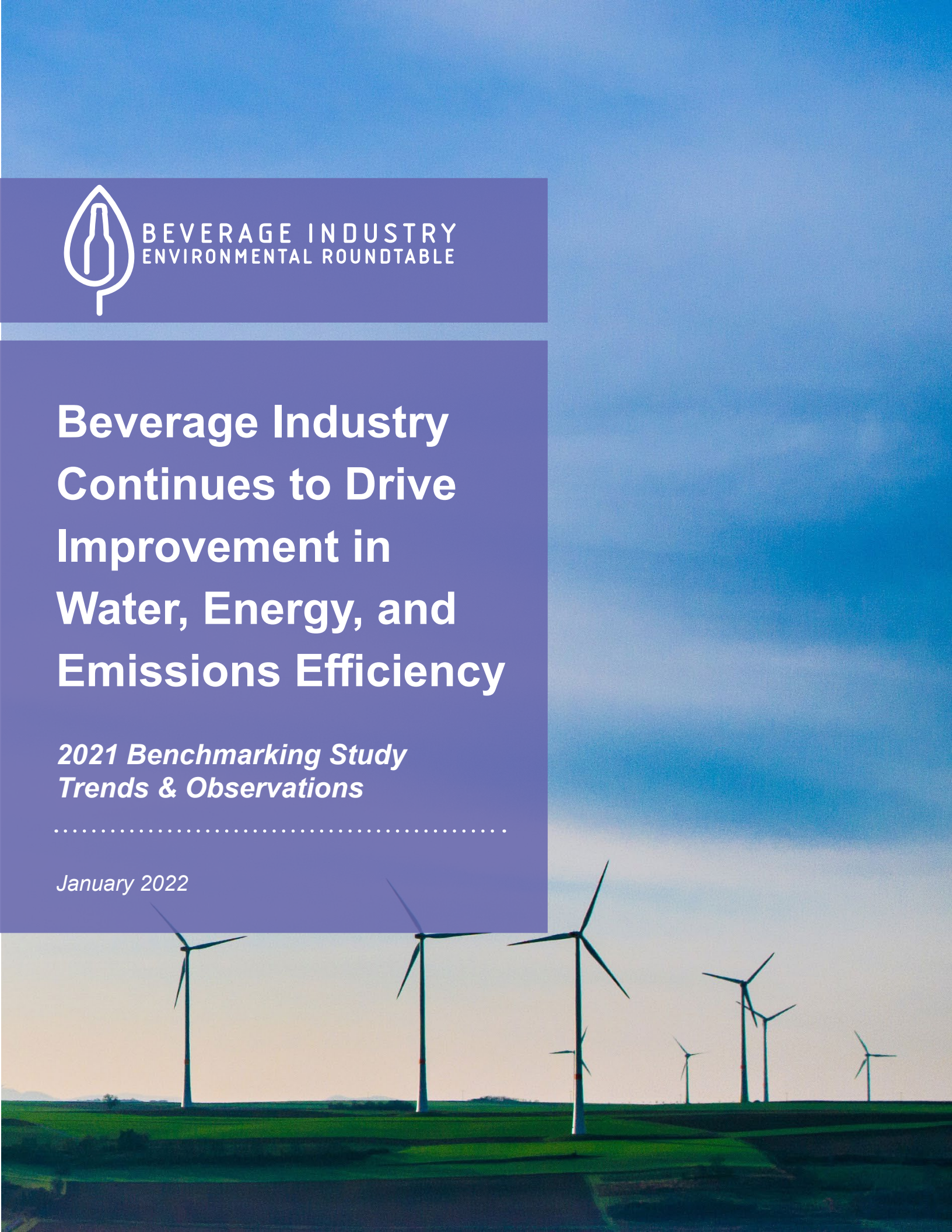
BEVERAGE INDUSTRY
ENVIRONMENTAL ROUNDTABLE

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

2021 Benchmarking Study
Trends & Observations

January 2022



Acknowledgements

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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:

Kentucky Distillers' Association

International Bottled Water Association

Distilled Spirits Council of the United States

Contents

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

In December 2021, the Beverage Industry Environmental Roundtable (BIER) completed its 11th global benchmarking study – a comprehensive quantitative and qualitative research of water, energy, and emissions efficiency in the beverage industry. In its 11 benchmarking studies, BIER has evaluated 16 years of industry performance for nearly 2,000 facilities worldwide. Final results represent a comprehensive set of production, water, energy, and greenhouse gas (GHG) emissions metrics which are normalized, categorized, and analyzed by facility and beverage type. The 2021 benchmarking study includes facility-level data for 2015, 2017, and 2020 from 14 BIER members and 3 partner contributors. The study shows improvements in water, energy, and emissions intensity ratios by 7%, 11%, and 17% respectively. Continued progress is represented through a variety of facility categories, production volumes, and geographic locations – showcasing that the beverage industry is taking a proactive approach to improving business performance while mitigating environmental impacts worldwide.

Industry Collaboration

The 2021 study included participation from 17 global beverage companies and associations, including 14 BIER members and 3 external partner contributors. The final dataset included over 1,900 facilities from 6 continents.

Growth in Production

Industry production volume increased 6% from 2015 to 2020, equivalent to an additional 16 billion liters of global beverages produced worldwide. Of facilities reporting three years of data, 45% reported an increase in production.

Resource Efficiency

The industry continues to demonstrate its dedication to stewardship and efficiency. From 2015 to 2020, water use, energy consumption, and emissions intensity ratios decreased by 7%,11%, and 17% respectively.

Improved Emissions Reporting

2021 marked the third benchmarking study to request Scope 1 and 2 emissions data at the facility-level, and participation continues to improve. Nearly 96% of facilities reported emissions, compared to 90% in 2016 and 95% in 2018 studies.

Performance at a Glance

Table 1 below provides an overview of findings from the 2021 benchmarking study. As shown in the table, nearly all facility types demonstrate decreasing resource consumption trends from 2015 to 2020 – a noteworthy improvement in efficiency as industry production volume increased over the reporting period. Additional supporting metrics and findings are provided in each of the corresponding facility-type sections of this report.

Table 1: 2021 Benchmarking Study Performance Overview

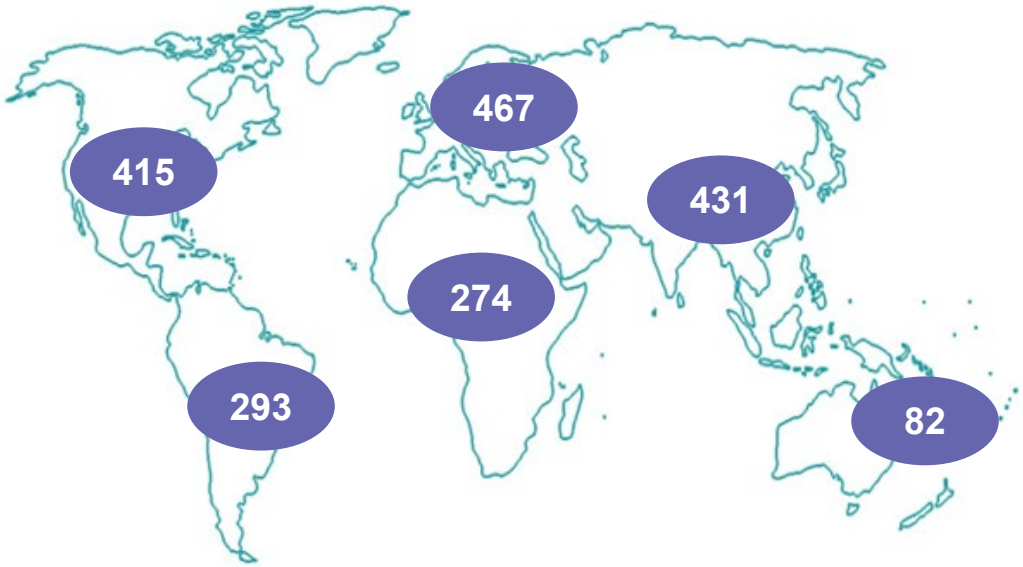
	2015	2017	2020
Total Companies Reporting	15	16	17
Total Facility Count	1,701	1,623	1,630
Total Production (Billion L)	288	291	304
Total Water Use (Billion L)	744	728	730
Total Energy Use (Billion MJ)	214	200	201
Total Emissions (MM MT CO2e)	15.88	16.01	15.25
Water Use Ratio (WUR) (L/L)	**2.59**	**2.50**	**2.40**
Brewery	*3.43*	*3.32*	*3.04*
Distillery	*31.15*	*28.84*	*26.21*
Winery	*2.67*	*3.87*	*4.00*
Bottling (All)	*1.93*	*1.88*	*1.93*
Energy Use Ratio (EUR) (MJ/L)	**0.74**	**0.69**	**0.66**
Brewery	*1.17*	*1.11*	*1.05*
Distillery	*14.14*	*12.44*	*14.82*
Winery	*1.15*	*2.11*	*1.32*
Bottling (All)	*0.41*	*0.38*	*0.37*
Emissions Ratio (g CO2e/L)	**61.04**	**56.84**	**50.74**
Brewery	*96.17*	*90.96*	*74.14*
Distillery	*783.24*	*771.53*	*812.77*
Winery	*34.46*	*87.20*	*77.78*
Bottling (All)	*37.36*	*35.33*	*33.71*

NOTE: Total production and facility count differs between water, energy, and emissions, as some facilities that provided water data were unable to provide energy and/or emissions data. "Total Companies Reporting" include 14 BIER members and 3 external partner contributors.

Key Study Findings

Continued Reporting Diversity: The 2021 study includes 2015, 2017, and 2020 data from 17 participating companies and associations, representing over 1,900 facilities worldwide across the three-year study period. Among all reporting facilities, 1,630 facilities reported 2020 data. Facility-level data was provided by 14 BIER members as well as 3 external contributors. The three contributors were Kentucky Distillers' Association, Distilled Spirits Council of the United States, and International Bottled Water Association. As shown in Figure 1, facilities were represented on six continents, with the majority of facilities located in Europe, Asia, and North America.

Figure 1: 2015-2020 Geographic Distribution, All Facilities



Correlation of Efficiency and Production Size: There is a correlation between water, energy, and emissions efficiency and reported production volume at a facility. This indicates that beverage manufacturing locations may recognize economies of scale. As demonstrated in Table 2 on the following page, 2020 energy and emissions ratios were lowest for facilities within the 200- to 500-million-liter production range, with water use ratios reported slightly higher than facilities producing more than 500 million liters. Sites with production volumes less than 50 million liters tended to report the highest ratios, whereas facilities producing greater than 500 million liters reported energy use and emissions ratios slightly higher than those within the 200- to 500-million-liter range. This trend is due to a variety of process-driven factors, including, but not limited to, production run length, frequency of product change-over, continuous bottling operation vs. batch run, 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 data set (i.e., production volume greater than 500 million liters). Distilleries and wineries tend to have the smallest production volumes and largest resource consumption due to their production processes, also contributing to higher ratios within the smaller production ranges.

Table 2: 2020 Efficiency Ratios by Production Volume Range

Production Range	2020 Water Use Ratio (L/L)	2020 Energy Use Ratio (MJ/L)	2020 Emissions Ratio (g CO2e/L)
<50 MM L	7.58	2.76	200.22
50-200 MM L	2.84	0.75	60.75
200-500 MM L	2.11	0.53	40.93
>500 MM L	2.08	0.60	44.07

Growth in Industry Production: Industry production volume increased by 5.6% from 2015 to 2020, equivalent to an additional 16 billion liters of beverages produced worldwide. Of facilities that provided three years of data, 45% reported an increase in production over the study period. A total of 148 facilities reported 2020 data for the first time, representing over 4% of total beverage production for the industry at large.

Water

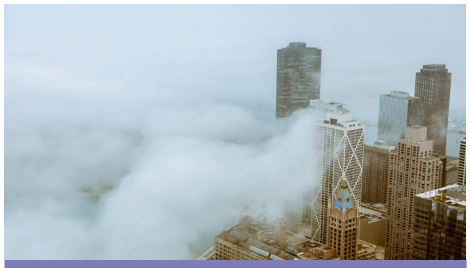
2020 Average Facility Water Use = 459,165,447 L

68% of facilities reporting water data for all 3 years decreased their WUR from 2015 to 2020

Energy

2020 Average Facility Energy Use = 126,216,060 MJ

64% of facilities reporting energy data for all 3 years decreased their EUR from 2015 to 2020



Emissions

2020 Average Facility Emissions = 9,667 MT CO2e

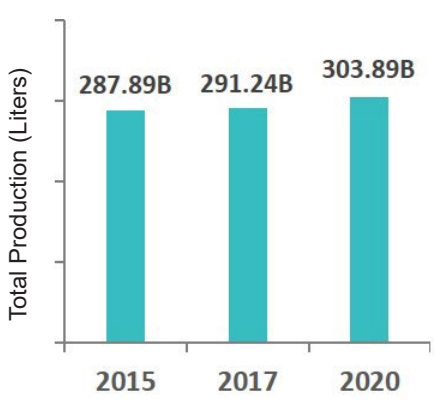
64% of facilities reporting emissions data for all 3 years decreased their emissions ratio from 2015 to 2020

Differences in Water, Energy, and Emissions Intensity Based on Facility Type: Water, energy, and emissions ratios continue to differ significantly between facility types due to variations in production processes, facility size, and water and energy intensity. Additional insight regarding the differences between facility and beverage type is available in the facility-specific sections of this report.

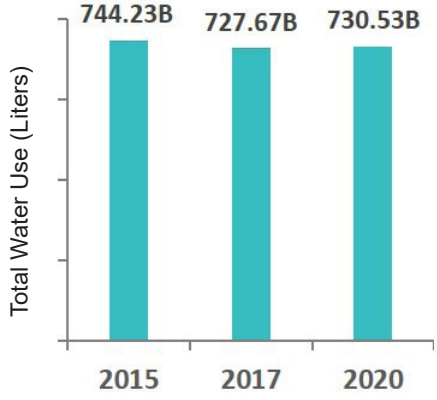
Improvement in Water, Energy, and Emissions Efficiency: Industry water use decreased by 1.84% from 2015 to 2020, an equivalent decrease of nearly 13 billion liters. The corresponding increased production over the same timeframe led to a 7% decrease in the industry-wide water use ratio (i.e., the amount of water used to produce one liter of product), with 68% of facilities reporting decreased water use ratios from 2015 to 2020. Total energy consumption decreased by nearly 13 billion megajoules, representing a 6% reduction from 2015 to 2020. Energy use ratio, defined as the amount of energy used to make one liter of beverage, decreased from 0.74 MJ/L to 0.66 MJ/L, equivalent to an 11% reduction over the study period. Of facilities that provided energy data for all three years, over 64% reported decreased energy use ratios from 2015 to 2020. Total emissions (Scope 1 and Scope 2 emissions) decreased over the course of the study period by about 4%. Alongside a decrease in reported emissions, the industry's production volume increased, driving a 17% decrease in emissions ratio. Of the facilities that were able to provide three years of emissions data, 64% reported decreasing emissions ratios between 2015 and 2020. Figures 2-4 below present the industry benchmarking trends for water, energy, and emissions efficiency throughout the reporting period.

Figure 2: Industry Production, Water Use, and Water Efficiency, 2015-2020

Industry Production
N=1,951
% Change: 5.56%
Mid-Percentile: 29 - 273 Bil L



Water Use
N=1,951
% Change: -1.84%
Mid-Percentile: 96 - 591 Bil L



Water Efficiency
N=1,951
% Change: -7.01%
Mid-Percentile: 1,62 - 3.49 L/L

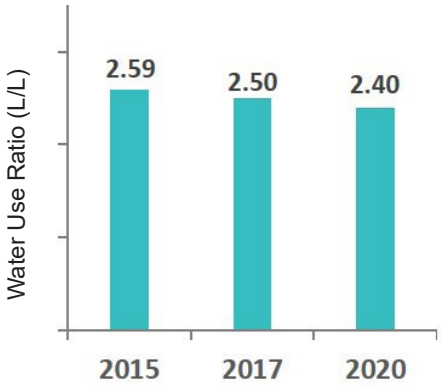
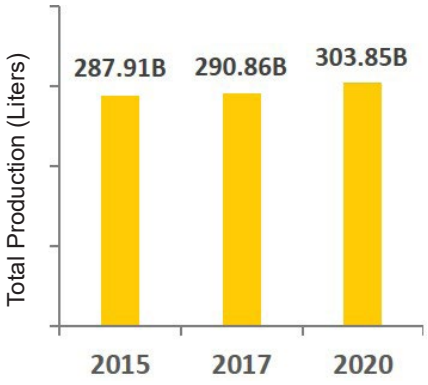
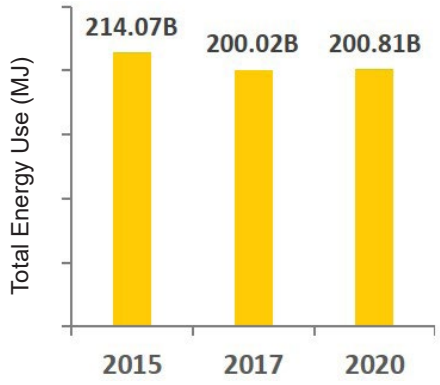


Figure 3: Industry Production, Energy Use, and Energy Efficiency, 2015-2020

Industry Production
N=1,947
% Change: 5.54%
Mid-Percentile: 29 - 273 Bil L



Energy Use
N=1,947
% Change: -6.20%
Mid-Percentile: 24 - 136 Bil MJ



Energy Efficiency
N=1,947
% Change: -11.12%
Mid-Percentile: 0.29 - 1.18 MJ/L

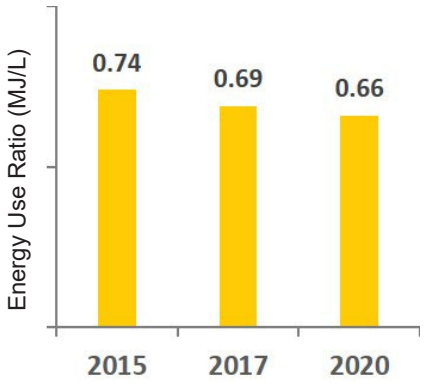
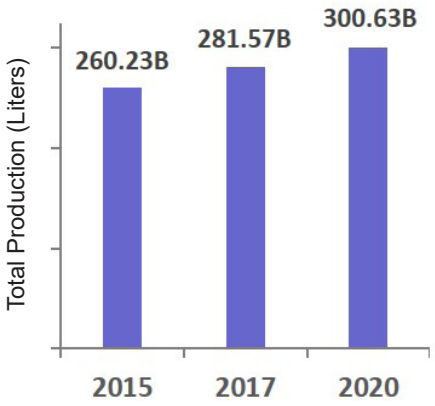
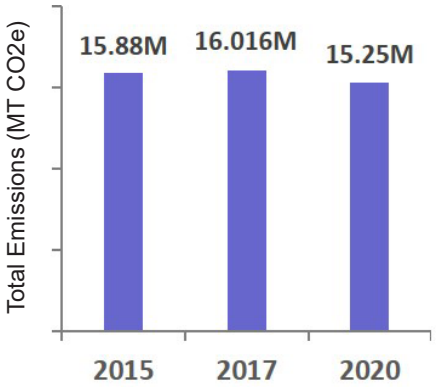


Figure 4: Industry Production, Total Emissions, and Emissions Efficiency, 2015-2020

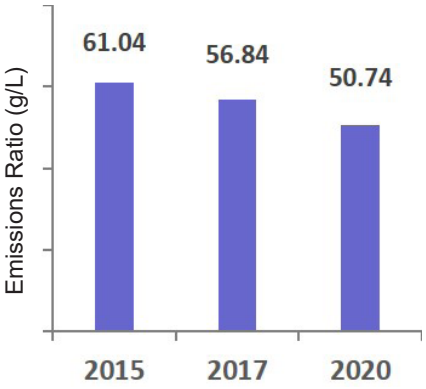
Industry Production
N=1,879
% Change: 15.53%
Mid-Percentile: 29 - 272 Bil L



Emissions
N=1,879
% Change: -3.97%
Mid-Percentile: 1,779 - 11,642 MT



Emissions Efficiency
N=1,879
% Change: -16.87%
Mid-Percentile: 24.07 - 91.73 g/L



Additional benchmarking analyses were completed for each of the four main facility types (i.e., brewery, distillery, winery, and bottling facilities) to identify beverage-specific trends in water and energy efficiency as well as emissions intensity. Facility types, general process definitions, and associated performance trends are presented in the following sections.

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 products (such as completely brewed beer or matured whiskey). No fermenting or distilling processes are conducted at bottling facilities.

The largest dataset of the 2021 benchmarking study was bottling facilities, which accounted for 67% of 2020 production volume and 62% of facilities. Bottling facilities have historically reported the lowest water and energy ratios due to less water- and energy-intensive processes. Other facility types that involve more resource-intensive processes (e.g., cooking, fermenting, and distilling) have accounted for the higher ratios. Bottling facilities continue to process and package a wide variety of beverage types, with 40% of facilities producing more than one type of beverage. For the purposes of this report, the focus was on the two largest sub-categories within the bottling data set: Carbonated Soft Drinks and Bottled Water.

Water

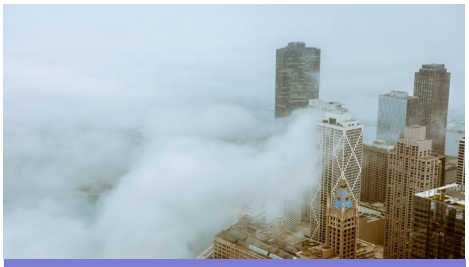
2020 Average Facility Water Use = 395,947,096 L

68% of facilities reporting water data for all 3 years decreased their WUR from 2015 to 2020

Energy

2020 Average Facility Energy Use = 75,975,248 MJ

61% of facilities reporting energy data for all 3 years decreased their EUR from 2015 to 2020



Emissions

2020 Average Facility Emissions = 6,885 MT CO2e

61% of facilities reporting emissions data for all 3 years decreased their emissions ratio from 2015 to 2020

Carbonated Soft Drinks

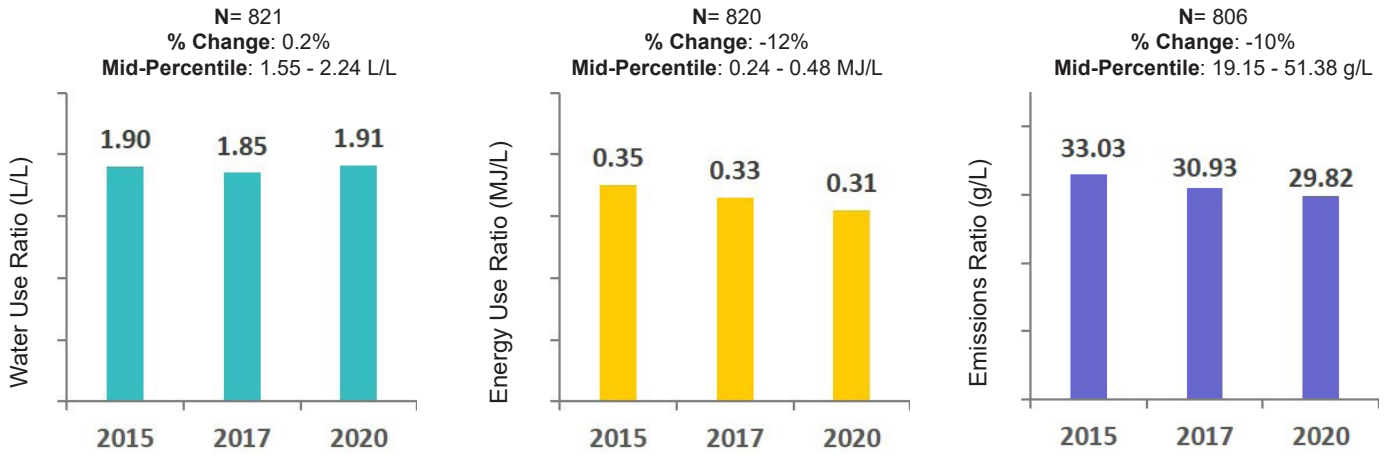
Carbonated Soft Drinks are defined as non-alcoholic, flavored carbonated beverages. This category includes colas, ginger ales, and seltzers, but excludes non-carbonated beverages such as ready-to-drink teas, coffees, fitness and energy drinks, and juices.

Carbonated Soft Drink facilities were the largest beverage type reported in the 2021 benchmarking study, which accounted for over 67% of total bottling facilities. Facilities included in this sub-group reported a beverage production mix (i.e., 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.

Figure 5: Process Map, Carbonated Soft Drinks

As shown in Figure 6, Carbonated Soft Drink facilities continued to demonstrate improvements in energy and emissions efficiency throughout the reporting period. Water use ratio increased slightly by 0.2% from 2015 to 2020, with 2021 marking the second 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 decreased across the study period, with corresponding reductions in energy use and emissions ratios by 12% and 10% respectively despite an increased production volume from 2015 to 2020.

Figure 6: CSD Water, Energy, and Emissions Efficiency, 2015-2020



Bottled Water

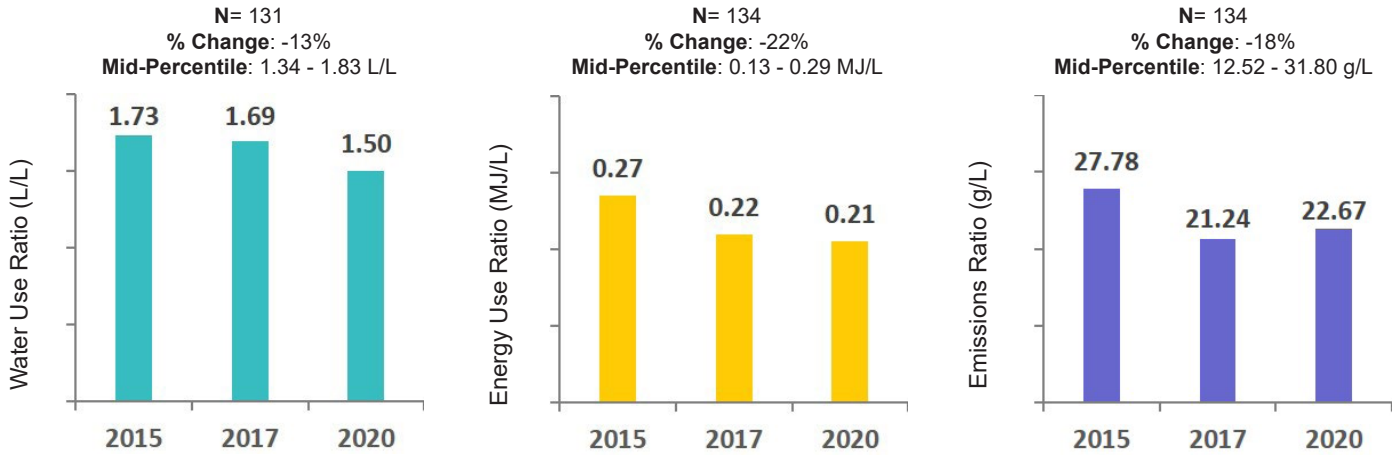
Bottled Water is defined as all unflavored bottled waters including spring water, purified water (produced by distillation, deionization, reverse osmosis or other processes), mineral water, sparkling bottled water, or well water.

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 that reported in the 2021 benchmarking study, 91% were bottled Natural Water; 4% were bottled Spring Water; and 4% were bottled Mineral Water facilities. As shown in Figure 7, water and energy use benchmarking boundaries included water treatment (as applicable) and bottling processes.

Figure 7: Process Map, Bottled Water

As demonstrated in Figure 8, bottled water facilities reported improvements in water, energy and emissions efficiency throughout the reporting period. The overall water use ratio decreased by 13% over the study period. Total energy use and emissions also decreased, despite an increased production volume from 2015 to 2020. Correspondingly, energy use and emissions ratios were reduced by 22% and 18% respectively.

Figure 8: Bottled Water Facilities Water, Energy, and Emissions Efficiency, 2015-2020



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 2021 benchmarking study, which accounted for 34% of industry production volume and 28% of the total facility count for 2020. Of the 452 breweries that reported 2020 data, 87% produced entirely beer, whereas the other 13% produced a variety of products including beer, bottled water, carbonated soft drinks, and non-carbonated beverages. As seen in Figure 9, this study accounted for all brewing processes except for upstream agricultural growth, malting, and distribution of finished products.

Figure 9: Process Map, Brewery

Water

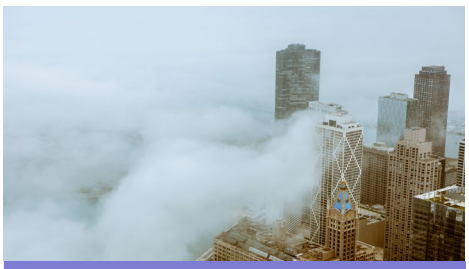
2020 Average Facility Water Use = 672,429,490 L

77% of facilities reporting water data for all 3 years decreased their WUR from 2015 to 2020

Energy

2020 Average Facility Energy Use = 232,456,963 MJ

74% of facilities reporting energy data for all 3 years decreased their EUR from 2015 to 2020



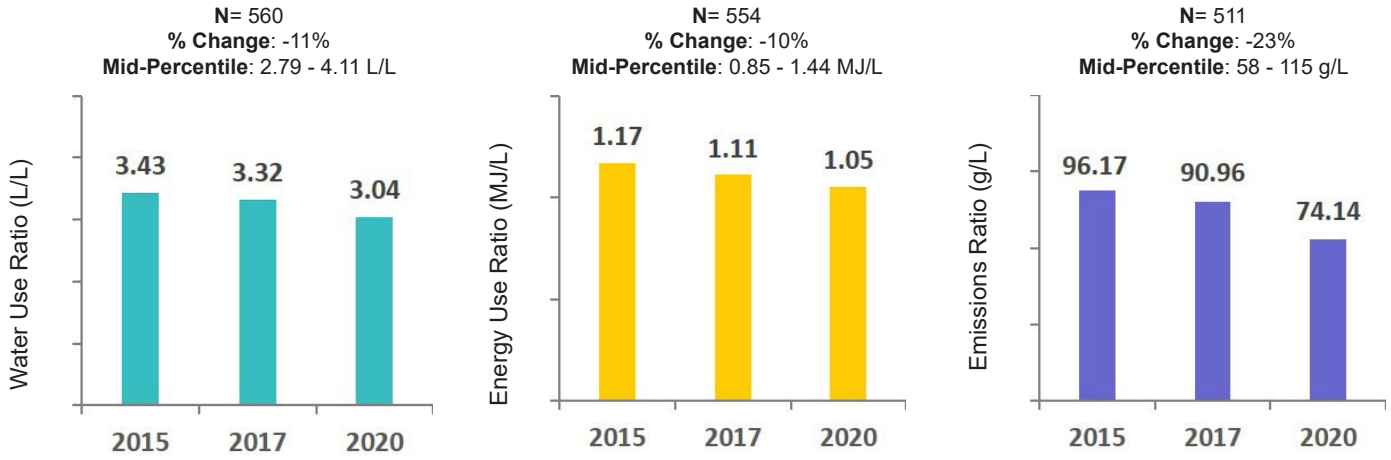
Emissions

2020 Average Facility Emissions = 16,424 MT CO2e

75% of facilities reporting emissions data for all 3 years decreased their emissions ratio from 2015 to 2020

Water, energy, and emissions efficiency continued to improve throughout the reporting period, as shown in Figure 10. Total water use decreased by nearly 48 billion liters between 2015 and 2020, with a corresponding 11% decrease in the water use ratio over the same timeframe. Energy and emissions efficiency also continued to show improvements, including a 10% decrease in total energy use and a 23% decrease in total emissions.

Figure 10: Brewery Water, Energy, and Emissions Efficiency, 2015-2020



Performance trends between all breweries and beer-only breweries were generally consistent throughout the reporting period. Water, energy, and emissions ratios for breweries that only produce beer were slightly higher, likely attributed to plants with mixed beverage productions being less resource-intensive depending on their complementary beverage types. Additional insight regarding the performance differences among breweries is presented in Table 3.

Table 3: Brewery Water, Energy, and Emissions Efficiency, 2015-2020

	All Breweries				Breweries - Beer Only			
Beverage Type	**2015**	**2017**	**2020**	**%Δ**	**2015**	**2017**	**2020**	**%Δ**
Water Use Ratio (L/L)	3.43	3.32	3.04	-11%	3.64	3.53	3.08	-16%
Energy Use Ratio (MJ/L)	1.17	1.11	1.05	-10%	1.16	1.09	1.06	-8%
Emissions Ratio (g CO2e/L)	96.17	90.96	74.14	-23%	81.91	77.11	78.75	-4%

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 accounted for less than 0.5% of industry production volume in the 2021 study. Of all distilleries that reported data in this study, 94% were able to provide data for all three reporting years, which was a 17% increase from the 2018 study. 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. As shown in Figure 11 below, benchmarking included all process steps except upstream agricultural growth and distribution of finished products.

Figure 11: Process Map, Distillery

Water

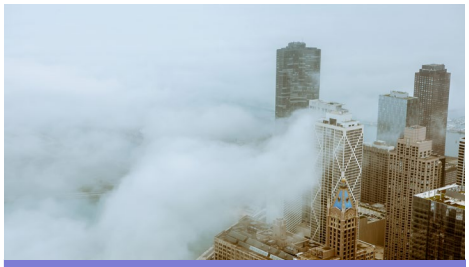
2020 Average Facility Water Use = 315,874,221 L

53% of facilities reporting water data for all 3 years decreased their WUR from 2015 to 2020

Energy

2020 Average Facility Energy Use = 182,543,308 MJ

50% of facilities reporting energy data for all 3 years decreased their EUR from 2015 to 2020



Emissions

2020 Average Facility Emissions = 10,030 MT CO2e

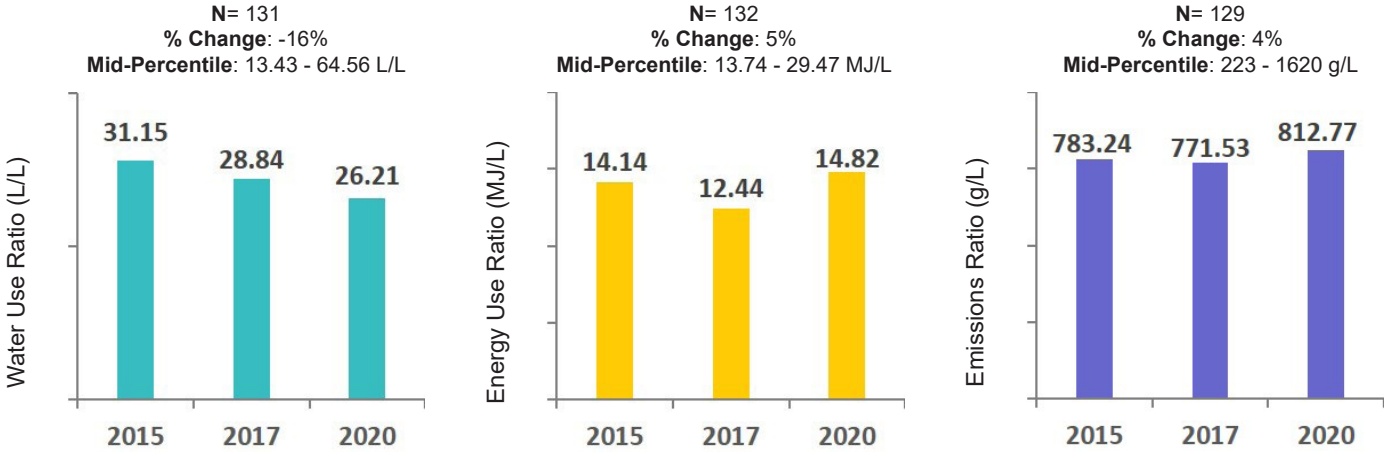
61% of facilities reporting emissions data for all 3 years decreased their emissions ratio from 2015 to 2020

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, distilleries' water use ratios excluding cooling water were over 80% less than the water use ratios including cooling water. Of facilities reporting the type of cooling water systems, the majority reported once-through systems, with over 20% of sites reporting either open-loop/evaporative or closed-loop/ compressive systems.

Figure 12: Effect of Cooling Water on Water Efficiency, 2015-2020

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, the water use ratio decreased by 16%. Energy use and emissions ratios increased slightly by 5% and 4% respectively. The increased energy and emissions ratios were likely attributed to more purchased steam and higher Scope 2 emissions reported compared to the 2015 baseline.

Figure 13: Distillery Water, Energy, and Emissions Efficiency, 2015-2020

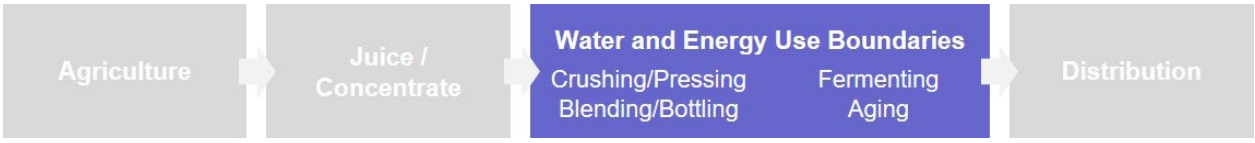


Wineries

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 2020 accounted for less than 0.27% of the industry total, with wineries comprising 3% 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 products, as seen in Figure 14.

Figure 14: Process Map, Winery



Water

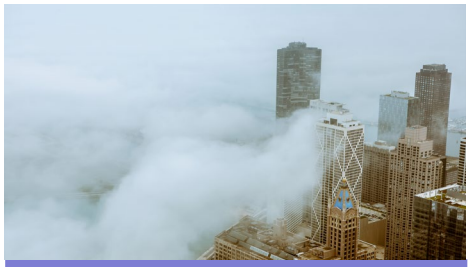
2020 Average Facility Water Use = 66,801,705 L

49% of facilities reporting water data for all 3 years decreased their WUR from 2015 to 2020

Energy

2020 Average Facility Energy Use = 22,995,962 MJ

51% of facilities reporting energy data for all 3 years decreased their EUR from 2015 to 2020



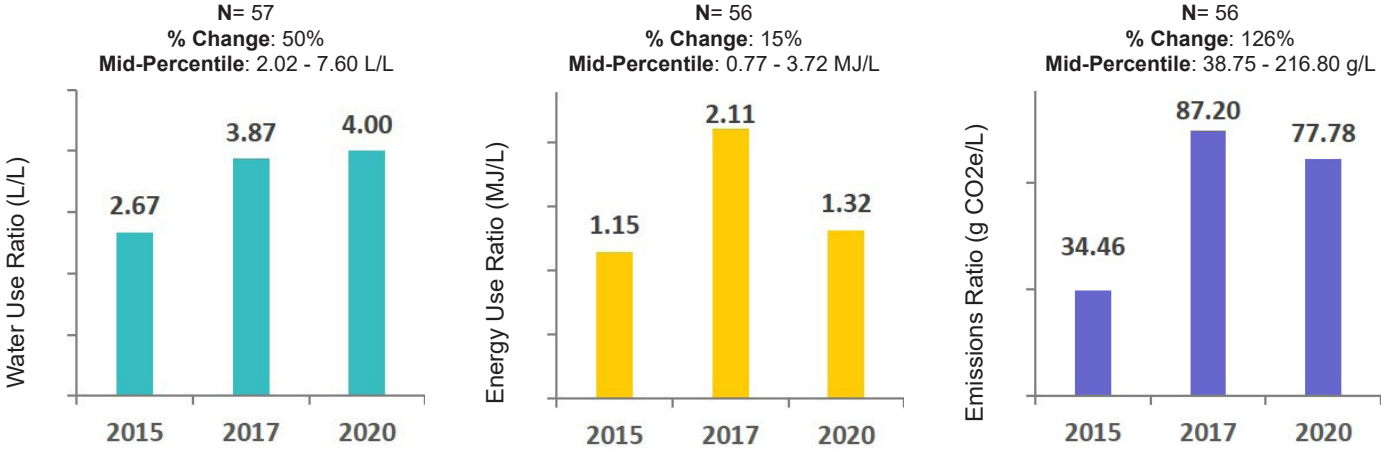
Emissions

2020 Average Facility Emissions = 1,351 MT CO2e

31% of facilities reporting emissions data for all 3 years decreased their emissions ratio from 2015 to 2020

Wineries experienced the most reporting complexity compared to other facility types within this study due to the potential impact of weather variations on production volumes, resulting in prominent variations within the year-over-year trends for water, energy, and emissions. Figure 15 below summarizes water intensity, energy efficiency, and emissions ratios of wineries over 2015-2020.

Figure 15: Winery Water, Energy, and Emissions Efficiency, 2015-2020



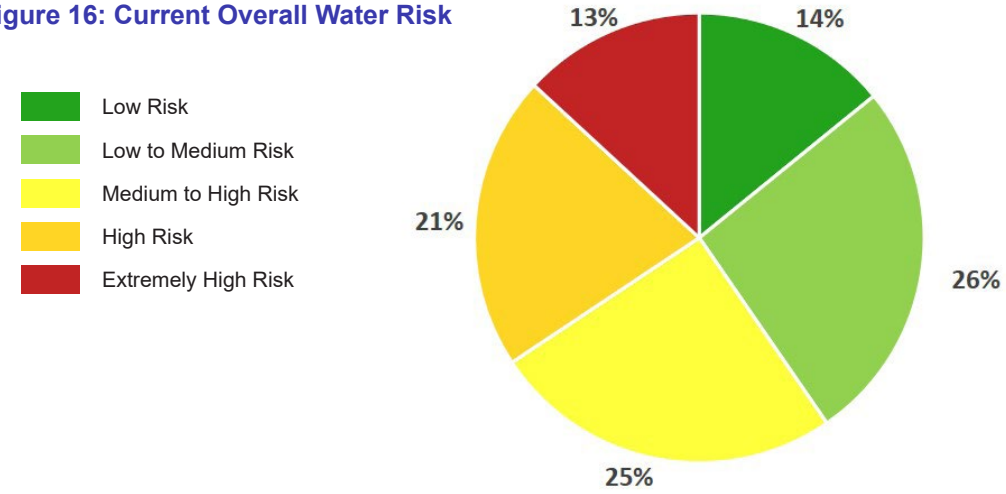
Water Availability and Wastewater Analysis

Global water availability is one of the most threatening and pervasive sustainability concerns. Freshwater resources have become increasingly vulnerable to climate change, overuse, and pollution. The BIER members are particularly sensitive to resource depletion, as water tends to be the largest ingredient by weight in beverage production. 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. Owing to increasing water stress, wastewater has also become an emerging focus area as many stakeholders are exploring meaningful available sources of 'new' water. The growing attention has prompted regulatory mandates and investments in wastewater treatment and recycling to drive water use efficiency.

The 2021 benchmarking study includes a comprehensive water scarcity analysis of all member facilities that reported both water use and production volume for 2020 as well as a wastewater treatment assessment. The WRI Aqueduct Water Risk Atlas tool was used to map and analyze water risk data for 1,410 facilities, representing 86% of BIER benchmarking sites.

As seen in Figure 16, more than 59% of facilities currently operate in areas that have 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 future water stress, facilities were analyzed for their projected water stress in the year 2030. As shown in Table 4, at least 34% of facilities with WRI Aqueduct data available are located within watersheds where water stress will increase. More than 60% of facilities in these areas reported decreasing water use ratios between 2015 and 2020,

indicating that the industry continues to drive efficiency improvements in areas where water stress is expected to increase within the next 9 years.

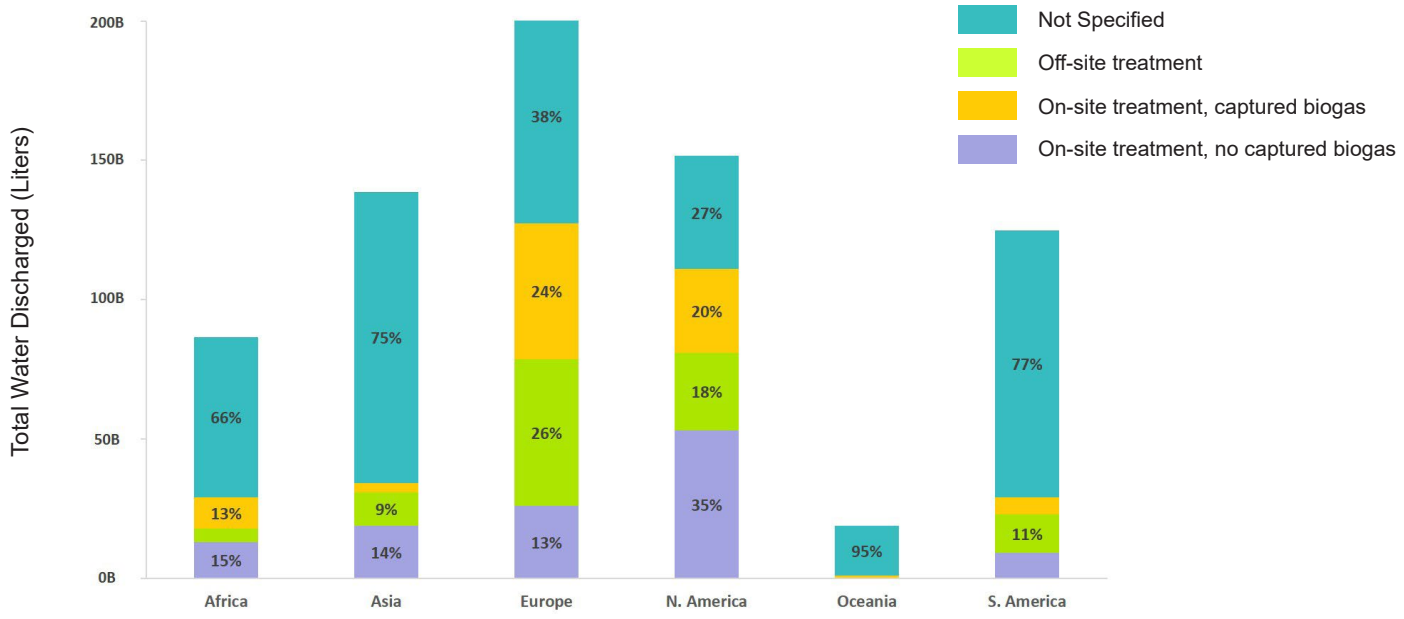
Table 3: Projected Water Supply, 2030

Project Water Supply, Business as Usual 2030	Number of Facilities	% of All Facilities	% Reporting WUR Improvement, 2015-2020
Near Normal Conditions	888	64%	59%
Drier but Low Stress	1	0%	100%
Somewhat More Stressed	4	0%	25%
Moderately More Stressed	47	2%	38%
Severely More Stressed	348	26%	62%
Extremely More Stressed	91	7%	63%
Exceptionally More Stressed	23	1%	48%

Please note that at the time of this study, WRI had updated its Aqueduct Water Risk Atlas tool and methodology. Analyses are conducted based on indicators and metadata provided via Aqueduct 3.0, which is the latest version since the update in 2019.

Alongside worldwide water risk, increasing awareness has been placed on wastewater treatment due to the converging factors of water stress, quality, and circularity. Figure 17 below is a comparison of common treatment methods used by reporting facilities across continents. On-site treatment with no captured biogas is most common among facilities in North America. In Europe, on-site treatment with captured biogas as well as off-site treatment are two methods that are commonly used.

Figure 17: Wastewater Treatment by Treatment Method and Continent



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. Opportunities for improvement in 2023 and beyond include:

- **Biennial Reporting:** BIER will use the same biennial benchmarking structure in 2023 and beyond but will seek to obtain relevant insights and suggestions from members between studies. Following this schedule, the next water, energy, and emissions benchmarking study is scheduled to occur in 2023, including data for 2017, 2020, and 2022.
- **Improved Reporting of Supplemental Data:** The BIER Benchmarking Team sought to improve the reporting and completion of supplemental data in 2021, however only some members were able to provide this level of data. BIER will continue to leverage member engagement to determine the appropriate balance between reporting burden and data collection for future studies.
- **Scope 3 Emissions Reporting:** The 2021 study did not require Scope 3 emissions reporting. As emissions management in supply chains has gained traction from various types of stakeholders, BIER will revisit Scope 3 emissions disclosure to discern whether or not quantification is an attainable goal for the next Benchmarking Study.

Conclusion

BIER is committed to sustaining the natural resources and mitigating environmental impacts associated with beverage production. This commitment is demonstrated first-hand through our benchmarking study that drives industry-wide collaboration, accountability, and performance improvement from each of our participating members.

The 2021 benchmarking study makes our 11th study since BIER's inception in 2006. The final dataset included participation from 17 leading beverage companies and partners representing over 1,900 production facilities worldwide based on three years of data. Industry water use, energy use, and emissions ratios decreased by 7%, 11%, and 17% respectively throughout the study period, with most of all four facility types (i.e., breweries, distilleries, wineries, and bottling facilities) reporting improvements in water and energy use ratios compared to 2015.

The study showcases our continued progress across a variety of facility types, production volumes, and geographic locations. BIER looks forward to continued engagement amongst our members, 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 (2015, 2017, 2020) of facility-specific data as described below:

- **Total 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 storm water/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 2021 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 2021 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 2015 and 2017 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, etc.) 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.

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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)