Scope 1 and 2 Greenhouse Gas Emissions from the fragrance industry

IFRA report on member survey performed in May 2024

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26 Sep 2024

This report has been prepared to establish a global industry average reference figure for emission intensity in the fragrance sector. KPMG and IFRA assume no responsibility or liability for any reliance placed on the report by third parties, including IFRA members or the general public. Any third-party use of this report is entirely at their own risk and responsibility.

Contents

Executive summary

The International Fragrance Association (IFRA) has undertaken a study to assess the greenhouse gas (GHG) emissions from the fragrance industry, focusing on Scope 1 and 2 emissions related to blending and storage activities in the years 2020, 2021 and 2022. This study aims to establish a global reference for emission intensity, provide insights into regional variations, and inform on decarbonisation strategies for the fragrance sector.

Study objectives

- Quantify average GHG emissions levels and establish a reference for emission intensity.
- Examine the relationship between GHG intensities and company size. For this study, we've divided and defined the 11 companies providing quantitative answers to the survey into two main groups: 1) **larger companies** which are companies that compound over 5,000 t of fragrance mixtures annually, and 2) **smaller companies** which are companies that compound under 5,000 t of fragrance mixtures annually.
- Analyse regional variations in GHG emission intensities across four regions: North America (USA and Canada), Asia, EMEA (Europe, Middle East, and Africa), and LATAM (Latin America).

Scope and limitations:

The survey specifically targeted companies engaged in blending and storage of fragrance mixtures, the core activity of the fragrance industry. Answers were received from a total of 31 respondent companies. However, due to challenges in data availability related to GHG emissions and varying levels of sustainability reporting maturity among the companies, only 11 of 31 respondent companies (4 larger companies and 7 smaller companies) were eligible for inclusion and detailed analysis.

It is important to note several key limitations of the survey. Firstly, the small sample size may impact the reliability of the findings, especially given the wide variation between data from larger and smaller companies. Secondly, since many fragrance companies are still refining their GHG data collection processes, there are some data gaps in obtaining complete Scope 1 and Scope 2 data for 2020-2022 across the 11 respondent companies, which affects the comparability of the results between the three years.

These limitations should be taken into consideration when interpreting the findings of the survey, as they may affect the overall reliability and applicability of the insights gathered.

Key findings:

- **Emissions Intensity:** The emissions intensity is the GHG emissions per unit of production, in this study GHG emissions (tCO_2e) per tonne of fragrance mixture produced. Our findings showed that emission intensity varied significantly across the 11 respondent companies. Based on the result that 8 out of 11 companies (3 larger and 5 smaller) have an emission intensity below 0.2 t CO_2e/t of fragrance mixture produced, IFRA believes that this can be considered as a reference for the industry and that it is an achievable emissions intensity target for the fragrance industry.
- **Emission Intensity Trend:** Over the surveyed time span of three years, no significant trend in emission intensity could be identified for the average of all 11 responding companies. For smaller companies, however, the average emission intensity decreased slightly every year from 2020-2022, indicating on average improved emissions management for the smaller companies.
- **Regional Variations in Emission Intensity:** There are regional differences in emission intensity with EMEA and LATAM activities showing only about half the emission intensity of Asian activities. A slight reduction in average emission intensity over the two years can be seen in each region. In North America, this was most likely due to a notable decrease in electricity grid emission factors. In the EMEA region, emission intensity also decreased, just at a slightly slower pace than the Americas. Asia's emission intensity also decreased overall from 2020-2022, with a slight increase in 2022, likely due to specific company practices in the region. In

LATAM, a slight reduction in average emissions intensity was observed over two years. This may be attributable to the energy mix in key countries like Mexico and Argentina, where a significant share of power comes from hydropower, wind, and natural gas.

These findings highlight the complex dynamics between production trends, emissions management, and regional variations within the fragrance industry. They underscore the importance of monitoring GHG emissions at a company level as a basis for taking decisions on emission reduction measures to enable reduction of the environmental impact of the sector.

Decarbonisation insights:

IFRA is pleased to share some of the best decarbonisation practices from the respondent companies that have demonstrated excellent emissions intensity management in our study.

Smaller Companies: In EMEA, successful small companies focused on improving insulation and regulating hot water tank temperatures, while in the Americas, they invested in solar panels and energy-efficient lighting.

Larger Companies: Efforts included sustainability initiatives like renewable electricity purchasing agreements, investing in energy efficiency measures (e.g. LED lighting and motion sensor lights), energy efficiency site assessments, and switching to refrigerants with a lower global warming potential.

This study provides valuable references for the fragrance industry, highlighting areas for improvement and guiding future decarbonisation efforts. Further data collection from a broader sample will enhance the reliability of global emissions estimates and support the industry's transition towards more sustainable practices.

Comparison of emissions with products under A.I.S.E:

The International Association for Soaps, Detergents, and Maintenance products (A.I.S.E) represents the detergents & maintenance products industry in Europe.

Over 900 companies are members with product categories such as Laundry Detergent Powder/Liquid, Dishwashing products, and Fabric Conditioners. As they report data for liquid and powder mixing activity which is broadly similar to IFRA companies Scope 1 & 2 activities, it is a relevant point of comparison from an activity point of view.

Based on A.I.S.E's analysis of data from 191 Manufacturing sites in 2023, their emissions intensity (tCO_2e emitted per tonne of production) was the following, showing a decrease of 45.6% from 2006 - 2023:

CO_2 EMISSIONS

KPI	REPORTING DATA	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020[4]	2021	2022	2023
	Number of reporting companies	8	19	33	45	59	65	72	89	93	92	100	100	103	112	102	112	112	114	114
	Manufacturing sites covered	62	78	108	133	152	162	172	191	185	175	183	178	180	187	184	183	189	193	191
CO_2	CO_2 emitted [1] kg of CO_2 emitted per tonne of production	80.9kg/t	66.9kg/t	64.6kg/t	64.3kg/t	60.9kg/t	57.3kg/t	52.0kg/t	53.0kg/t	55.6kg/t 2	54.3kg/t	50.0kg/t	46.4kg/t	42.5kg/t	39.6kg/t	37.5kg/t	39.5kg/t	41.5kg/t	38.7kg/t	36.4kg/t

We isolated the comparative figures for the period covered in the IFRA survey:

AISE : 2020: 0.0395 tCO_2e/t 2021: 0.0415 tCO_2e/t 2022: 0.0387 tCO_2e/t (weighted average)

IFRA (EU) : 2020: 0.106 tCO_2e/t 2021: 0.098 tCO_2e/t 2022: 0.096 tCO_2/t (weighted average of all respondents with production in Europe)

It is not possible to directly compare the absolute tCO2e/t values between AISE and IFRA for many reasons (scope may be different, product mix is different (IFRA members do not manufacture powders), scale, number of ingredients mixed per formula and number of different formula produced are all very different, weighted/non weighted average calculation, etc.). The trend, however, can be compared and interestingly overall AISE also reported relatively flat data for 2020-2022, the significant decrease stemming from the years up to 2019.

Introduction

Fragrances are blends of aromatic organic compounds that possess a pleasant odour. Their constituent ingredients can be derived from bio-based or fossil-based raw materials or can be directly extracted from biomass. There are thousands of registered fragrance ingredients, and most are based on alcohols, aldehydes, ketones, esters and lactones.

While fragrances are often used to mask unpleasant odours, they also cater to the emotional needs of consumers. Consumers expect fragrances to be part of the experience of using various products from personal and home care to luxury perfumes through their characteristic and distinct smell. Thus, the fragrance industry interweaves science and creativity, as fragrance houses strive to create unique scents that provide benefits and help differentiate brands in the market.

The fragrance industry provides fragrance mixtures to manufacturers of personal and home care products like fine fragrances, cosmetics, detergents and air care diffusers. Manufacturers depend on carefully crafted distinct odours to establish competitive advantages helping them grow sales volume, margins and brand loyalty, while also giving them a distinguishable brand signature.

The International Fragrance Association (IFRA) was established in 1973 to represent the collective interest of the fragrance industry throughout the world. Today, it comprises of 7 multinational companies and 23 national associations across 24 countries in four regions – Asia-Pacific, Europe, Latin America and North America. IFRA seeks to promote the safe use and enjoyment of fragrance and ensure recognition of the economic, social and cultural value of fragrances and fragrance ingredients. Through the IFRA Code of Practice and IFRA Standards, the association also sets out standards on the level of use of certain fragrance ingredients which are recognized by customers, trade bodies and regulators around the world.

The IFRA Global Strategy outlines four long term strategic goals:

- **Self-regulation and advocacy** – Legislators and regulators value the IFRA Standards as a responsible approach to the safe use of fragrance materials
- **Global collaboration** – The fragrance industry and its partner associations are models of global collaboration
- **Sustainability** – The fragrance industry is a positive force for environmental, social and economic sustainability
- **Consumer knowledge and enjoyment** – Consumer knowledge of fragrance materials leads to greater understanding, trust and enjoyment

Under the 'Sustainability' goal, IFRA aims to:

- Implement and continuously promote IFRA-IOFI Sustainability Charter
- Develop common understanding of responsible sourcing and encourage its adoption
- Create guidance for members to comply with requirements on responsible sourcing
- Develop partnerships that improve sustainability efforts
- Report on progress
- Increase public understanding of industry environmental practices

Purpose of the study

In our efforts to enhance sustainability in the fragrance industry, IFRA worked on consolidating data on Scope 1 and 2 Greenhouse Gas (GHG) emissions that arise from both the blending of fragrance ingredients to produce fragrance mixtures, and the storage and cooling of these ingredients and/or mixtures.

Having surveyed 31 respondent companies, including both larger and smaller companies involved in the fragrance manufacturing, the report aims to:

1. **Establish a GHG intensity reference** – The emission intensity of the sector was calculated using data from 11 respondent companies that were involved in blending and storage activities between 2020-2022.
2. **Explore the relationship between GHG intensities and size of the company** – Separate GHG intensities were calculated and analysed for larger and smaller companies within the survey.
3. **Analyse region-based GHG intensities** – Annual GHG emissions intensities for four regions were calculated - North America, Asia, EMEA and Latin America - between 2020-2022.

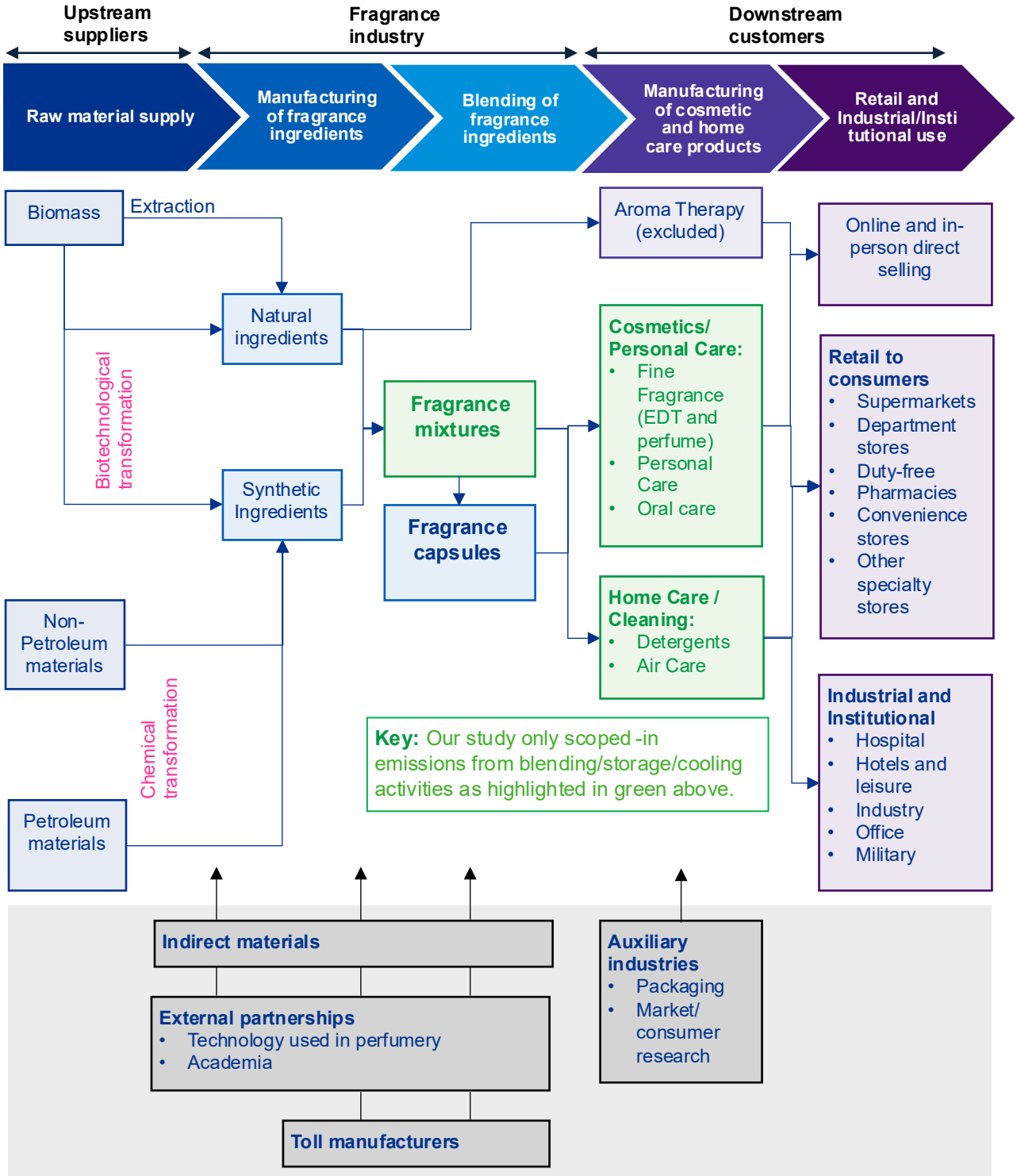
Sharing examples of best practices

The objective of this report is to provide IFRA members with a comprehensive understanding of emissions resulting from blending and storage activities in both larger and smaller companies. This information will assist them in developing future decarbonisation strategies in line with the requirements set forth by regulators, customers and other stakeholders in global markets.

Additionally, the emissions reference outlined in the report will serve as valuable information for fragrance companies, especially those who are either currently above this reference or are starting on the journey to calculate their emissions intensity.

Scope of this study (1/2)

The fragrance industry value chain diagram



Scope of the study (2/2)

For the scope of this survey, IFRA collected global emissions for the years 2020, 2021, and 2022 that were strictly related to:

- **Blending of fragrance ingredients to create fragrance mixtures** sold to cosmetic and home care product manufacturers
- **Storage and cooling of those fragrance ingredients and mixtures**.

The blending/storage emission activities excluded from the scope of this survey were:

1. Base manufacture for reselling as a fragrance ingredient.
2. Capsule manufacture and encapsulation of fragrances.
3. Sales into the Aromatherapy Industry.

Any other emissions from the fragrance value chain (e.g. fragrance ingredient manufacturing plants, sales/admin offices, fragrance creation centres, transportation) were considered out of scope for the purposes of this survey.

For more detailed definitions for the scope of this survey, please refer to the glossary at the end of this report.

Approach and methodology (1/3)

The methodology of this study involves a multi-step process to filter for relevant companies, gather detailed emissions and production data, and perform a comprehensive analysis. This methodology ensures that the data collected is relevant, accurate, and tailored to the specific needs of the study.

Survey design

The invitation to participate in the survey was directly sent via e-mail to the 98 fragrance industry companies that have demonstrated their commitment to sustainability by signing the IFRA IOFI sustainability charter.
A total of 31 companies within the fragrance industry participated in the survey. The survey was designed in a way that only those companies that are involved in the blending/storage of fragrance mixtures were requested to provide their GHG emission data.

The survey was designed to collect data on emissions reported for mixing and storage activities, using available Scope 1 and Scope 2 emission data for the years 2020, 2021, and 2022.

Survey implementation

The survey was distributed via email and conducted through an online survey platform to ensure ease of access and submission. It included qualitative and quantitative questions on annual emissions data (including a split by geography whenever applicable), annual quantity of fragrance mixtures produced (including split by geography whenever applicable), share of different sources in the electricity mix and quantities of different product categories (cosmetic and home care). It also included other qualitative questions on emissions verification, methodology standards, nature of business operations, key decarbonisation initiatives and SBTi target setting.

The responses were collected, compiled, and initially analysed to filter out companies that did not meet the study's criteria. The filter was based on the following parameters:

- Stage 1 – Availability of Scope 1 (direct emissions from owned or controlled sources) and Scope 2 (indirect emissions from the generation of purchased electricity, steam, heating, and cooling) emissions data for 2020, 2021, and 2022
- Stage 2 (a) – Availability of emissions data specific to blending and/or storage activities for fragrance mixtures
- Stage 2 (b) – Availability of emissions data specific to final fragrance mixtures, excluding bases sold to other fragrance companies

This filtering process was set up to give an idea of the maturity of the industry with regard to carbon inventories, and to determine if the respondents had the in-scope data needed for this study. Respondent companies that met all three criteria proceeded to the next stage, where more detailed data collection and analysis were performed. In aggregate, only a total of 11 respondents cleared all these filters – 4 larger companies; and 7 smaller companies.

Data collection

For the companies that met the filtering criteria, detailed data on annual production quantities of fragrance mixtures and associated GHG emissions were collected. The data was requested at two levels (whenever available):

- Consolidated global level: Data representing the total emissions and production quantities for the entire company
- Regional level: Data providing emissions and production quantities by region to allow for a more granular analysis

Approach and methodology (2/3)

Companies were asked to provide historical data where available and to specify the methodologies used in their GHG emissions calculations to ensure consistency and accuracy.

Data collection was performed through secure data exchange platforms, carried out by KPMG as an independent, third-party consultant to ensure independence, confidentiality and integrity. KPMG analysed each company's data and only provided IFRA with aggregated data insights; this was done to ensure that no company identifiers or individual company data would be shared with IFRA.

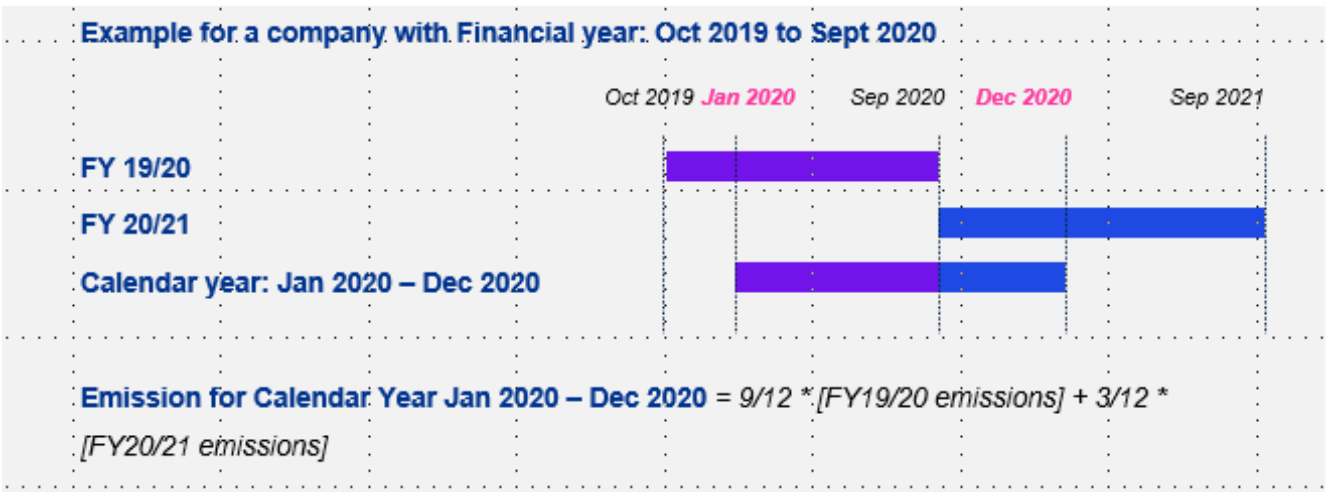
Ensuring data standardisation

A. Calculations for respondents' total emissions must account for emissions related to the relevant greenhouse gases from the Kyoto Protocol/GHG Protocol, including:

- The GHG emissions from the combustion of fossil fuel in owned or controlled boilers, furnaces, vehicles, etc. (Scope 1)
- The total amount of fugitive HFC (hydrofluorocarbon) emissions from use of refrigeration and air conditioning equipment (Scope 1)
- The GHG emissions from the generation of purchased energy consumed by the company (Scope 2)

Respondents were required to convert their total emissions data into CO_2e equivalents. Conversion factors for various greenhouse gases were provided to ensure consistency and comparability across responses. For more details on conversion factors used, please refer to the footnote[1]. Additionally, respondents used different emission factor sources and calculation methodologies due to regional variations, which might affect comparability to a limited degree. For more details on emission factors sources and reporting frameworks used, please see point C below. Lastly, for all the scope 1 and 2 emissions disclosures, respondents were encouraged to provide any full-year emissions data available.

B. To ensure emissions data was aligned for the same time period, respondents that reported emissions data based on their financial year which differed from the calendar year were required to follow the example below for calculating Scope 1 and 2 Greenhouse Gas (GHG) emissions for a calendar year.



[1] GHG Protocol - Global Warming Potential Values

Approach and methodology (3/3)

C. Emission factor sources used were very varied, with most signatories using more than one source of emission factors. This might affect the comparability of emissions between respondents.

Emission factor sources used by signatories	% of respondents
US EPA related (ex. Country specific handbooks, country specific grid factors)	~ 45%
IPCC related (ex. GWP, AR4 to AR6)	~ 36 %
Emission factors provided by individual country electricity operators/ country specific grid factors	~ 36%
Individual country ministry provided emission factors (ex. ADEME/ IDEA/ DEFRA)	~ 36%
Others (etc. specialized software with built-in emission factors, IEA handbooks, GHG protocol handbooks, emission factors directly from suppliers)	~ 55%

Data analysis

The collected data was analysed to assess the following:

- **Emissions Intensity:** Calculation of GHG emissions (tCO_2e) per tonne of fragrance mixture produced to determine the GHG emissions intensity of fragrance blending and storage.
- **Trend Analysis:** Examination of GHG emissions and emission intensity data over the years 2020, 2021, and 2022 was carried out to identify trends and changes in emissions levels.
- **Regional Variability:** Analysis of emissions and production data was carried out at the regional level to identify any geographical differences in GHG emission intensity.

Statistical and data visualisation tools were employed to present the findings on GHG emission intensity clearly and to identify patterns and insights. Key statistical analysis tools used are defined below:

1. **Average GHG emission intensity of respondent companies:** To calculate the average GHG emission intensity for all respondent companies, we added up each company's intensity value (tCO_2e per tonne of fragrance mixture produced) and then divided the total by the number of respondent companies.
2. **Median GHG emission intensity of respondent companies:** To find the median GHG emission intensity for all respondent companies, we arranged the GHG emission intensity values of all respondent companies from smallest to largest and selected the middle value. If there was an even number of respondent companies for that year, we selected the average of the two middle values.
3. **Weighted average emission intensity of respondent companies:** To calculate the weighted average, we multiplied each company's GHG emission intensity by its share of the total fragrance production in our dataset. For example, if Company A produced 30% of the total fragrance production and had an intensity of 0.2 tCO_2e/t of fragrance mixture produced, we multiplied 0.2 by 0.30, getting a result of 0.06. We obtained the results for each of the respondent companies in the dataset and then added them to get the weighted average.

The analysis also includes identification of best practices.

Reporting and interpretation

The final stage involved compiling the results into a comprehensive report. This report includes:

- Executive Summary: A high-level overview of the key findings and implications for the fragrance industry
- Detailed Analysis: In-depth examination of the emissions data, production quantities, and regional variations
- Recommendations: Practical recommendations for companies to reduce their GHG emissions based on the study's findings
- Conclusion: A summary of the study's contributions to understand the environmental impact of the fragrance industry and recommendations for future surveys.

By following this detailed methodology, the study aims to provide valuable insights into the environmental impact of the fragrance industry and to contribute to efforts aimed at reducing GHG emissions in the sector.

Key limitations of the study

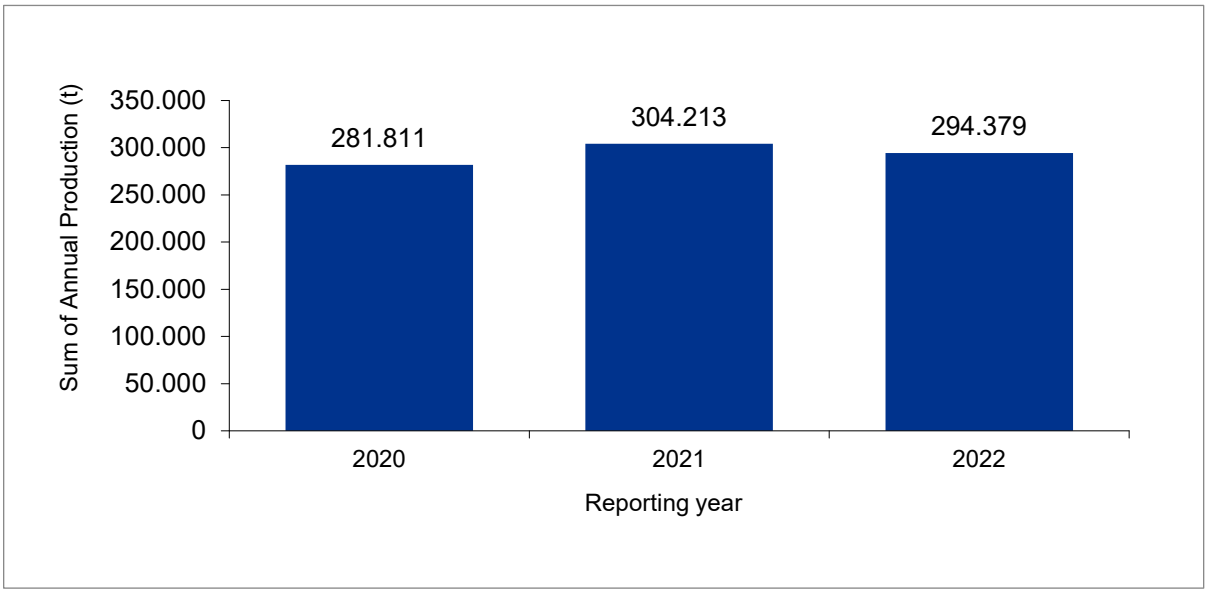
The key limitations of the study are as follows:

- **Small sample size** –31 companies responded to the survey, but upon filtering these companies based on involvement in blending and storage activities of fragrance mixtures and non-inclusion of companies that cannot separate the sale of bases to third parties, only 11 respondent companies were considered for the emission intensity analysis.
- **Skewness** –The analysis of survey responses revealed that the four largest respondent companies accounted for approximately 97% of the total surveyed emissions (in tCO_2e) and about 97% of the total production volume in the dataset of 11 respondent companies. This skews the weighted average, which is tied to production volume towards larger companies' data. Therefore, the average of the respondent company data is more appropriate for certain analysis. Additionally, for certain analysis the median is given, which reduces the impact of outliers on the results.
- **Non-availability of HFCs data** – Poor quality of fugitive HFCs data; 6 out of 11 respondents reported zero HFCs related data for all 3 years. Even some large respondent companies either did not collect HFC data or reported no contribution from refrigeration activities. Large fluctuations within the recorded HFC data revealed that even though HFC emissions can have a significant share (even up to 70-90%) of total scope 1 emissions, they vary greatly over the years compared to emissions from combustion which remain consistent on a year-on-year basis.

Key findings (1/4)

Sector production

Sum of Annual Fragrance Mixture Production (t) of 11 Surveyed Companies: Trends and Patterns from 2020-2022



The 11 respondent companies that provided quantitative data in the survey reported a notable growth of approximately **7.9%** for the sum of total annual fragrance mixture production during the 2020-2021 period. However, this was followed by a decline in the total sum of around **-3.2%** in the subsequent 2021-2022 period.

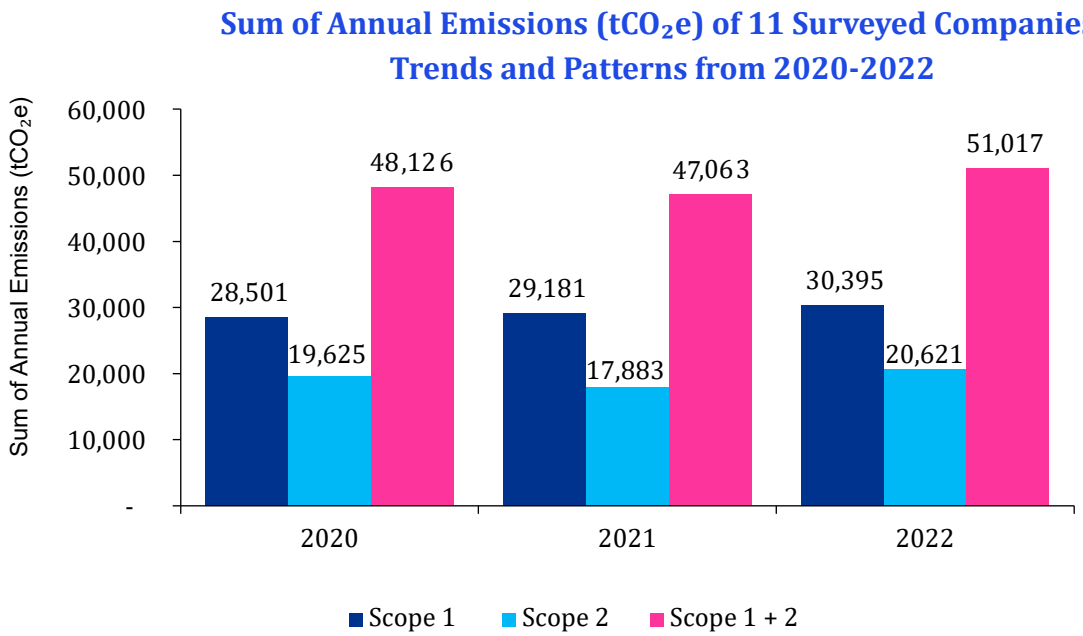
Looking at the individual answers to the survey, between 2020 and 2021, a majority of the respondent companies reported a production increase of anywhere between **7 and 16%,** with not a single company seeing a decline in production from 2020-2021. Statistical analysis of the 11 companies revealed an average production increase of **11%** during this period, with a median increase of **9%.**

Between 2021 and 2022, most of the 11 respondent companies indicated a decrease in production ranging from **-2%** to **-6%**. Interestingly there were also a few respondent companies that increased their production from 2021 – 2022 by **4 to 8%.** Statistical analysis of the 11 companies revealed an average production decrease of **-1.5%** during this period, with a median decrease of **-2.1%.**

Additionally, from 2020 to 2021, one large survey respondent increased total production by **61%,** highlighting the industry's potential for consolidation leading to rapid growth of individual companies due to mergers and acquisitions.

Key findings (2/4)

Sector emissions



The total emissions from respondents show an upward trend growing from 48,126 t CO_2e in 2020 to 51,017 in 2022, which is an increase of total emissions of approximately **6%** from 2020 to 2022.

From the data shown above, there appears to be a discrepancy between the trend of total annual emissions and the production of fragrance mixtures.

- From 2020-2021, total production grew around **7.9%** while total emissions fell around **-2.2%**
- From 2021-2022, total production fell around **3.2%** while total emissions grew around **8.4%**

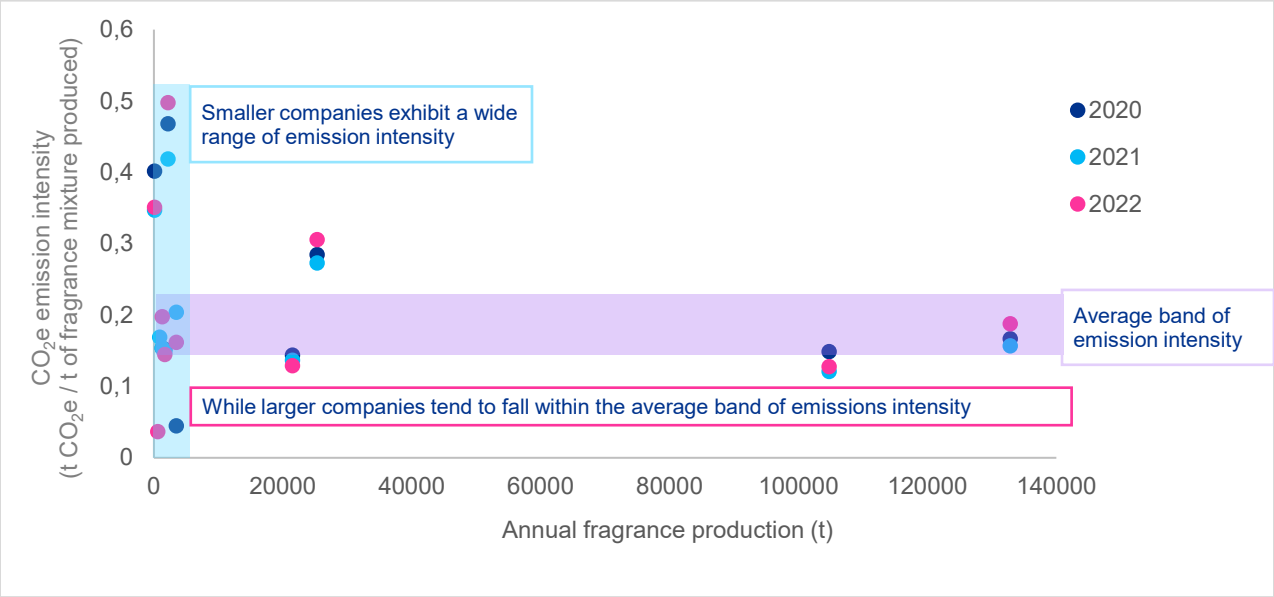
This divergence between total production trend, total emission trend, and emission average trend is an interesting finding. Due to the small sample size and the significant variation in company sizes among the 11 respondents, analysis showed that a few larger companies with increasing emissions can disproportionately impact the overall industry emissions data.

For example, one large company in the survey experienced a 12.5% increase in total emissions from 2021 to 2022, and this accounted for approximately 70% of the overall increase in annual emissions from the dataset during the 2021 to 2022 period. This highlights the strong influence that larger respondent companies have on our dataset. Likewise, decarbonisation efforts carried out by larger companies in the fragrance industry will also have a strong influence on the industry's overall GHG emissions.

Key findings (3/4)

Sector emissions intensity

Comparison of GHG Emission Intensities vs. Production Capacity: Insights from 11 Surveyed Companies

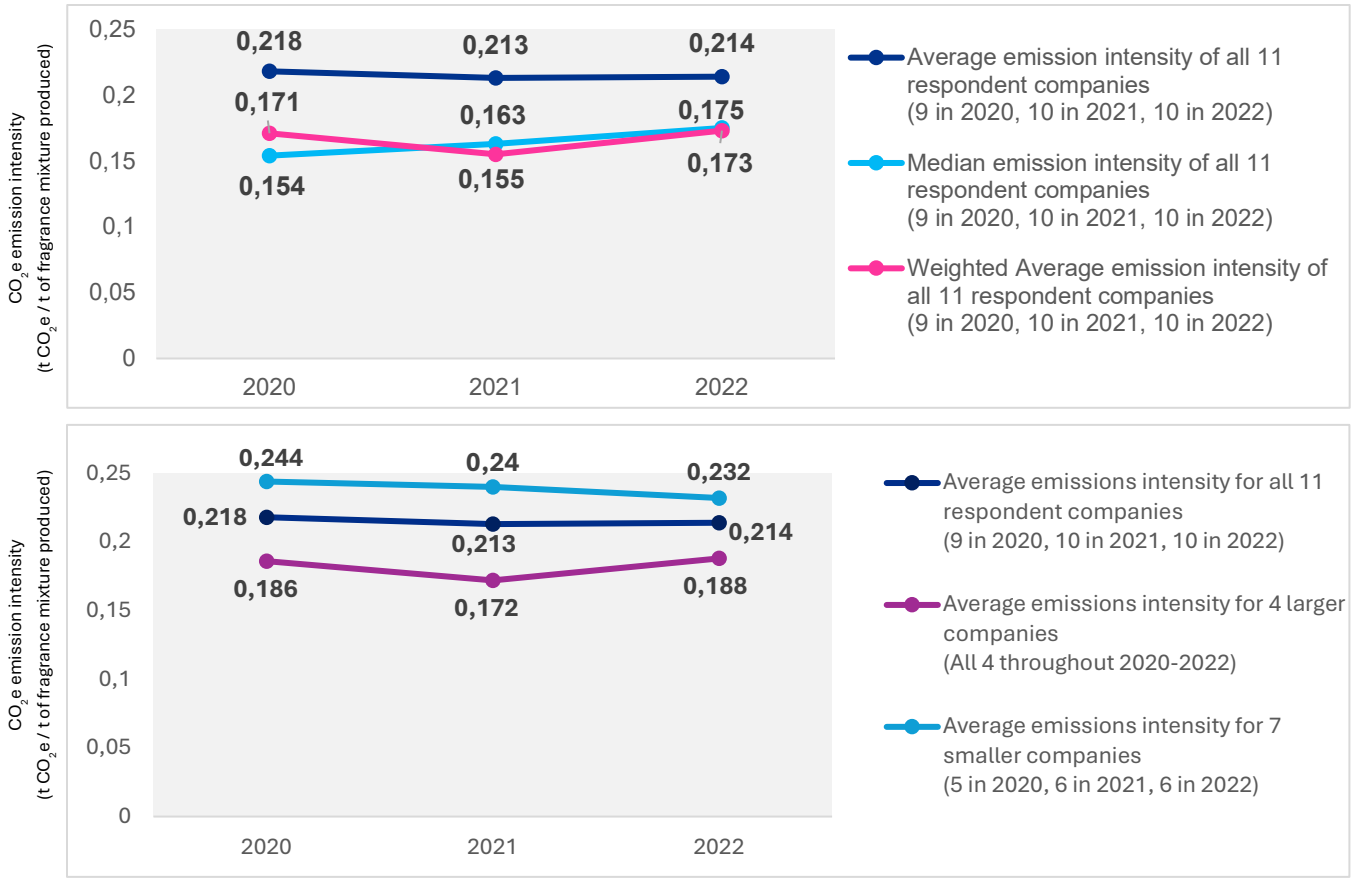


For this study, the GHG emissions intensity of a company is calculated by taking their total scope 1+2 emissions (tCO_2e) for the year and dividing it by their production (in tonnes) for that year. Based on the visual above, 8 out of 11 respondent companies (3 larger and 5 smaller ones) have an emission intensity below 0.2 kg tCO_2e/t of fragrance mixture. IFRA recommends this value as an achievable target for companies with higher emission intensity to work towards.

As shown in the graphic above, two smaller companies (companies with annual production below 5,000 t) have a higher GHG emission intensity as compared with larger companies. At the same time the lowest GHG emission intensity is reported by a smaller company, highlighting the large variety in emission intensity (about a factor 10) for the smaller companies. The emission intensity of the 4 larger companies on the other hand only spreads by about a factor 2.

As mentioned above, there are smaller companies that have successfully displayed excellence by having lower emissions intensities than the larger players. This suggests that all companies can bring down emissions without relying on improved production efficiency through large-scale production.

Analysis of Annual GHG Emission Intensities (t CO_2e / t of Fragrance Mixture Produced) of All 11 Surveyed Companies, including 4 Larger Companies (>5,000 t CO_2e) and 7 Smaller Companies (<5,000 t CO_2e)



Having analysed the GHG emissions intensity data[2] for all 11 respondent companies in our dataset, over the surveyed time span of three years, no significant trends in GHG emission intensity could be identified. Comparing the 2020 and the 2022 data for the average emission intensity and the weighted average emission intensity shows clearly that no significant development took place within these three years, as the figures for both years are almost the same with no clearly identifiable industry trends. Only the median emission intensity shows a consistent increase from 2020-2022, however, this slight increase is not representative of the overall industry development.

The gap between the average and the median emissions intensity data suggests that there are a few outliers that are skewing the data to higher values. Therefore, the use of a median helps to discount the effect of outliers in the sample to illustrate the emission intensity of the sector more accurately. This is supported by the illustration of the weighted average emission intensity, which gives more weight towards larger producers, and discounts the effect of outlier data from smaller companies in our dataset.

[2] *For a more detailed explanation on our calculation methodology for Average, Median, and Weighted Average GHG emission intensity, please refer to the Approach and Methodology section in page 11 of the report.*

A separate analysis of the emissions intensity data showed that 3 of the 4 larger companies (which made up 88.6% of the total production volume of the overall dataset), saw their emissions intensity increase anywhere between 6% to 19% from 2021 to 2022. This caused the overall weighted average to rise. This effect can be seen in greater detail in the second graph, which shows that the average intensity of the 4 larger companies increased from 2021 to 2022, while the average emissions intensity of the 7 smaller companies has actually been decreasing slightly every year from 2020 to 2022.

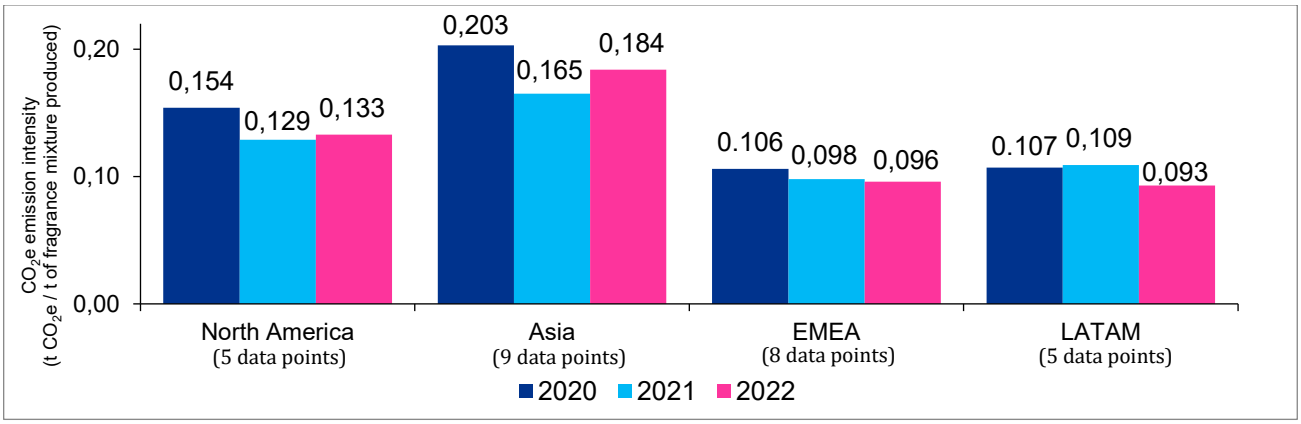
The second graph comparing average emission intensity based on respondent company size also shows a clear difference in average emissions intensity between larger and smaller companies. This suggests that on average smaller companies are less mature in their decarbonisation journey as compared to the larger companies. However, this survey result has to be viewed in light of the finding described above that smaller companies exhibit a large variety of emission intensities and the company with the lowest emission intensity in this survey is a smaller company.

Lastly, it was observed that the average emission intensity of larger companies is in line with the total sector's weighted average emissions intensity. This is due to the fact that the 4 largest companies accounted for approximately 97% of the total surveyed emissions (in tCO_2e) and about 97% of the total fragrance production volume in our dataset of 11 companies.

Key findings (4/4)

Regional GHG emissions intensity

Weighted Average Regional Emissions Intensity of the 11 Surveyed Companies from 2020-2022



To calculate the weighted average regional emissions intensity, the emissions for each data point in the region for that year were summed up and divided by the sum of fragrance production in the region. In general, GHG intensity is decreasing slightly for all regions over the three year timespan. Notably, emissions intensity in North America saw the largest reduction from 2020 – 2022. This could be partly due to the ongoing decarbonisation of the US electricity grid emissions factor; data from the US EPA[3] states that the average grid emission intensity in the US was 0.371 $kgCO_2e$ /KWh in 2022 vs 0.430 $kgCO_2e$ /KWh in 2020, representing a decrease of 13.7% from 2020-2022.

For EMEA, data from the European Environment Agency[4], notes that the GHG emission intensity for the EU-27 was 0.227 $kgCO_2e$/KWh in 2020, and 0.258 $kgCO_2e$/KWh in 2022, which represents a 13.66% increase in the EMEA region emission factor from 2020-2022. This difference may help explain the greater average emission intensity reduction in North America compared to EMEA.

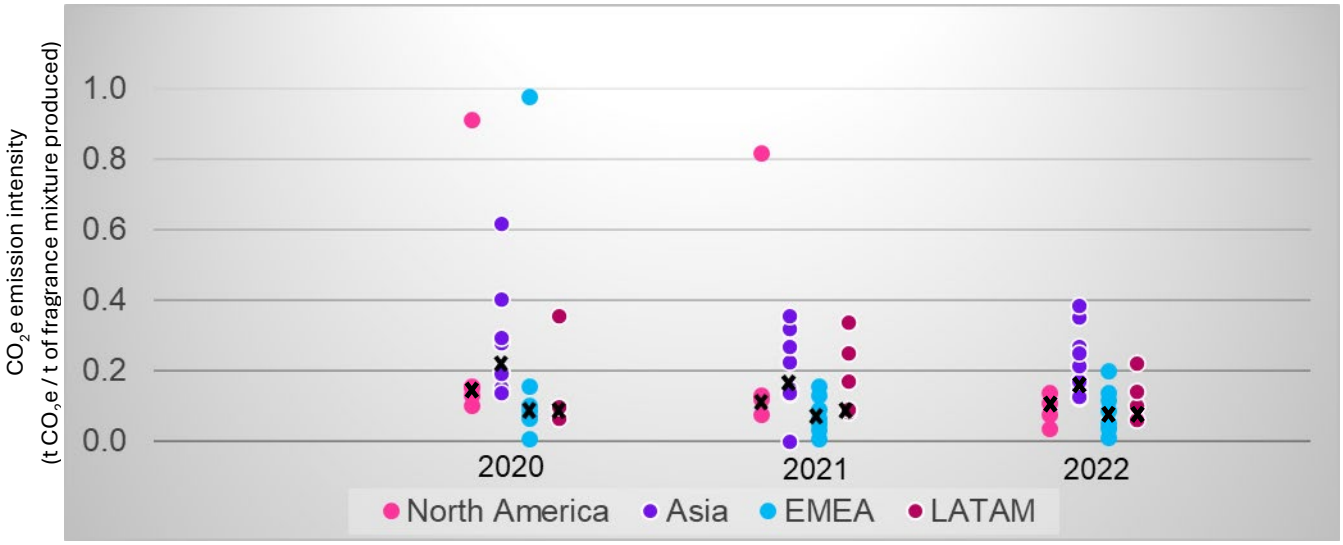
For the LATAM and Asia regions, each country has different grid emission factors, and finding a single reliable emission factor source for the respective regions has proven challenging, making it difficult to calculate an average each of the respective regions. However, for the LATAM region, one factor potentially contributing to the region's lower average emissions intensity could be the energy mix in key operating countries like Brazil, Mexico, and Argentina. According to the IEA[5], renewable energy meets almost 45% of primary energy demand in Brazil via large hydropower plants and use of biofuels and waste. Additionally, in other key operating countries like Mexico and Argentina, the primary energy sources are natural gas and oil, which typically have lower emission factors than coal. According to the IEA[6], in Mexico, coal only makes up 5.4% of the total energy mix, while in Argentina it makes up only 1.6%.

For the Asia region, our survey shows that it had the highest average emissions intensity during the 2020-2022 period. A possible reason for this could be the higher emission factors of the grids of large Asian countries such as India and China, both of which currently still rely heavily on coal for their energy mix. According to the IEA[7], in China, coal makes up 60.6% of the total energy mix, while in India, coal makes up 44.6%. However, this is expected to change over time as

[3] GHG Emission Factors Hub | US EPA
[4] Greenhouse gas emission intensity of electricity generation in Europe | European Environment Agency's home page (europa.eu)
[5] Brazil - Countries & Regions - IEA
[6] Mexico - Countries & Regions - IEA, Argentina - Countries & Regions - IEA
[7] China - Countries & Regions - IEA, India - Countries & Regions - IEA

these countries move towards net zero. Additionally, the survey data showed that Asia's intensity increased in 2022 due to one respondent increasing their absolute Scope 1+2 emissions by 10-15% in Asia, but producing slightly less, which skewed the data upwards. The others had figures in line with the previous year.

Spread of Regional GHG Emissions Intensity Of 11 Surveyed Companies from 2020-2022



The graphic above highlights the individual data points for emissions intensity per region, the data clearly reveals a range of intensities across different regions, especially in North America and Asia. A weighted average emissions intensity was also calculated and is shown as a black 'X' in the graphic above, reflecting the influence of larger companies on the dataset. The range of weighted averages over the three years for each region is as follows:

- North America: 0.128 - 0.154
- Asia: 0.167- 0.203
- EMEA: 0.095- 0.106
- LATAM: 0.094- 0.107

Ignoring the one outlier in NA and EMEA, the emission intensities of the different companies in Asia have the largest spread among the regions. This emission intensity spread in Asia, however, has decreased within the three years with the high emission intensities coming down, likely due to gradual changes in energy mix for their electricity grids as well as advancements in production efficiency over time.

Nevertheless, in 2022 the weighted average of the emission intensity in Asia with 0.173 remains 1.84 times higher than the emission intensity of 0.094 in LATAM.

Key recommendations (1/3)

1. Our survey showed that around 65% of responding fragrance companies either haven't started reporting their Scope 1 and 2 emissions or were unable to separately report GHG emissions for blending/storage activities.

	Number of surveyed companies	% of the 31 respondent companies
Total Companies Surveyed	31	100%
Reporting scope 1 and 2 emissions	22	71% remaining (29% did not pass this filter stage)
Standards adopted by fragrance industry respondents (out of 22 remaining respondent companies): • 76% - GHG protocol, • 14% GHG Protocol & ISO 14061-1 • 5% - ISO 14061-1 • 5% Others		
Scope 1 and 2 emissions from blending and storage activities can be provided separately with emissions from fragrance mixture base mixing being excluded.	11	35.5% remaining (64.5% did not pass this filter stage)
Standards adopted by our 11 respondents that fully responded: • 91% GHG protocol • 27% use both GHG Protocol & ISO 14061-1 • 9% ISO 14064-1		

Our survey showed that 29% of responding fragrance companies have not started calculating or reporting their Scope 1 and 2 emissions, and about 36% were unable to separately report GHG emissions from blending/storage activities.

Key reasons cited for not being able to report GHG emissions include:

1. Not being ready to collect GHG emissions data due to other competing priorities at their company.
2. Having limited resources such as lack of dedicated sustainability department, manpower, and data collection tools.

Key reasons cited for not being able to report emissions from blending/storage activities separated from emissions from fragrance mixture base mixing include:

1. Exclusively sells fragrance mixtures as bases to other manufacturers
2. Difficulty estimating GHG emissions data by proportioning emissions based on mass of final fragrance mixtures sold/not sold as bases.

Key recommendations for fragrance companies planning to report Scope 1 and 2 emissions data

1. Fragrance companies starting their GHG reporting are encouraged to follow the **GHG Protocol Corporate Standard**, a globally recognised GHG reporting framework used by approximately 90% of the fragrance industry.

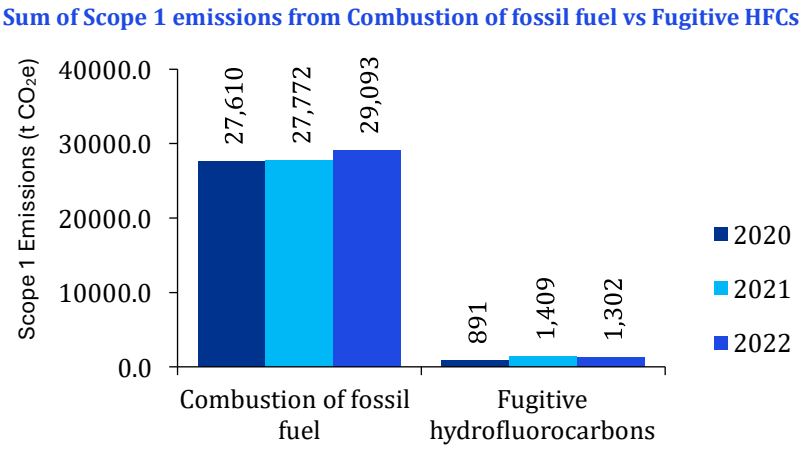
2. During the start of a company's GHG reporting journey, it is common to engage external consultants **to help verify and validate a companies' methodology related to GHG data collection**, calculation and reporting methods, which helps ensure accurate, comparable, and compliant reporting.

IFRA's goal is to help accelerate decarbonisation in the fragrance industry. Therefore, IFRA encourages more fragrance companies to take the initiative to better understand their emissions. This will help identify emissions reduction opportunities, and drive sustainability improvements across the industry.

Key recommendations (2/3)

2. Scope 1 breakdown indicates that blending and storage activities is fossil fuel heavy, and that Scope 1 makes up approx. 60% of all Scope 1 + 2 emissions.

Companies who perform blending and storage activities can consider improving the fuel efficiency of their equipment. This is a decent opportunity for decarbonisation as Scope 1 makes up about 60% of all blending/storage emissions based on our survey respondents.



Issues related to the data collection of fugitive HFC data from blending/storage activities

Fugitive HFC emissions as a % of Total Scope 1 emissions											
Survey Respondent	1	2	3	4	5	6	7	8	9	10	11
FY 2020	31%	0%	1%	51%	0%	0%	91%	0%	0%	0%	3%
FY 2021	16%	0%	6%	40%	0%	0%	0%	0%	0%	0%	3%
FY 2022	74%	0%	1%	37%	0%	0%	44%	0%	0%	0%	15%

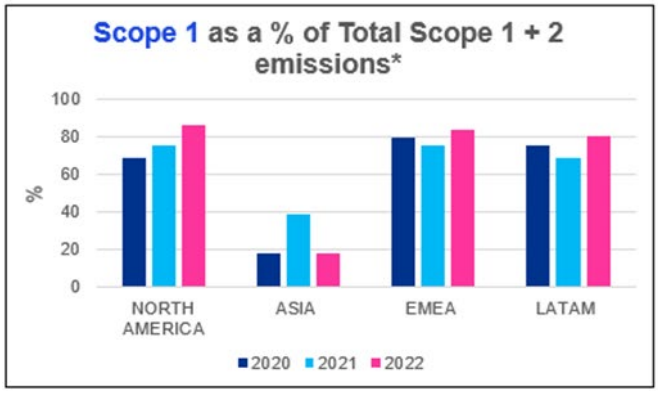
As shown in the table above:

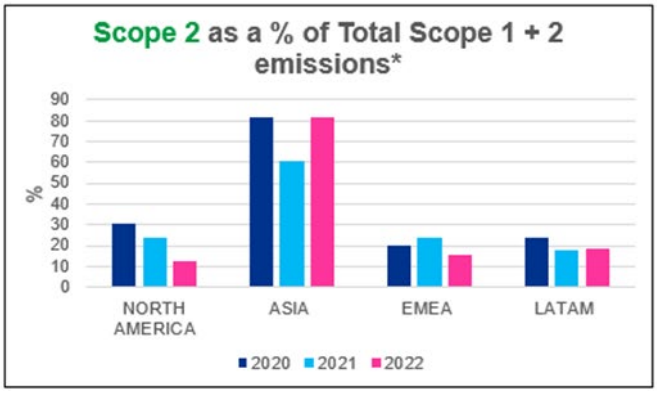
- Of the 11 respondents, 6 (including large companies) reported zero HFC emissions over all three years, suggesting that these companies either didn't collect HFC data or didn't use refrigeration, the latter being unlikely.
- The 5 companies that did report HFC data showed large year-on-year fluctuations, maybe due to the reporting nature of coolant gas purchases, which may not occur annually, making analysis challenging. HFC emissions were a significant part of Scope 1 for some, and their variability contrasted with the more stable emissions from fossil fuels.

Key takeaway to remedy future issues with fugitive HFCs data -
The survey suggests that companies are still refining their data collection processes for HFC emissions related to blending and storage activities. It is hoped that future surveys will see improved HFC reporting, allowing the gathering of more accurate insights for the fragrance industry.

Key recommendations (3/3)

3. Scope 1 and Scope 2 breakdown indicates that certain decarbonisation initiatives might work better for different regions moving forward.





**The annual % contribution data shown above represents the average % contribution of Scope 1 or Scope 2 emissions to Total Scope 1 + 2 emissions, with each country in a region considered as a separate data point.*

Key takeaways

- **North America, EMEA, and LATAM** have a significantly **higher % of Scope 1 compared to Scope 2 (~ 70% to 90%),** this is likely due to Lower Grid Emission factors and/or greater purchasing of Renewable Energy Certificates reducing Scope 2.
- **Asia** shows a **lower % of Scope 1 compared to Scope 2** emissions, suggesting that the region has greater opportunities for decarbonisation through Scope 2 improvements compared to other regions.

4. Key decarbonisation learnings from smaller companies with < 0.2 emission intensity

Key efforts from a smaller company operating in EMEA

1. Installing and maintaining insulation for hot water tanks ,as well as regulating the temperature of hot water tanks.
2. Implementing an accounting plan to analyse the amount of carbon emitted year on year to prioritise key areas for targeted carbon improvement.

Key efforts from a smaller company operating in North America

1. Installation of on-site solar panels.
2. Investment in Energy efficiency assets such as installation of motion sensor lights and LED lighting

5. Key decarbonisation learnings from larger companies with < 0.2 emission intensity[8]

Key efforts from larger companies operating globally

1. Renewable Electricity purchase agreements, with goals to meet 100% RE by 2030
2. Sustainability and Energy CAPEX funds to prioritise projects that have both an environmental benefit and financial return
3. Monthly tracking and validation of best practices, and follow-up on energy savings from Continuous Improvement and CAPEX projects across all sites.
4. Conducting energy efficiency site assessments to identify opportunities to improve efficiencies, as well as tracking energy savings. This includes use of a utilities metering and platform to monitor consumption of utilities in real time and identify improvement opportunities.
5. Refrigerant gas changed to coolant with lower global warming potential, and cooling equipment maintenance.

[8] *Large companies operated in most regions; therefore, we were unable to split efforts by region. For future surveys, there will be more considerations for adding targeted questions to gain more insights on localised decarbonisation efforts.*

Conclusion

This IFRA study on greenhouse gas (GHG) emissions in the fragrance industry provides a foundation for identifying pathways for emissions reduction. By focusing on Scope 1 and 2 emissions from blending and storage activities, the study aims to establish a global reference for this specific step in the fragrance value chain and inform on strategic decarbonisation efforts across the industry. In line with IFRA's long-term goal of enhancing the industry's contribution to sustainable development, the aim is to continue sharing best sustainability practices and track progress year on year after this study.

Despite the challenges related to data collection, the study's findings offer actionable insights for fragrance companies. While larger companies are driving the majority of absolute emissions, the disparities in emission intensity within the group of smaller companies suggest that there are significant opportunities for smaller enterprises to implement effective decarbonisation strategies. There are even examples of smaller companies that have achieved very low emission intensities by deploying emission reducing practices, such as energy efficiency measures and renewable electricity purchasing, which can serve as models for broader adoption across the sector.

The increasing focus on sustainability among larger companies, exemplified by investments in energy efficiency and renewable electricity sourcing, highlights the sector's capacity for innovation and adaptation. These efforts align with the industry's broader goals of reducing its carbon footprint and achieving sustainability targets.

In conclusion, this study serves as a crucial step in establishing a global reference for fragrance industry emissions and providing a framework for future decarbonisation initiatives. The insights gained from this research will guide IFRA members in refining their sustainability strategies and support the industry's transition towards a more environmentally responsible future.

For future studies, continued efforts to expand the dataset and address existing limitations will be essential for refining the reference and achieving more accurate and actionable results. The collaboration between industry stakeholders and increasing data collection will be vital in driving the fragrance industry towards its sustainability objectives and ensuring long-term environmental stewardship.

Acknowledgement

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Glossary (1/2)

Definition	In accordance with	Elaboration
Scope 1 Greenhouse gas (GHG) emissions	***Greenhouse Gas Protocol and US EPA*** Calculation Tools | GHG Protocol Link- Combustion	Scope 1 emissions refer to the direct greenhouse gas (GHG) emissions that originate from sources under the control or ownership of an organization. These emissions are generally associated with activities such as fuel combustion in boilers, furnaces, or vehicles. Examples of scope 1 emissions include the release of carbon dioxide (CO_2), methane (CH4), and nitrous oxide (N2O) during the burning of fossil fuels or other organic materials. In essence, scope 1 emissions are directly generated by the organization's own operational activities and are within its immediate control.
Scope 2 Greenhouse gas (GHG) emissions	***Greenhouse Gas Protocol and US EPA*** Calculation Tools | GHG Protocol Scope 1 and Scope 2 Inventory Guidance | US EPA	Scope 2 emissions refer to the indirect greenhouse gas (GHG) emissions that arise from the consumption or use of purchased electricity, steam, heat, or cooling by an organization. These emissions occur as a result of activities outside the direct control of the organization but are associated with its operations.
Greenhouse Gas (GHG)	***Greenhouse Gas Protocol*** Link- GHG Protocol	*The GHG Protocol includes the Kyoto Protocol's basket of 7 GHG for both Scope 1 and Scope 2 emissions: Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulfur hexafluoride (SF6), as well as Nitrogen Trifluoride (NF_3). To convert non-CO_2 GHG emissions into CO_2e equivalents, companies should use global warming potential (GWPs) to allow for aggregation and comparison.*
Average GHG emissions intensity of 11 respondent companies	***Standard statistical analysis tool***	*To calculate the average GHG emission intensity for all respondent companies, we added up each company's intensity value (tCO_2e per tonne of fragrance mixture produced) and then divided the total by the number of respondent companies.*
Median GHG emission intensity of 11 respondent companies:	***Standard statistical analysis tool***	*To find the median GHG emission intensity for all respondent companies, we arranged the GHG emission intensity values of all respondent companies from smallest to largest and selected the middle value. If there was an even number of respondent companies for that year, we selected the average of the two middle values.*
Weighted Average emission intensity of 11 respondent companies:	***Standard statistical analysis tool***	*To calculate the weighted average, we multiplied each company's GHG emission intensity by its share of the total fragrance production in our dataset. For example, if Company A produced 30% of the total fragrance production and had an intensity of 0.2 tCO_2e/tonne, we multiplied 0.2 by 0.30, getting a result of 0.06. We obtained the results for each of the respondent companies in the dataset and then added them to get the weighted average.*
Metric Tonne (t)	***Standard metric unit*** IUPAC Gold Book	*Metric Tonne (t) represents The International Union of Pure and Applied Chemistry (IUPAC) definition a tonne as a unit of mass equal to 1,000 kilograms.*

Glossary (2/2)

Definition	In accordance with	Elaboration
Cosmetic Product	***EU Cosmetic Products Regulation*** of 30 November 2009. (page 1) Link	Cosmetic products may include creams, emulsions, lotions, gels and oils for the skin, face masks, tinted bases (liquids, pastes, powders), make-up powders, after-bath powders, hygienic powders, toilet soaps, deodorant soaps, perfumes, toilet waters and eau de Cologne, bath and shower preparations (salts, foams, oils, gels), depilatories, deodorants and anti-perspirants, hair colorants, products for waving, straightening and fixing hair, hair-setting products, hair cleansing products (lotions, powders, shampoos), hair-conditioning products (lotions, creams, oils), hairdressing products (lotions, lacquers, brilliantines), shaving products (creams, foams, lotions), make-up and products removing make-up, products intended for application to the lips, products for care of the teeth and the mouth, products for nail care and make-up, products for external intimate hygiene, sunbathing products, products for tanning without sun, skin-whitening products and anti-wrinkle products.
Detergent Products	EU Detergents regulation of 31 March 2004. (Article 2) Link	'Detergent' means any substance or containing soaps and/or other surfactants intended for washing and cleaning processes. Detergents may be in any form (liquid, powder, paste, bar, cake, moulded piece, shape, etc.) and marketed for or used in household, or institutional or industrial purposes. Other products to be considered as detergents are 1. 'Auxiliary washing - mixtures intended for soaking (pre-washing), rinsing or bleaching clothes, household linen, etc.; 2. 'Laundry fabric-softener' - mixtures intended to modify the feel of fabrics in processes which are to complement the washing of fabrics; 3. 'Cleaning' - mixtures intended for domestic all purposes cleaners and/or other cleaning of surfaces (e.g.: materials, products, machinery, mechanical appliances, means of transport and associated equipment, instruments, apparatus, etc.); 4. 'Other cleaning and washing' - mixtures intended for any other washing and cleaning processes.
Air Care Products	The European product categorisation system (Section 5.1, page 15) Link	Air care products serve to odourise or deodorise the indoor rooms (e.g. in homes, offices) or specific objects or items (e.g. shoes, cars, household appliances). Includes incense, candles and matches used to light them. Excludes biocidal products. Examples include: 1. Air care products for indoor rooms (continuous or instant action) 2. Air care products for shoes, vehicles 3. Ambient deodorisers (excludes room deodorisers) - Applies to certain products where the only intended use is to deodorise enclosed spaces (e.g. wardrobes, cupboards), household appliances (e.g. refrigerator, vacuum cleaner) or objects (e.g. rubbish bins). 4. Incense 5. Candles –scented and unscented 6. Matches 7. Other air care products – Other air care products and ambient deodorisers not already covered.

KPMG

Thank you