficiency. From 2013 to 2017, total water use and energy consumption decreased 4% and 7%, respectively.

Improved Emissions Reporting

2018 marked the second Benchmarking Study to request Scope 1 and 2 emissions data at the facility-level, and is the first year that these results will be shared externally. Nearly 95% of facilities were able to report Scope 1 and 2 emissions.

Performance at a Glance

Table 1 below presents water use, energy use, and emissions ratios for the four main facility types (Brewery, Distillery, Winery, and Bottling). As shown in Table 1, nearly all benchmarking trends demonstrate a decreasing trend from 2013 to 2017 – a noteworthy improvement in efficiency as industry production volume increased over the same reporting period. Additional insight and supporting metrics are provided in each of the corresponding facility-type sections of this report.

Table 1: 2018 Benchmarking Study Performance Overview

	2013	2015	2017
Total Companies Reporting	18	19	19
Total Facility Count	1,623	1,696	1,636
Total Production (Billion L)	283	293	295
Total Water Use (Billion L)	781	764	746
Total Energy Use (Billion MJ)	217	215	202
Total Emissions (MM MT CO2e)	15.28	15.97	15.58
Water Use Ratio (WUR) (L/L)	**2.76**	**2.61**	**2.53**
Brewery	*3.68*	*3.45*	*3.35*
Distillery	*43.28*	*34.47*	*32.68*
*Winery **	*3.86*	*3.92*	*3.98*
Bottling (All)	*2.01*	*1.91*	*1.87*
Energy Use Ratio (EUR) (MJ/L)	**0.77**	**0.74**	**0.69**
Brewery	*1.23*	*1.16*	*1.11*
Distillery	*14.46*	*13.47*	*12.03*
*Winery **	*1.50*	*1.76*	*1.86*
Bottling (All)	*0.44*	*0.41*	*0.38*
Emissions Ratio (g CO2e/L)	**63.13**	**61.02**	**57.77**
Brewery	*106.76*	*95.36*	*90.77*
Distillery	*764.93*	*753.42*	*696.84*
*Winery **	*112.99*	*115.03*	*126.92*
Bottling (All)	*38.81*	*37.40*	*35.15*

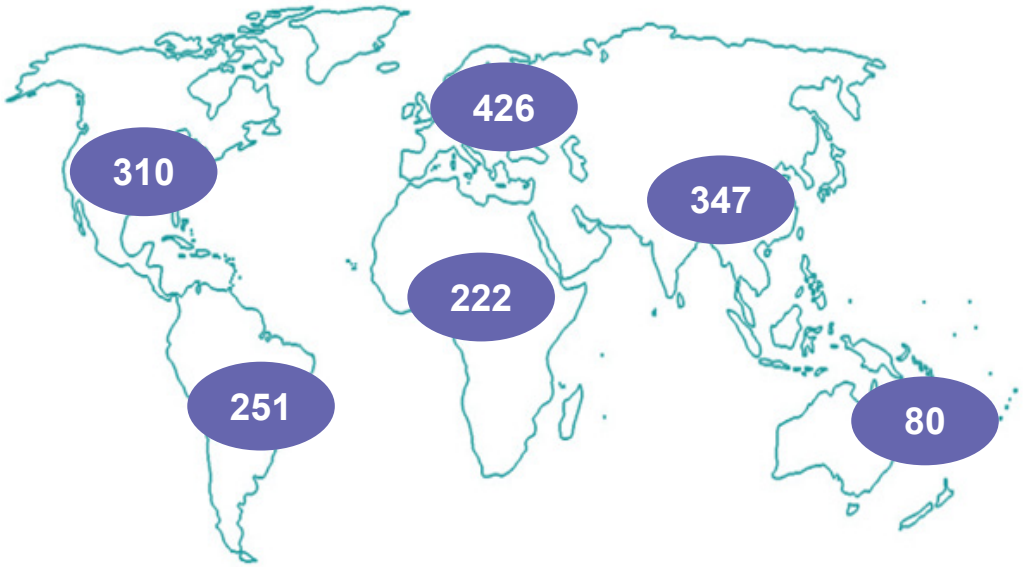
NOTE: Total production and facility count differ between water and energy, as some facilities that provided water data were unable to provide energy data. "Total Companies Reporting" include 15 BIER members and 4 external partner contributors.

* Winery data represents a Fixed Dataset (only representing wineries with all three years of data reported).

Key Study Findings

Continued Reporting Diversity: The 2018 study included data from 19 participating companies, representing over 1,600 facilities worldwide. Facility-specific data was provided by 15 individual BIER Members as well as 4 external contributors: The Dutch Brewers Association; European Fruit Juice Association; Kentucky Distillers Association; and Nestlé Waters North America. As shown in Figure 1, facilities were represented in each of the six continents included in the study, with the majority of facilities located in Europe and Asia.

Figure 1: 2017 Geographic Distribution, All Facilities



Differences in Water, Energy, and Emissions Efficiency Based on Facility Type: Water use, energy use, and emissions ratios continue to differ significantly between facility types due to the variation between production processes, facility size, and water and energy intensity. For example, alcohol distillation tends to be more water and energy intensive than the production of beer, largely due to the differences in fermentation, cooking, and cooling processes between the two beverage types. Bottling facilities continue to demonstrate the least water- and energy-intensive processes, as some bottling facilities (such as wine and distilled spirits bottlers) receive finished beverages that have been produced at separate locations. Additional insight regarding the differences between facility and beverage type is available in the facility-specific sections of this report.

Correlation Between Efficiency and Production Size: As seen in previous benchmarking studies, there is a correlation between water and energy efficiency and reported production volume at a facility. This indicates that beverage manufacturing locations may recognize economies of scale when producing significant quantities of beverages. As demonstrated in Table 2, 2017 water and energy ratios were lowest for facilities within the 200,000 – 500,000 kiloliter production range. This trend is driven by a variety of process-driven factors, including production run lengths, frequency of product change-overs, continuous bottling operations versus batch runs, and the level of process automation. Although larger production facilities may have more continuous processes, there is an apparent apex regarding the efficiency and resources required to operate the largest facilities within the dataset (>500,000 kiloliters production volume). Distilleries and wineries tend to have the smallest production volumes and largest resource consumption due to their production processes, also contributing to the increased ratios within the smaller production ranges.

Table 2: 2017 Efficiency by Production Volume

Production Range	2017 Water Use Ratio (L/L)	2017 Energy Use Ratio (MJ/L)	2017 Emissions Ratio (g CO2e/L)
<50,000 kL	5.65	2.17	158.08
50-200,000 kL	2.92	0.74	65.53
200-500,000 kL	2.24	0.57	48.64
>500,000 kL	2.31	0.65	53.13

Growth in Industry Production: Industry production volume increased 4% from 2013 to 2017, equivalent to an additional 12 billion liters of beverages produced worldwide. Of facilities reporting three years of data, 51% reported an increase in production over the study period. A total of 131 facilities reported data for the first time in 2017, representing over 4% of total beverage production for the industry at large.

Water

2017 Average Facility Production = 180,375 KL

2017 Average Facility Water Use = 456,245 KL

66% of facilities reporting water data for all 3 years decreased their WUR from 2013 to 2017

Energy

2017 Average Facility Energy Use = 123.45 MM MJ

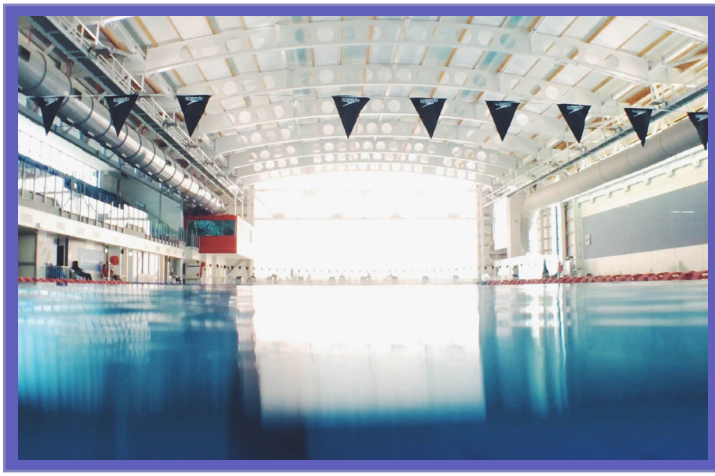
63% of facilities reporting energy data for all 3 years decreased their EUR from 2013 to 2017

Emissions

2017 Average Facility Emissions = 9,523 MT CO2e

62% of facilities reporting emissions data for all 3 years decreased their emissions ratio from 2013 to 2017

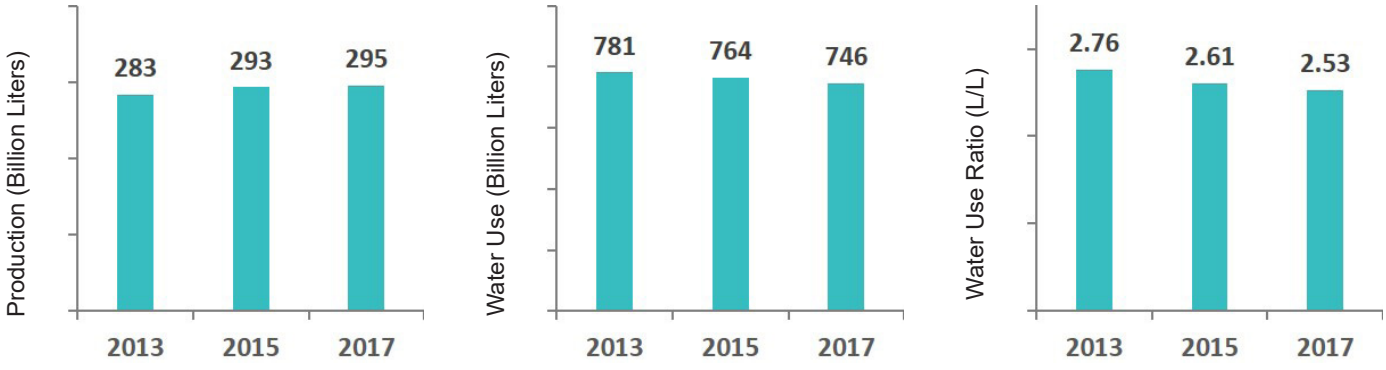
Improvement in Water, Energy, and Emissions Efficiency: Industry water use decreased over 4% from 2013 to 2017, an equivalent savings of nearly 35 billion liters. The corresponding production increases over the same timeframe led to an 8% decrease in the industry-wide water use ratio, with 66% of facilities reporting a decreased water use ratio from 2013 to 2017. Total energy use decreased by nearly 15 billion megajoules, representing a 7% reduction from 2013 to 2017. Energy use ratio, defined as the amount of energy used to make one liter of beverage, decreased from 0.77 MJ/L to 0.69 MJ/L, equivalent to a 10% reduction over the study period. Of facilities reporting energy data for all three years, over 63% reported a decreased energy use ratio from 2013 to 2017. Total emissions[1] (Scope 1 and Scope 2) increased throughout the reporting period but were normalized by the increasing production volume, resulting in a decreasing emissions ratio from 2013 to 2017. Figures 2-4 on the next page present the industry benchmarking trends for water, energy, and emissions efficiency throughout the reporting period.



Industry-wide volume-weighted water use ratio decreased from 2.76 to 2.53 L/L from 2013 to 2017. This improvement in water use efficiency corresponds to an industry-wide water use avoidance of nearly 35 billion liters, enough to fill an Olympic-sized swimming pool nearly 14,000 times. *

**Based on a standard Olympic Swimming Pool volume of 2.5 million liters. "Olympic-Sized Swimming Pool." World Atlas. https://www.worldatlas.com*

Figure 2: Industry Production, Water Use, and Water Efficiency, 2013-2017



1. Total emissions represent a combined total for Scope 1 and Scope 2 emissions, as defined by the Greenhouse Gas Protocol. Scope 2 emissions are primarily location-based but may include market-based totals if that was the only quantification available. https://ghgprotocol.org/

Figure 3: Industry Production, Energy Use, and Energy Efficiency, 2013-2017

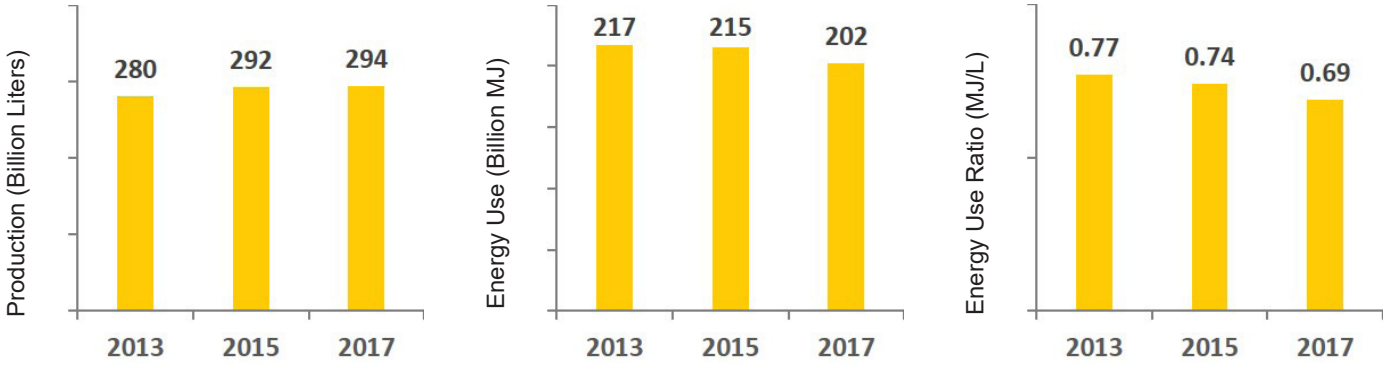
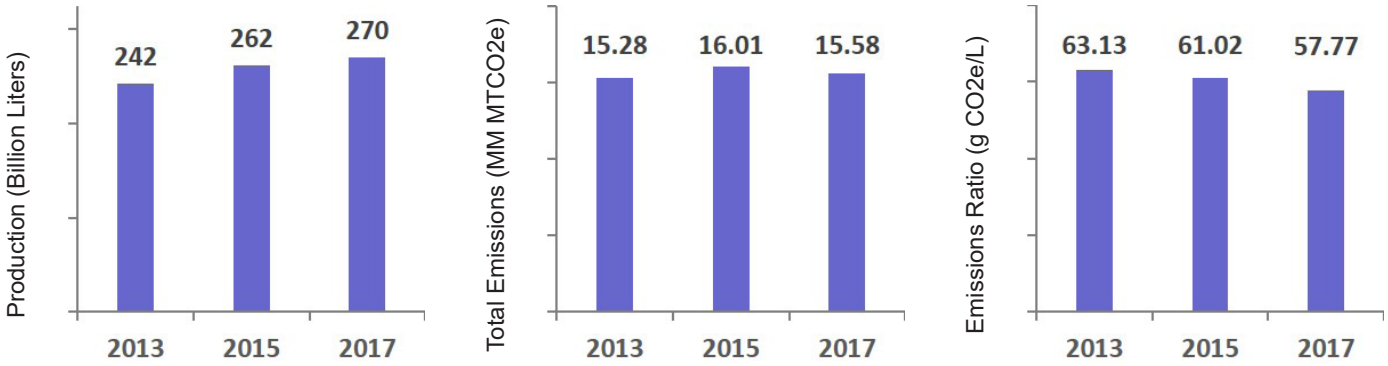


Figure 4: Industry Production, Total Emissions, and Emissions Efficiency, 2013-2017



Additional benchmarking analyses were completed for each of the four main facility types (Brewery, Distillery, Winery, and Bottling) to identify additional beverage-specific trends in water and energy efficiency. Facility types, general process definitions, and associated performance trends are presented in the following sections. Select observations based on supplemental data collection and analysis of fixed trends are included as applicable.

Bottling Facilities

Bottling facilities are defined as locations where concentrate, syrup, flavors/infusions, and/or bulk alcohol are blended with water and packaged into various container types. Bottling facilities also encompass facilities which receive finished bulk product (such as completely brewed beer or matured whiskey). No fermenting or distilling processes are conducted at bottling facilities.

The largest dataset of the 2018 Benchmarking Study was Bottling facilities (all types), accounting for 65% of 2017 production volume and 61% of total facility count. Bottling facilities have historically used the least amount of water and energy to yield one liter of product due to fewer water, energy, and emissions-intensive processes compared to other beverage types that may require additional cooking, fermenting, and distilling methods. Bottling facilities continue to process and package a wide variety of beverage types, with 38% of facilities producing more than one type of beverage. For the purposes of this report, the focus was on the two largest sub-groups within the bottling data set: Carbonated Soft Drinks and Bottled Water.

Water

2017 Average Facility Production = 191,757 KL

2017 Average Facility Water Use = 358,760 KL

65% of facilities reporting water data for all 3 years decreased their WUR from 2013 to 2017

Energy

2017 Average Facility Energy Use = 72.48 MM MJ

62% of facilities reporting energy data for all 3 years decreased their EUR from 2013 to 2017

Emissions

2017 Average Facility Emissions = 6,480 MT CO2e

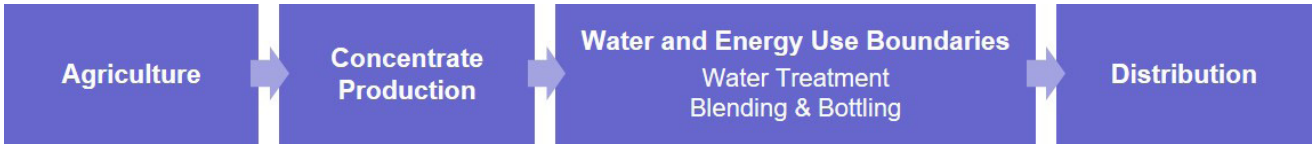
58% of facilities reporting emissions data for all 3 years decreased their emissions ratio from 2013 to 2017

Carbonated Soft Drinks

Carbonated Soft Drinks are defined as non-alcoholic, flavored carbonated beverages. This category includes colas, ginger ales, and seltzers, but excludes non-carbonated beverages such as ready to drink teas, coffees, fitness and energy drinks, and juices.

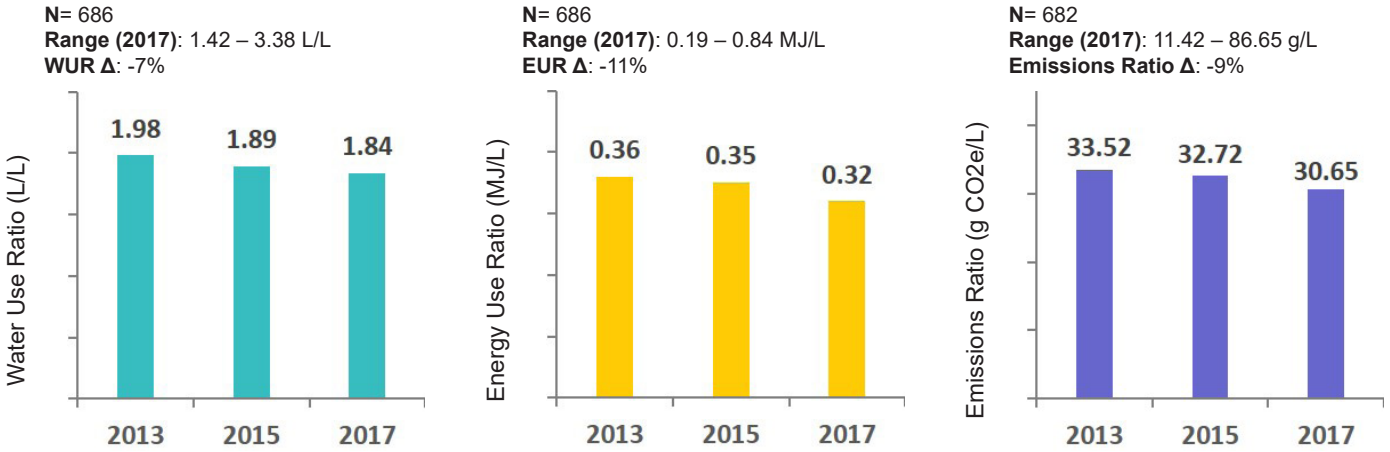
Facilities included in this sub-group reported a beverage production mix (percentage of each type of beverage produced at the facility) of at least 50 percent Carbonated Soft Drinks. Figure 5 demonstrates the boundaries of the operations where water and energy use were included in the benchmarking report. Carbonated Soft Drink facilities were the largest beverage type reported in the 2018 Benchmarking Study, accounting for over 68% of all bottling facilities.

Figure 5: Process Map, Carbonated Soft Drinks



As shown in Figure 6, Carbonated Soft Drink facilities continued to demonstrate improvements in water, energy, and emissions efficiency throughout the course of the reporting period. Water use ratio decreased 7% from 2013 to 2017, with 2018 marking the first Benchmarking Study where Carbonated Soft Drink bottlers achieved a water use ratio below 2.0 L/L for three consecutive years. Total energy use and emissions also decreased across the study period, with a corresponding reduction in energy use and emissions ratios despite an increased production volume from 2013 to 2017.

Figure 6: CSD Water, Energy, and Emissions Efficiency, 2013-2017

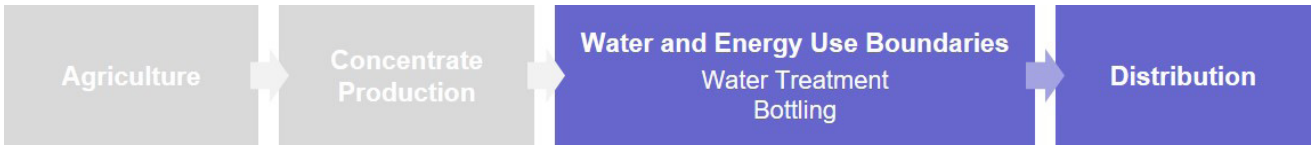


Bottled Water

Bottled Water is defined as all unflavored bottled waters including spring water, purified water (produced by distillation, deionization, reverse osmosis or other processes), mineral water, sparkling bottled water, or well water.

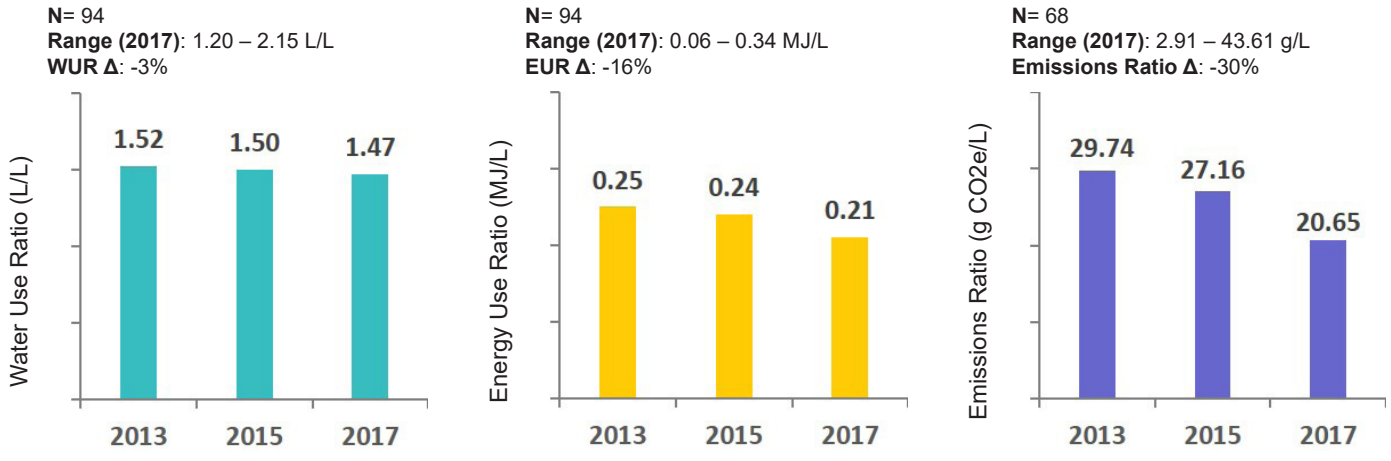
Facilities included in this sub-group reported a beverage production mix of at least 50 percent for Natural Water, Spring Water, and/or Mineral Water. Of all bottled water facilities reported in the 2018 Benchmarking Study, 83% bottled Natural Water; 16% bottled Spring Water; and 1% bottled Mineral Water. As shown in Figure 7, water and energy use benchmarking boundaries included water treatment (as applicable), bottling processes, and product water.

Figure 7: Process Map, Bottled Water



As demonstrated in Figure 8, bottled water facilities reported an improvement in water, energy, and emissions efficiency throughout the reporting period, with production volume increasing 11% from 2013 to 2017. Of the facilities reporting three years of data, 57% reported a reduction in their water use ratio; 70% reported a reduction in their energy use ratio, and 76% reported a reduction in their emissions ratio.

Figure 8: Water Bottling Water, Energy, and Emissions Efficiency, 2013-2017



Breweries

Breweries are defined as facilities conducting all processes after the malting process to produce beer (mashing/lautering, boiling, fermenting, aging, and packaging).

Breweries were the second largest facility type reported in the 2018 Benchmarking Study, accounting for 34% of industry production volume and 28% of total facility count for 2017. Of the 453 breweries reporting 2017 data, 83% produce 100% beer, whereas the other 17% produce a variety of products including beer, waters, carbonated soft drinks, and non-carbonated beverages. As seen in Figure 9, benchmarking accounted for all brewing processes except for upstream agricultural growth, malting, and distribution of finished product.

Figure 9: Process Map, Brewery

Water

2017 Average Facility Production = 221,108 KL

2017 Average Facility Water Use = 740,812 KL

76% of facilities reporting water data for all 3 years decreased their WUR from 2013 to 2017

Energy

2017 Average Facility Energy Use = 248.63 MM MJ

68% of facilities reporting energy data for all 3 years decreased their EUR from 2013 to 2017

Emissions

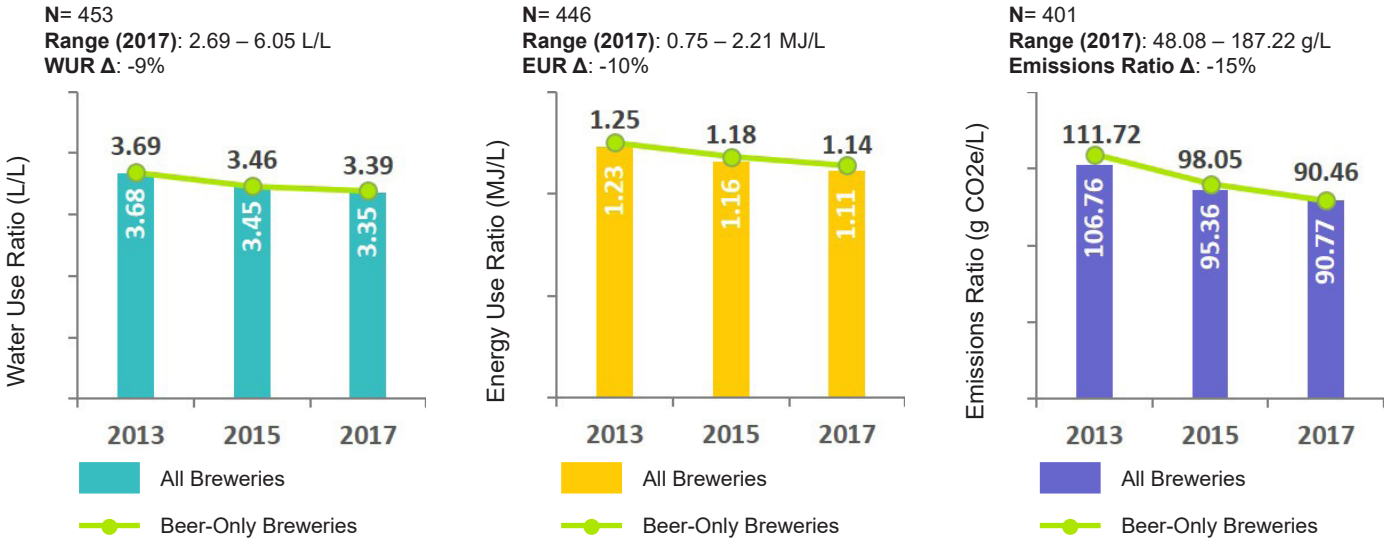
2017 Average Facility Emissions = 15,040 MT CO2e

74% of facilities reporting emissions data for all 3 years decreased their emissions ratio from 2013 to 2017

As shown in Figure 10, water, energy, and emissions efficiency continued to improve throughout the reporting period. Total water use decreased by nearly 27 million kiloliters between 2013 and 2017, corresponding to a 9% decrease in water use ratio over the same timeframe. Total energy use decreased 8%, corresponding to a 10% reduction in energy use ratio. Brewery emissions increased nearly 3% from 2013 to 2017 but were normalized by an increasing production volume, resulting in a 15% decrease in emissions ratio. Prominent drivers in brewery efficiency include the following:

- Variations among brewing processes (fermentation/malting)
- Level of cleaning process automation
- Use of high-efficiency equipment
- Differences in packaging type: small packaging (bottles or cans) vs. bulk packaging (kegs or tanks)
- Use of refillable containers
- Brewery production volume

Figure 10: Brewery Water, Energy, and Emissions Efficiency, 2013-2017



**NOTE: "All Breweries" refers to facilities that produce beer and supplemental beverages, whereas "Beer-Only Breweries" refers to facilities that only produce beer.*

Performance trends between all breweries and beer-only breweries were generally consistent throughout the reporting period. As shown in Figure 10, performance ratios for breweries that only produce beer were slightly larger, likely attributed to combination plants being less resource-intensive depending on their complementary beverage type. For example, facilities that produced beer and carbonated soft drinks in 2017 reported water use ratios up to 20% less than the average water use ratio for beer-only facilities.

Distilleries

Distilleries are defined as facilities that receive agricultural inputs (grains, agave, molasses, etc.) and conduct processes (cooking, fermenting, distilling and storage/maturation) to produce bulk alcohol.

Distilleries tend to be one of the most complex datasets captured within the study due to the wide variety of distilling processes and spirit types. In 2018, distillery members collaborated to further refine distilling-related definitions and reporting methodology. As seen in Figure 11 on the next page, benchmarking includes all process steps except upstream agricultural growth and distribution of finished product.

Figure 11: Process Map, Distillery

Water

2017 Average Facility Production = 12,583 KL

2017 Average Facility Water Use = 411,198 KL

52% of facilities reporting water data for all 3 years decreased their WUR from 2013 to 2017

Energy

2017 Average Facility Energy Use = 151.35 MM MJ

53% of facilities reporting energy data for all 3 years decreased their EUR from 2013 to 2017

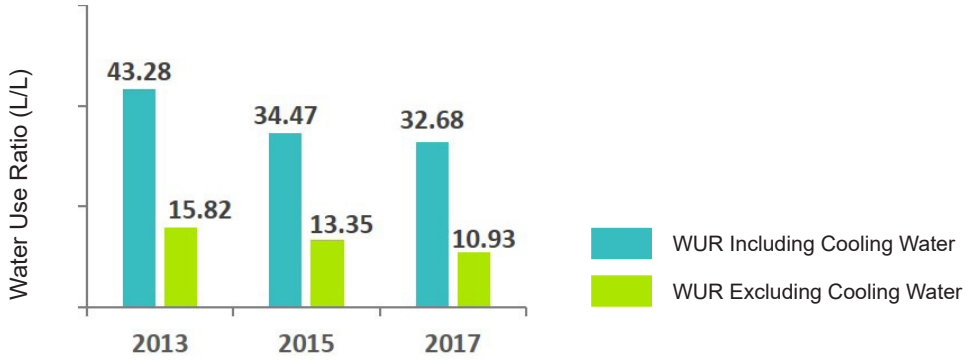
Emissions

2017 Average Facility Emissions = 8,868 MT CO2e

64% of facilities reporting emissions data for all 3 years decreased their emissions ratio from 2013 to 2017

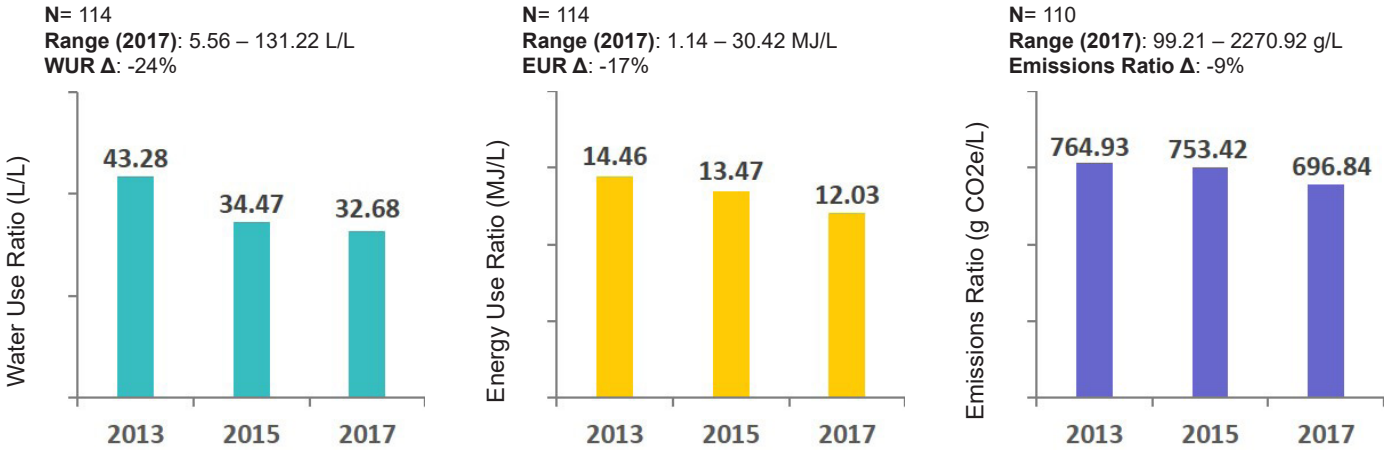
Distilleries tend to be the most water-intensive facility type within the industry due to the distilling and cooling processes, as demonstrated by their higher water use ratios compared to other facility types. Cooling water remains the largest component of a distillery's water use profile, historically driving the larger water use ratios reported for this facility type. As shown in Figure 12 at right, distillery water use ratios excluding cooling water were over 60% less than the distillery ratios including cooling water.

Figure 12: Effect of Cooling Water on Distillery Water Efficiency, 2013-2017



Distilleries, which tend to have more water, energy, and emissions-intensive processes, continued to report improved efficiency throughout the reporting period. As shown in Figure 13, water use, energy use, and emissions ratios decreased 24%, 17%, and 9%, respectively.

Figure 13: Distillery Water, Energy, and Emissions Efficiency, 2013-2017

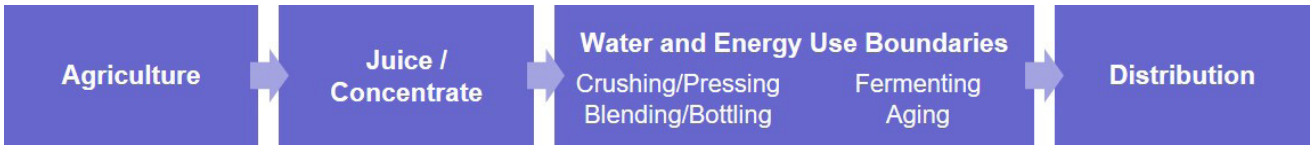


Wineries

Wineries are defined as facilities where the scope of processes include the crushing and pressing of grapes, fermentation, storage/aging, and bottling of product.

Wineries continue to be the smallest dataset within the Benchmarking Study, by both volume and facility count. Total wine production for 2017 accounted for less than 0.03% of the industry total, with wineries comprising 4% of total facilities reported. The benchmarking study accounted for all process steps with the exception of upstream agricultural growth, juice/concentrate and distribution of finished product, as seen in Figure 14.

Figure 14: Process Map, Winery



Water

2017 Average Facility Production = 12,441 KL

2017 Average Facility Water Use = 48,333 KL

43% of facilities reporting water data for all 3 years decreased their WUR from 2013 to 2017

Energy

2017 Average Facility Energy Use = 18.41 MM MJ

17% of facilities reporting energy data for all 3 years decreased their EUR from 2013 to 2017

Emissions

2017 Average Facility Emissions = 1,346 MT CO2e

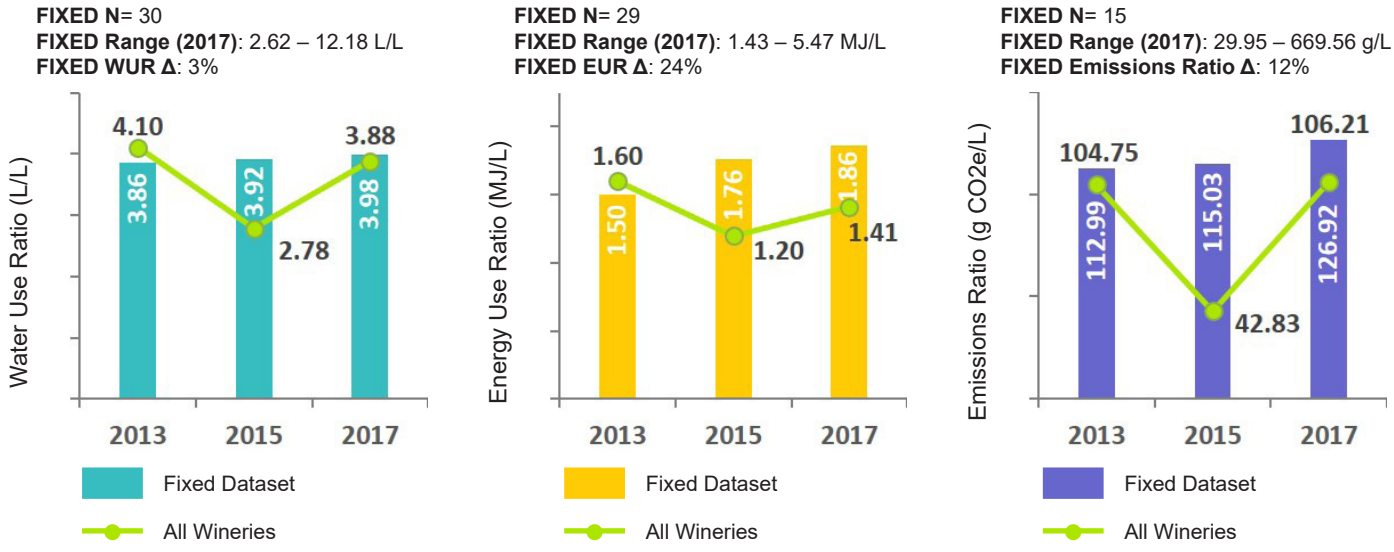
40% of facilities reporting emissions data for all 3 years decreased their emissions ratio from 2013 to 2017

Wineries experienced various reporting complexities throughout the study period, resulting in variations within the year-over-year trends for water, energy, and emissions efficiency. Prominent drivers included facility closures, reporting system updates, and the addition of several wineries reporting data for the first time in 2017.

To account for these reporting complexities, data is presented two ways in Figure 15 – a Fixed Dataset (only representing wineries with all three years of data reported), and All Wineries (representing all wineries that reported for any year during the study period).

Based on the analysis of fixed trends, water, energy, and emissions ratios all increased over the course of the reporting period for facilities able to report all three years of data. Of these facilities, production volume decreased 19% from 2013 to 2017, whereas water use, energy use, and emissions slightly decreased. The majority of wineries included within the Fixed Dataset reported increasing water, energy, and emissions ratios throughout the study period, likely attributed to the prominent decrease in reported production volume.

Figure 15: Winery Water, Energy, and Emissions Efficiency, 2013-2017



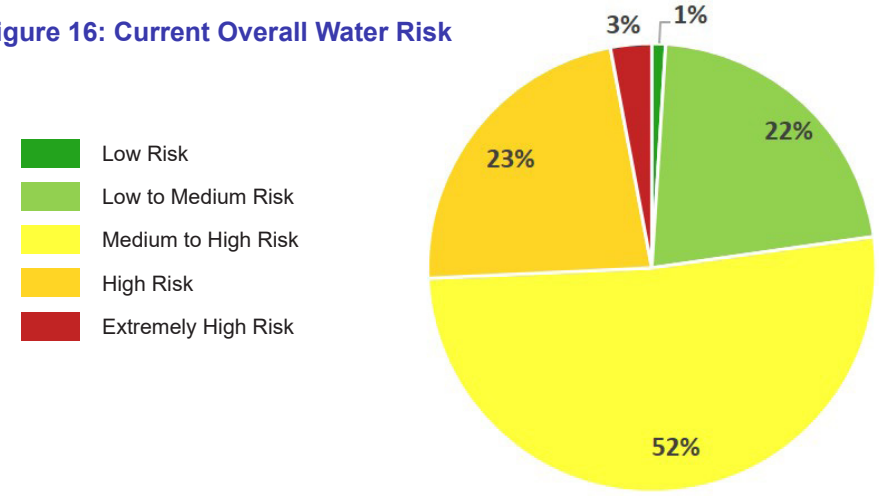
**NOTE: "Fixed Dataset" refers to facilities reporting data for all three years.*

Water Availability Analysis

Global water availability is one of the most threatening and pervasive sustainability concerns of the modern era, with freshwater resources becoming increasingly vulnerable to climate change, overuse, pollution, and growing demand. BIER members are particularly sensitive to resource depletion, as water tends to be the largest component of beverage production for the majority of members. In recent years, BIER members have increased their focus on water risks through source water vulnerability assessments and Water Working Group initiatives to evaluate risks, collaborate on solutions, and promote efficient and sustainable water use within the beverage industry at large.

The 2018 Benchmarking Study included a comprehensive water scarcity analysis of all member facilities that reported both water use and production volume for 2017. The World Resources Institute (WRI) Aqueduct Water Risk Atlas tool was able to map and analyze water risk data for 1,530 facilities, representing 94% of BIER benchmarking participants. As seen in Figure 16, over 78% of facilities currently operate in areas that possess at least a medium overall water risk. Overall water risk accounts for physical risks, including water quality and quantity, as well as regulatory and reputational risks.

Figure 16: Current Overall Water Risk



To further evaluate if efficiency improvements were occurring in areas with increasing water stress, water use ratio improvements were compared with 2030 Business as Usual projections. As shown in Table 3 on the following page, at least 72% of facilities with WRI Aqueduct data available are located within watersheds where water stress will increase. Over 56% of facilities in these areas reported decreasing water use ratios between 2013 and 2017, indicating that the industry continues to drive efficiency improvements in areas where water stress is expected to increase within the next 11 years.

Table 3: Projected Water Supply, 2030

Project Water Supply, Business as Usual 2030	Number of Facilities	% Reporting WUR Improvement, 2013-2017
Near Normal Conditions	417	54%
Drier but Low Stress	5	40%
Moderately More Stressed	105	61%
Severely More Stressed	574	54%
Extremely More Stressed	216	62%
Exceptionally More Stressed	213	55%

Please note that at the time of this study, WRI Aqueduct methodology was consistent with previous benchmarking reports and had not been updated since the tool was released in 2014. Analyses are conducted based on indicator metadata provided via Aqueduct Global Maps 2.1, which is scheduled to be updated in 2019.

Future Benchmarking Study Recommendations & Conclusion

BIER is constantly seeking to improve and refine the Benchmarking Study to ensure that results continue to be insightful and valuable to our members and stakeholders. Opportunities for improvement in 2019 and beyond include:

- **Biennial Reporting:** BIER will continue to use the same biennial benchmarking structure in 2020 and beyond but will seek to obtain relevant insights and suggestions from the Membership between studies. Following this schedule, the next water, energy, and emissions Benchmarking Study is scheduled to occur in 2020, including data for 2015, 2017, and 2019.
- **Definition and Methodology Revisions:** BIER benchmarking guidance and glossaries were updated to align with Global Reporting Initiative (GRI) guidelines in 2018. The BIER Benchmarking Team will continue to engage the Membership in 2019 to gather additional insight and suggestions for methodology refinement in 2020.

Conclusion

Our commitment to delivering safe, high-quality beverage products requires the responsibility to sustain the natural resources used to create them. Since 2006, the Beverage Industry Environmental Roundtable (BIER) has sought to maintain a proactive and collaborative approach that seeks to reduce environmental impacts, mitigate risk, and promote increasing sustainability within the beverage industry at large. This commitment is demonstrated first-hand through our biennial Benchmarking Study that drives collaboration, accountability, and performance improvement from each of our participating members.

The 2018 Benchmarking Study was a milestone achievement, marking our tenth Study since BIER's inception in 2006. The final dataset included participation from 19 leading beverage companies representing over 1,600 production facilities worldwide. Industry water and energy use ratios decreased 8% and 10% (respectively) throughout the study period, with all four facility types (Brewery, Distillery, Winery, Bottling Facility) reporting an improvement in water and energy use efficiency compared to 2013.

Our continued progress is represented through a diverse variety of facility types, production volumes, and geographic locations - a clear illustration of the proactive approach the beverage industry is taking to improve business performance while mitigating environmental impacts worldwide. BIER looks forward to continued engagement amongst our Membership, stakeholders, and various working groups to ensure that benchmarking insights are meaningful, accurate, and conducive to our primary goal: to enhance collaboration and advance sustainability within the beverage sector.

Benchmarking Definitions & Methodology

To establish the benchmarking dataset, each company submitted three years (2013, 2015, 2017) of facility-specific data as described below:

- T**otal Water Usage:** All water used by the plant (including Bottling and Industrial Water) from all sources used for activities including but not limited to: beverage production, cleaning/sanitizing processes, cooling waters, sanitation, landscaping, etc. Total Water Usage includes stormwater/rainwater captured for activities defined above. The scope of this study does not include water used to grow ingredients or at warehousing or office facilities. This definition is generally aligned with GRI Standard 303-1 (2016). Total Water Usage excludes Return Water.

- **Total Energy Consumption:** All energy consumed on site from all sources used for activities including but not limited to: facility operation, beverage production, cleaning/sanitizing processes, bottling processes, pasteurization, cooling, sanitation, etc. This definition is generally aligned with GRI Standard 302-1 (2016).

- **Scope 1 Emissions:** Direct GHG emissions from owned or controlled sources (e.g., generation of electricity, heating, cooling and steam from fuel combustion). This definition is generally aligned with GRI Standard 305-1 (2016). Please note: for the purposes of the 2018 BIER Benchmarking study, Scope 1 does not include owned transportation fleets.

- **Scope 2 Emissions:** Indirect GHG emissions from the consumption of purchased or acquired electricity, heat or steam. This definition is generally aligned with GRI Standard 305-2 (2016).

- **Total Greenhouse Gas (GHG) Emissions:** The sum of absolute Scope 1 and Scope 2 emissions. Scope 3 emissions were not quantified for the 2018 BIER Benchmarking Study.

- **Total Beverage Production:** The volume of finished product generated at a facility or by a company. For facilities that produce alcoholic beverages, total beverage production should represent the actual volume of product (wine gallons) and should not be scaled to a specific alcohol content.

- **Water Use Ratio (L/L):** Calculated as the ratio of Total Water Usage to Total Beverage Production and is an indicator of the efficient use of water by a company of facility.

- **Energy Use Ratio:** A measure of efficiency defined on a Facility Specific or Company-Wide basis as Total Energy Consumption / Total Beverage Production. This definition is generally aligned with GRI Standard 302-3 (2016).

- **Emissions Ratio:** A measure of efficiency defined on a Facility Specific or Company-Wide basis as Total GHG Emissions / Total Beverage Production. This definition is generally aligned with GRI Standard 305-4 (2016).

- **Beverage Facility Types:** Four facility types were identified for the data collection process: Bottling Facility, Brewery, Distillery, and Winery. This study did not include warehouses, corporate offices, food products, glass shops, or malting operations.

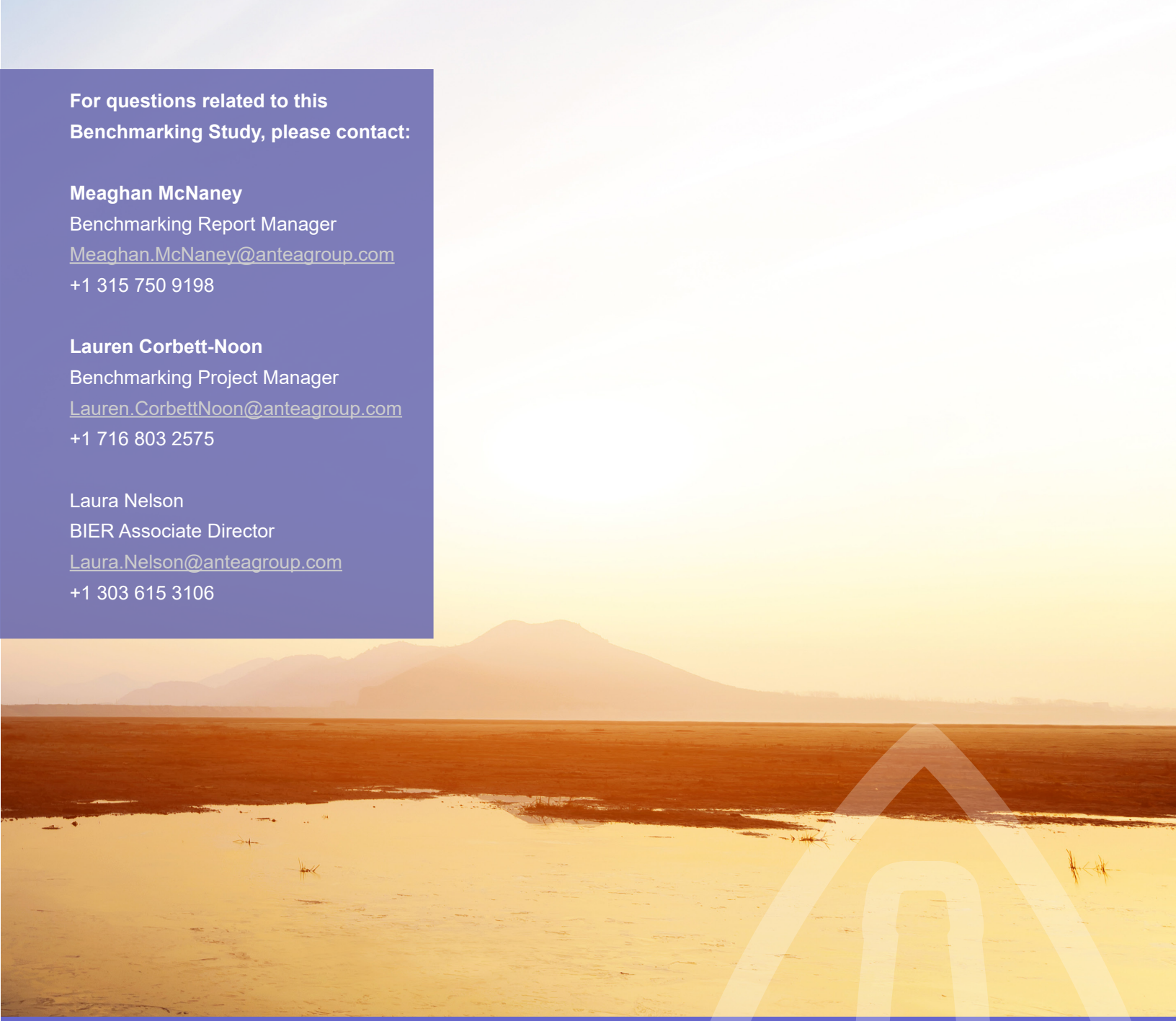
- **Beverage Product Mix:** A description of all Beverage Production Shares across a company or individual facility. The sum of Beverage Production Shares across an entity should equal 100 percent. For purposes of this study, ten beverage types were identified: beer, bottled water, carbonated soft drinks, distilled spirits (high-proof), distilled spirits (low proof), juice – not from concentrate, juice from concentrate, non-carbonated beverages, wine and other.

It is important to note that the benchmark represents an amended data set – facilities were permitted to submit revisions for 2013 and 2015 data and were added or removed based on acquisitions and divestitures within the individual participant companies. Participants also submitted supplemental process information for their facilities (e.g., package type, cooling water use, pasteurization type) to evaluate trends observed during data analysis.

The bases for the analyses are the water use ratio, energy use ratio, and emissions ratio, which are broad indicators of how efficiently a facility uses water and energy for beverage production. The annual study, including data collection, analysis, verification, and reporting, has been managed by Antea Group, a third-party consultant, since the study's inception.

For the purposes of this study, four types of beverage production facilities were identified: bottling, brewery, distillery and winery. While the study included all water and energy use, and total emissions, at these facility types (including water use, energy use, and total emissions for employee services, on-site landscaping, etc.), non-manufacturing facilities, such as office buildings and warehouses, were excluded from the study.

Facility type was determined by the primary process conducted at each facility. Further, bottling facilities were broken down into additional sub-categories based on product mix, to account for the various product types processed at bottling facilities. All facilities reported a beverage product mix, or a percentage breakdown of the different beverage types produced at each facility.



For questions related to this Benchmarking Study, please contact:

Meaghan McNaney
Benchmarking Report Manager
Meaghan.McNaney@anteagroup.com
+1 315 750 9198

Lauren Corbett-Noon
Benchmarking Project Manager
Lauren.CorbettNoon@anteagroup.com
+1 716 803 2575

Laura Nelson
BIER Associate Director
Laura.Nelson@anteagroup.com
+1 303 615 3106

About the Beverage Industry Environmental Roundtable (BIER)

The core mission of Beverage Industry Environmental Roundtable (BIER) is to advance the sector's environmental sustainability by developing industry-specific methods and data. In other words, we seek to create tools and methodologies that accelerate sustainability and its journey from analysis to action.

BIER is a technical coalition of leading global beverage companies working together to advance environmental sustainability within the beverage sector. Formed in 2006, BIER aims to accelerate sector change and create meaningful impact on environmental sustainability matters. Through development and sharing of industry-specific analytical methods, best practice sharing, and direct stakeholder engagement, BIER accelerates the process of analysis to sustainable solution development.

BIER is facilitated by Antea Group (https://us.anteagroup.com)