TPCC
TOURISM PANEL
ON CLIMATE CHANGE

HORIZON PAPER

Hotel Stocktake

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THE TPCC IDENTIFIES STRATEGIC KNOWLEDGE GAPS TO MEET THE SECTOR'S PARIS CLIMATE AGREEMENT OBLIGATIONS AND COMMISSION EXPERT REVIEWS OR NEW ANALYSIS TO SUPPORT RELATED POLICY AND DECISION-MAKING. THE PAPERS WILL BE STAND-ALONE AND REFLECT THE INTERPRETATION OF SCIENCE BY THE AUTHORS.

The TPCC welcomes collaboration with all tourism stakeholders to accelerate the low carbon transition and advance climate resilient tourism development. If you have questions about the TPCC or interests in our Horizon Paper series, Stocktake or Science Assessment.

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INTRODUCTION

This report provides a data-driven analysis for the hotel industry's greenhouse gas (GHG) emissions baseline and progress since 2017, supplemented with energy and water data. The analysis presents trends in absolute emissions and carbon emissions per room for the estimated global hotel supply, to enable annual monitoring of industry decarbonization according to the latest Intergovernmental Panel on Climate Change (IPCC) pathways over time.

This initial comparative analysis aims to assess whether the industry is progressing effectively toward these benchmarks, thereby evaluating its alignment with global climate action goals from 2017 through 2022, with a focus on progress between 2017 and 2019, as well as between 2019 and 2022. 2017 to 2019 represents the pre-pandemic period where tourism was booming and exponential growth in the hotel industry was expected. 2019 to 2022 represents the COVID-19 pandemic era, characterized by widespread travel restrictions and public health measures leading to hotel closures and reduced occupancy rates.

2021 was a challenging year to gauge progress in terms of an industry-wide footprint, given that many hotels were still closed or operating at low occupancy, leading to a stark 27.49% decrease in total carbon emissions among all hotels between 2019 and 2021. This trend was echoed in specific categories, with full service resorts, full service non-resorts, and limited service hotels reducing their emissions by 25.13%, 29.83%, and 18.69%, respectively.

However, this runs contrary to the trend in the preceding years, whereby emissions had steadily risen by 2.39% between 2017 and 2019. Thus, had the COVID-19 pandemic not devastated the global travel industry for an extended period, the hotel industry would not have adequately met any straight-line decarbonization expectations for absolute emissions reductions. With the gradual recovery of the travel industry, global carbon emissions increased 12.33% year-on-year from 2021 to 2022, and we anticipate that this trend will continue into 2023.

Though some progress was made on a per room intensity basis, it remains to be seen whether the reduced emissions intensity can be sustained in 2023 and beyond. Between 2017 and 2019, emissions intensity decreased by 7.5% across all hotels, and thereafter dropped sharply by 23.94% between 2019 and 2022. Although emissions intensity expectedly rose by 8.33% in 2022, it remained significantly lower than 2017 levels.

In summary, the continuous growth of the hotel industry, fueled by pent-up demand from travelers, will require deeper decarbonization in the latter half of this decade in order to catch up to global commitments.

Based on the findings, we identified three key drivers of the industry's decarbonization progress: (i) changes in hotel supply; (ii) changes in emission factors; and (iii) uptake of mitigation measures. These factors each have an individual and collective impact on the hotel industry's sustainability performance.

This report offers a structure and approach that can provide valuable insights into the current and future state of climate action within the global hotel industry, with a view toward alignment with science-based decarbonization pathways.

Through this analysis, we aim to contribute meaningfully to the ongoing dialogue on sustainable practices and encourage the industry's continuous efforts toward decarbonization.

METHODOLOGY

DATA SOURCES

The analysis draws from two primary datasets: (i) hotel supply (number of hotels and rooms), and (ii) hotel performance (carbon emissions, energy, and water usage per room), building upon them to derive the global supply dataset and industrywide footprint. This section provides an overview of the methodology used. More details can be found in Appendix 1: Methodology for Hotel Supply and Appendix 2: Methodology for Sustainability Performance.

Hotel Supply Data

It should be noted that no single source of truth or database exists that captures all hotels globally, which is doubly challenging given the lack of definition of what constitutes a *hotel* amid the evolving landscape of accommodation. Therefore, an estimation and extrapolation exercise was performed to arrive at the figures, building on the original Hotel Global Decarbonisation Report undertaken in 2016 by Greenview and the Sustainable Hospitality Alliance which outlined the original Paris-Aligned pathway to industry decarbonization.

Hotel supply was compiled from the hotel and room supply statistics by country for each year by analyzing three data sources – the United Nations World Tourism Organization (UNWTO), STR and Expedia. As there were fluctuations in the data across the various sources, an approach was developed to quantify the hotel industry supply for the years of 2017 to 2022 based on the best available data for each year and applying an estimation methodology.

Of the 222 countries in the dataset, we prioritized the top countries that were large contributors of rooms to the global room supply. Further analysis was done for a total of 46 priority countries.

As the data encompassed the entire hotel industry, an apportionment method was employed to estimate hotel and room counts for full service resorts, full service non-resorts, and limited service. This method involved applying hotel segments data from the CHSB index as a reference, using the ratio of hotels in each country and multiplying by the country's corresponding room count to arrive at an estimated number of hotels in each of the segments. This apportionment process allowed for a more detailed analysis of the trends in the hotel and room supply by segments.

Hotel Sustainability Performance Data

Environmental performance metrics were extracted from the Cornell Hotel Sustainability Benchmarking Index (CHSB) datasets from calendar years 2017[1], 2018[2], 2019[3], 2021[4] and 2022, using country-level median values for the following metrics to obtain per room coefficients per country:

- Hotel Carbon Footprint Per Room Per Year (Measure 2)
- Hotel Carbon Footprint Per Square Meter Per Year (Measure 4)
- Hotel Energy Usage Per Square Meter Per Year (Measure 6)
- Hotel Water Usage Per Square Meter Per Year (Measure 9)

As the focus of this report is decarbonization, more attention is given to the analysis of carbon footprint and energy usage. Additional data on water usage is provided for reference, given its growing relevance to decarbonization and sustainability as a whole (see Appendix 4: Water Consumption).

Median values were obtained for each country in primary segment configurations based on a basic categorization of whether the hotel was limited service or full service, and whether a full service hotel was a resort[5], for the following three segments[6]:

- Full Service Resorts
- Full Service Non-Resorts
- Limited Service

The segmentation allows us to compare hotels with similar attributes and operating processes for a fairer analysis, and to identify if there were differing trends among the three categories. Without segmentation, there would be an exceedingly wide range of performance data given the differences in how these three groups consume energy and water. To normalize performance for energy consumption and water usage per room, each country's ratio of rooms to square meters was first calculated using Measures 2 and 4. This was then multiplied by Measures 6 and 9 respectively, to estimate the segment's energy consumption and water usage per room per year.

[1] Source publication available at: https://ecommons.cornell.edu/items/2c504c68-e355-4b04-aea7-42d9a0ca2df8
[2] Source publication available at: https://ecommons.cornell.edu/items/bbe4c82c-6701-4167-a8da-1e95e7564ea7
[3] Source publication available at: https://ecommons.cornell.edu/items/eeeb23fe-76d1-4db2-a0bb-61447b56810a
[4] Source publication available at: https://ecommons.cornell.edu/items/f50b30f1-40ea-4c87-95d0-83c8009f6497
[5] This methodology is aligned to the CHSB Index, which assumes that a limited service hotel is not a resort.
[6] For 2017 and 2018, hotels were only segmented into two categories - full service and limited service. In 2019, this was expanded into three categories.

CALCULATIONS & OUTPUT

Hotel Sustainability Performance

Using the carbon emissions, energy, and water performance coefficients determined for each country and segment, the total emissions, energy usage, and water consumption were calculated for each country by multiplying the coefficients by the respective room count for each segment. The country totals were then aggregated by sub-regions, regions and globally as presented later in this report, by multiplying the corresponding environmental performance coefficients by the room count for each country across each segment.

The same methodology was used for the like-for-like dataset for 2022, with the key assumption that the hotel supply figure in 2017 held constant until 2022. As such, the 2017 hotel supply data was multiplied by the corresponding 2022 environmental performance data, to arrive at a simulation of like-for-like performance. More details can be found in Appendix 5: Like-for-like Comparison.

Emission Factors Analysis

The set of emission factors (EFs) applied to each respective energy type, and analyzed for its impact on global emissions, was geographically based on available data, with annual references for each country and energy type outlined in the guidance document for all CHSB cycles referenced in this report. All GHG EFs for the electric power grid in each country or market are location-based. Location-based EFs are calculated based on the average carbon emission intensity associated with generating and consuming a specific energy type in a specific geographic location where the facility operates.

Since EFs are a key component in carbon emissions calculations, they were also analyzed to identify their impact on the global footprint of the hotel industry. Particularly, the analysis focused on the electric power grid EFs because electricity can constitute approximately 60 to 75% of total energy usage in a hotel.

The global average electric power grid EF for 2019, 2021, 2022, and 2023, and the percentage change across the years were calculated to identify trends in global EFs. The global average EF calculated is a weighted average, with the weight of each country calculated by multiplying the number of properties from that country participating in CHSB by the median of Measure 1 (HCMI Rooms Footprint Per Occupied Room). The weight of each country is then multiplied by the respective country's EF to get an EF weight. The EF weight of all countries are then summed to get the global average EF.

The 2019 global average EF is based on data from CHSB2021, 2021 global average EF is based on data from CHSB2023, and the 2022 and 2023 global average EFs are based on data from CHSB2024.

FINDINGS

HOTEL SUPPLY

This section presents the major trends observed in the hotel and room supply statistics, based on our efforts to quantify the footprint of the industry. These figures were derived through estimations from several datasets and do not represent an exact census of hotels worldwide. More information on the estimation approach can be found in the Methodology section of this report.

Between 2017 and 2022, the data showed consistent expansion of the global hotel industry, driven by rising travel demand. Growth in hotel supply spiked in 2019, with 6.82% more hotels and 6.64% more rooms than in 2018. However, the growth momentum slowed significantly after 2019 as the COVID-19 pandemic led to unprecedented disruptions, including travel restrictions, lockdowns, and a steep decline in international and domestic tourism. Despite these challenges, the industry began to show signs of recovery in 2022. (More details in Table 1.)

Table 1 shows the overall global hotel and room count from 2017 to 2022 and the breakdown of data for the three hotel segments (full service resorts, full service non-resorts and limited service hotels). Limited-service hotels accounted for the vast majority of global hotel and room count, followed by full service non-resorts, and then full service resorts. The growth rates across all segments were consistent at about 3 to 4% growth from 2021 to 2022.

Table 1 Global Hotel & Room Count from 2017 to 2022

Segment	Metric	2017	2018	2019	2021	2022
All Hotels	**Hotel Count**	460,719	478,497	511,134	534,512	553,676
	% Change	-	3.86%	6.82%	4.57%	3.59%
	Room Count	21,930,248	22,764,374	24,276,995	25,188,175	25,997,945
	% Change	-	3.80%	6.64%	3.75%	3.21%
Full Service Resorts	**Hotel Count**	13,822	14,355	15,334	16,035	16,610
	% Change	-	3.86%	6.82%	4.57%	3.59%
	Room Count	1,096,512	1,138,219	1,213,850	1,259,409	1,299,897
	% Change	-	3.80%	6.64%	3.75%	3.21%
Full Service Non-resorts	**Hotel Count**	27,643	28,710	30,668	32,071	33,221
	% Change	-	3.86%	6.82%	4.57%	3.59%
	Room Count	2,193,025	2,276,437	2,427,699	2,518,818	2,599,794
	% Change	-	3.80%	6.64%	3.75%	3.21%
Limited-Service Hotels	**Hotel Count**	419,254	435,432	465,132	486,406	503,845
	% Change	-	3.86%	6.82%	4.57%	3.59%
	Room Count	18,640,711	19,349,718	20,635,446	21,409,949	22,098,253
	% Change	-	3.80%	6.64%	3.75%	3.21%

Taking a bird's-eye view of hotel supply over the three key time periods of analysis, the global hotel count increased 10.94% between 2017 and 2019, which slowed to an increase of 8.32% between 2019 and 2022. Similarly, the global room count increased 10.70% between 2017 and 2019, which fell to 7.09% between 2019 and 2022. This dip was aligned with our expectations given the impact of the pandemic on the travel industry. Nonetheless, comparing 2017 and 2022, hotel count and room count still increased by 20.18% and 18.55% respectively, indicating continued industry growth.

Reviewing the data at a regional level, hotel and room counts consistently rose across all regions, though the expansion pace expectedly decelerated in 2021 and 2022 due to the pandemic. From 2017 to 2022, Asia had the most significant growth in the number of hotels, whereas Africa saw the highest increase in room count. By 2022, Europe represented nearly half of the world's hotels, and Asia contributed close to 40% of the global room count.

SUSTAINABILITY PERFORMANCE

This section presents the key findings of the hotel industry's sustainability performance in terms of carbon emissions and energy usage. More details on the breakdown by countries, sub-regions and regions can be found in Appendix 3: Supplementary Tables, and key findings on water usage can be found in Appendix 4: Water Consumption.

Carbon Emissions

There has been a significant drop in global carbon emissions (Scope 1 and 2) across all hotel segments, dropping by 16.60% from 194,088,553 metric tons of CO2e in 2017 to 161,870,416 metric tons of CO2e in 2022. (More details in Table 2.) Nonetheless, as the travel industry rebounds, emissions are expected to rise in 2023.

Between 2017 and 2019, in the pre-pandemic era, global carbon emissions from hotels increased by 2.39% despite an increase in global room count of 10.70%. (See Table 3.) This is likely due to more hotels adopting sustainability measures in response to increased awareness and interest from eco-conscious travelers. Some common measures are designing a carbon reduction plan, tracking their carbon footprint, and introducing sustainable modes of transportation. The uptake rates of such mitigation measures are discussed in a subsequent section of this report.

Between 2019 and 2022, there was a large decrease in global emissions of 18.55%, a downturn primarily attributed to the COVID-19 pandemic and its effects on the travel and hospitality industry. Due to travel restrictions and safety concerns, many hotels experienced low occupancy rates, and some were forced to close temporarily.

Emissions Intensity

As industry-wide aggregate footprint data may not be fully representative due to hotel closures, the carbon emissions intensity was also analyzed on an emissions per room basis. Overall, emissions intensity has fallen sharply by 29.65% between 2017 and 2022.

From 2017 to 2018, the global average emissions per room decreased by 2.56%, followed by a larger drop of 5.07% in 2019. This could have been caused by increased uptake of sustainability measures, in addition to the impact of the emission factors (EFs) used in calculating hotels' emissions. The trends of the electric power grid EFs are discussed in a subsequent section of this report. Between 2019 and 2021, the emissions intensity dropped further by 30.11%, likely due to the pandemic and reduced travel. However, between 2021 and 2022, emissions intensity increased by 8.83%, indicating recovery of the tourism industry with higher hotel occupancy. (See Table 2.) This upward trend in emissions intensity will likely continue into 2023.

As earlier mentioned in the Methodology section, emissions data was also categorized into the three hotel segments to allow for more granular analysis of the trends by segments. However, analysis was limited for the full service resorts and non-resorts before 2019 due to data gaps. For 2017 and 2018, hotels were only segmented into two categories – full service and limited service. In 2019, this was expanded into the current three categories.

Between 2019 and 2022, full service resorts recorded the largest decrease in emissions intensity (-26.49%), followed by limited-service hotels (-22.04%). (See Table 3.) Between 2021 and 2022, full service non-resorts recorded the largest jump in emissions intensity of 21.81%. In contrast, full service resorts had a slight increase of 1.87% and limited-service hotels had a slight decrease of 0.52%. (See Table 2.) In general, limited-service hotels could have performed better than their full-service counterparts due to the following possible reasons. First, they tend to have reduced facilities (e.g. spa, swimming pool, restaurants), hence consuming less energy and water. Second, they are typically smaller in size and have fewer rooms than full service hotels, meaning that there is less space to heat and/or cool, which would result in reduced energy consumption.

Table 2 shows the overall carbon emissions trends from 2017 to 2022 and the breakdown of data for the three hotel segments (full service resorts, full service non-resorts and limited service hotels).

Table 2 Global Carbon Emissions Trends from 2017 to 2022[7]

Segment	Metric	2017	2018	2019	2021	2022
All Hotels	**Total**	194,088,553	196,309,887	198,734,417	144,099,753	161,870,416
	% Change	-	1.14%	1.24%	-27.49%	12.33%
	Per Room	8,850	8,624	8,186	5,721	6,226

[7] Hotels were not categorized into 3 segments until the 2019 calendar year dataset. Hence the 2017 and 2018 data for full service resorts and non-resorts is not available for historical comparisons in this study.

Segment	Metric	2017	2018	2019	2021	2022
	% Change	-	-2.56%	-5.07%	-30.11%	8.83%
Full Service Resorts	Total	-	-	17,865,641	13,375,835	14,064,601
	% Change	-	-	-	-25.13%	5.15%
	Per Room	-	-	14,718	10,621	10,820
	% Change	-	-	-	-27.84%	1.87%
Full Service Non-resorts	Total	-	-	22,726,234	15,947,475	20,049,393
	% Change	-	-	-	-29.83%	25.72%
	Per Room	-	-	9,361	6,331	7,712
	% Change	-	-	-	-32.37%	21.81%
Limited-Service Hotels	Total	114,326,989	114,664,801	100,446,525	81,674,710	83,858,124
	% Change	-	0.30%	-12.40%	-18.69%	2.67%
	Per Room	6,133	5,925.92	4,868	3,815	3,795
	% Change	-	-3.38%	-17.86%	-21.63%	-0.52%

Note: Total emissions are reported in metric tons of CO2e and emissions per room are reported in kgCO2e.

Emissions Progress from 2017 Baseline

Comparing the 2019 results to the 2017 baseline as shown in Table 3, aggregate emissions increased by 2.39%, while emissions per room decreased by 7.50%. Using a 1.5-Degree scenario pathway of absolute emissions decreasing by 4.2% per year, the industry progress across the two years was significantly off-track.

Comparing the 2022 results to the 2017 baseline, although aggregate emissions decreased by 16.60% over the five-year period, this was still insufficient to meet the 1.5-Degree scenario pathway. In addition, this reduction is not representative of a trend given the drastic impact of the COVID-19 pandemic. Numerous markets were still in the midst of recovering from the pandemic as of 2022 and tourism levels had yet to normalize. Overall, emissions from the hospitality sector are likely to surge in 2023 once hotel occupancy recovers to 2019 levels.

2021 and 2022 saw modest year-on-year increases in global room count of 3.75% and 3.21% respectively, primarily driven by growth in Asia Pacific. Given the forecasted pipeline of hotel rooms and the projected increase in emissions, the industry will find it challenging to meet a 1.5-Degree scenario straight-line decarbonization pathway, and will need to compensate with substantial decarbonization through 2030.

Table 3 shows the changes in global carbon emissions over the three time periods of analysis.

Table 3 Changes in Global Carbon Emissions between 2017, 2019 and 2022[8]

Segment	Metric	Change between 2017 and 2019	Change between 2019 and 2022	Change between 2017 and 2022
All Hotels	Total	2.39%	-18.55%	-16.60%
	Per Room	-7.50%	-23.94%	-29.65%
Full Service Resorts	Total	-	-21.28%	-
	Per Room	-	-26.49%	-
Full Service Non-resorts	Total	-	-11.78%	-
	Per Room		-17.62%	-
Limited-Service Hotels	Total	-12.14%	-16.51%	-26.65%
	Per Room	-20.63%	-22.04%	-38.13%

Note: Total emissions are reported in metric tons of CO2e and emissions per room are reported in kgCO2e.

Energy Usage

Between 2017 and 2022, there was a slight decrease in absolute global hotel energy consumption of 6.75% from 478,885,981 kWh to 446,581,575 kWh. (More details in Table 4 and Table 5.) Although there were large fluctuations in global energy consumption in the intervening years, it is noteworthy that by 2022 the total energy usage had risen again to slightly below 2017 levels.

Between 2017 and 2019, in the pre-pandemic era, global energy usage increased by 8.92% alongside an increase in global room count of 10.70%. (See Table 4.) This slight disparity may have been due to the implementation of energy-efficient technologies and practices, as discussed in a subsequent section of this report on Mitigation Measures.

Between 2019 and 2022, global energy consumption plummeted by 14.38%, reflecting the pandemic's significant repercussions on the travel and hospitality sectors. As noted earlier, many hotels were closed or operating at lower occupancy rates. With fewer guests, there was less demand for energy-consuming amenities such as heating, cooling, lighting, and other electrical appliances. Additionally, hotels may have implemented energy conservation measures to reduce costs during a period of low revenue.

From 2021 to 2022, global energy usage expectedly rose (by 13.54%) as tourism levels recovered. Nonetheless, the absolute energy usage was still significantly lower than that in 2019, which could be due to the increased uptake of energy efficiency measures and renewable energy. This is discussed in a subsequent section on Mitigation Measures.

It is noteworthy that between 2017 and 2022, though global energy usage only decreased by 6.75%, global carbon emissions decreased by 16.60% (See Table 5 and Table 3). This disparity

[8] Hotels were not categorized into 3 segments until the 2019 calendar year dataset. Hence the 2017 and 2018 data for full service resorts and non-resorts is not available for historical comparisons in this study.

is likely due to improvements in the electric power grid EFs across many countries, which will be discussed in a subsequent section on EF trends.

Energy Intensity

Energy intensity was also analyzed by calculating the energy usage per room. Overall, energy intensity has fallen significantly by 21.34% between 2017 and 2022.

Between 2017 and 2019, the global average energy usage per room remained fairly stable, with only a slight dip of 1.61%. Over the pandemic years between 2019 and 2021, there was a sharp drop in energy intensity of 27.32%. In 2022, the overall energy intensity rose slightly by 10% with the return of travel, though this still represented a drop of 20.05% compared to 2019 levels. (See Table 4 and Table 5.)

When analyzing the energy intensity trends by segment, limited-service hotels performed the best by far, averaging only 10,281kWh per room in 2022. Full service non-resorts recorded almost double that energy intensity at 22,110kWh per room, and full service resorts had the highest energy intensity of 29,334kWh per room.

All segments' energy intensity showed reductions between 2019 and 2021, but increased again between 2021 and 2022. Similarly, limited-service hotels had the smallest increase in energy intensity of only 0.87%, corresponding to our earlier observation that limited-service hotels usually perform better than their full-service counterparts given that their business model tends to be less resource-intensive. Full service non-resorts recorded a significant increase in energy usage per room (21.87%) from 2021 to 2022. (See Table 4.)

Table 4 *shows the overall energy usage from 2017 to 2022 and the breakdown of data for the three hotel segments (full service resorts, full service non-resorts and limited service hotels).*

Table 4 Global Energy Usage from 2017 to 2022[9]

Segment	Metric	2017	2018	2019	2021	2022
All Hotels	Total	478,885,981	502,799,485	521,595,280	393,342,385	446,581,575
	% Change	-	4.99%	3.74%	-24.59%	13.54%
	Per Room	21,837	22,087	21,485	15,616	17,178
	% Change	-	1.15%	-2.73%	-27.32%	10.00%
Full Service Resorts	Total	-	-	39,061,027	35,468,094	38,131,169
	% Change	-	-	-	-9.20%	7.51%
	Per Room	-	-	32,179	28,162	29,334
	% Change	-	-	-	-12.48%	4.16%
	Total	-	-	61,886,092	45,697,793	57,480,608

[9] Hotels were not categorized into 3 segments until the 2019 calendar year dataset. Hence the 2017 and 2018 data for full service resorts and non-resorts is not available for historical comparisons in this study.

Segment	Metric	2017	2018	2019	2021	2022
Full Service Non-resorts	*% Change*	-	-	-	-26.16%	25.78%
	Per Room	-	-	25,492	18,143	22,110
	% Change	-	-	-	-28.83%	21.87%
Limited-Service Hotels	Total	289,924,977	290,182,162	251,689,146	218,215,866	227,188,597
	% Change	-	0.09%	-13.27%	-13.30%	4.11%
	Per Room	15,553	14,997	12,197	10,192	10,281
	% Change	-	-3.58%	-18.67%	-16.44%	0.87%

Note: Total energy is reported in megawatt-hours and energy per room is reported in kilowatt-hours.

Table 5 *shows the changes in global energy usage over the three time periods of analysis.*

Table 5 Changes in Global Energy Usage between 2017, 2019 and 2022[10]

Segment	Metric	Change between 2017 and 2019	Change between 2019 and 2022	Change between 2017 and 2022
All Hotels	Total	8.92%	-14.38%	-6.75%
	Per Room	-1.61%	-20.05%	-21.34%
Full Service Resorts	Total	-	-2.38%	-
	Per Room	-	-8.84%	-
Full Service Non-resorts	Total	-	-7.12%	-
	Per Room	-	-13.27%	-
Limited-Service Hotels	Total	-13.19%	-9.73%	-21.64%
	Per Room	-21.58%	-15.71%	-33.90%

KEY DRIVERS OF CHANGE

In the previous section, our findings have shown decreases across all four key metrics between 2017 and 2022: (i) global carbon emissions; (ii) emissions intensity; (iii) global energy usage and (iv) energy intensity. However, these figures had also fluctuated significantly in the intervening years given the disruptive impact of the COVID-19 pandemic on the travel industry.

This section discusses three critical drivers of the industry's decarbonization progress which have influenced the above findings: (i) changes in hotel supply; (ii) changes in emission factors; and (iii) uptake of mitigation measures. Each of these factors should be kept in view when evaluating the industry's sustainability performance.

A fourth possible driver is weather conditions. With climate change causing rising temperatures and larger fluctuations in weather patterns, hotel operations may require more energy and water, which will result in both year-over-year changes and longer-term trends in the industry's

[10] Hotels were not categorized into 3 segments until the 2019 calendar year dataset. Hence the 2017 and 2018 data for full service resorts and non-resorts is not available for historical comparisons in this study.

sustainability performance. While we acknowledge this as a potential factor, we have excluded weather changes from this analysis due to the current lack of available data and universally agreed-upon methods for quantifying the impact of weather variations on hotel building energy loads.

HOTEL SUPPLY AND OCCUPANCY

As earlier highlighted, hotel supply (number of hotels and rooms) consistently increased from 2017 to 2022. Prior to the COVID-19 pandemic, the hotel industry had been forecasted to grow rapidly in the next two decades. As global recovery after the pandemic continues, we expect tourism and the hotel industry to pick up as well. With the anticipated growth in hotel supply, the footprint of the industry will naturally increase.

While the absolute number of hotels and rooms is critical, we should also consider the efficiency of these new hotels being built. These new developments are largely in Asia, which saw the largest increase in hotel count of 7.21% between 2021 and 2022. Over the same period, hotels in Asia produced an increase in total carbon emissions of 15.82%, and an increase in energy usage of 16.39%. These figures indicate that much of the new hotel supply being added in Asia is less efficient than the existing building stock, which will be an industry challenge to tackle as the pipeline of new hotel development is concentrated primarily in Asia.

Besides hotel supply, hotel occupancy inevitably affects emissions as well. Throughout the pandemic, many hotels experienced significantly lower occupancy which likely influenced energy and water usage through 2022, although we are unable to quantify the exact contribution of reduced occupancy rates to these metrics. Though occupancy is tracked through CHSB, these are not representative of all hotel types and geographies, and the data is confidential. Nevertheless, more comprehensive insights into global and regional occupancy trends can be obtained through STR.

EMISSION FACTORS

The next key driver impacting sustainability performance trends are the emission factors (EFs) used in calculating hotels' emissions. In particular, we focused on the electric power grid EFs because electricity can constitute approximately 60 to 75% of total energy usage in a hotel.

The data analysis shows that trends in carbon emissions and energy usage are not always correlated. Despite global energy usage only decreasing by 6.75% between 2017 and 2022, global carbon emissions decreased by 16.60% (See Table 5 and Table 3). This discrepancy could have been caused by two primary reasons. First, hotels may be increasing their percentage of energy derived from their own renewable sources. Second, the GHG EFs for the electric power grid in respective markets may be improving as utilities decarbonize and themselves become more efficient. Many countries saw decreases in the carbon emissions output per kWh of electricity. However, as described in the sections on renewable energy and emission factors, there was little

uptake in renewables through 2021 on a global basis. Hence, the larger contributor to the hotel industry's decarbonization on a global scale is likely the change in grid EFs. This is consistently the case from 2019 to 2022, where there was a decrease in the global average GHG EFs for the electric power grid by 6.7% from 2019 to 2021, and 3.5% from 2021 to 2022 (See Table 6). Between 2019 and 2022, the total decrease in EF was 9.9%.

Therefore, hotels will still benefit from grid decarbonization due to market and government policy actions. Achievement of science-based carbon pathways is still within reach for hotels if they implement energy efficiency measures and purchase renewable energy through market-based mechanisms as well as onsite generation. Data from the recent Green Lodging Trends Report (GLTR)[11] in 2022 indicated a significant uptake in purchase of energy from renewable sources, which indicates that many hotels may be increasing the pace of adoption of this decarbonization solution.

Nevertheless, the total hotel carbon emissions could potentially rise in 2023, due to the slight increase in EFs by 0.4% between 2022 and 2023 (See Table 6). The increase in EF between 2022 and 2023 is because a majority of the country EFs analyzed have increased between the two years. 52.6% of the countries analyzed have an increase in EF for purchased electricity (See Table 7).

It is noteworthy that this runs counter to the overall trend of decreasing EFs observed from 2019 to 2022. The standard practice for EF calculations is to use the most recent EFs published within the same calendar year. However, EFs typically have a delay of 1 to 3 years depending on the referential data source (e.g. EFs published in 2023 may have been in reference to a 2021 data set). Therefore, the rise in EFs in 2023 could be attributed to the COVID-19 era when energy usage patterns were disrupted, resulting in reduced efficiency. Nonetheless, moving forward we anticipate that EFs will continue decreasing over time as more governments adopt energy efficiency measures and transition to lower-carbon and renewable energy sources.

Table 6 Change in Global Average Emission Factor for Purchased Electricity from 2019 to 2023

	2019 to 2021	2021 to 2022	2019 to 2022	2022 to 2023
% Change in Emission Factor	-6.7%	-3.5%	-9.9%	0.4%

[11] Report available at https://greenview.sg/services/green-lodging-trends-report/.

Table 7 Percentage of Countries that have an Increase in Emission Factor for Purchased Electricity between 2022 and 2023

	Decrease in Emission Factor	No change in Emission Factor	Increase in Emission Factor
Percentage of countries analyzed	44.3%	3.2%	52.6%

The relative change for specific countries is shown in Table 8 and Table 9. These are the top 10 countries with the highest reduction in EFs and the top 10 countries with the highest increase in EFs, out of the top 46 countries which were earlier identified as large contributors of rooms to the global room supply. Due to data sharing restrictions and licensing agreements, the specific EFs associated with each of the countries were not disclosed. These tables show the percentage changes in emission factors for purchased electricity between 2019 and 2022.[12]

Table 8 Top 10 Countries with Highest Reduction in EFs from 2019 to 2022 (out of Top 46 Countries)

Country	% Change in EFs From 2019 to 2022
Switzerland	-59.0%
Austria	-51.5%
Portugal	-43.4%
Spain	-38.6%
Sweden	-36.5%
Italy	-33.7%
Bulgaria	-29.2%
Ireland	-25.7%
Croatia	-25.5%
Germany	-24.6%

Table 9 Top 10 Countries with Highest Increase in EFs from 2019 to 2022 (out of Top 46 Countries)

Country	% Change in EFs From 2019 to 2022
Vietnam	75.3%
Colombia	72.1%

[12] Some of the countries identified in Table 8 and Table 9 have a high percentage change in EFs between 2019 and 2022 because their actual EF values are very low, as seen in the case of Norway.

Country	% Change in EFs From 2019 to 2022
Norway	56.6%
Cuba	33.3%
Philippines	6.5%
Morocco	4.8%
South Africa	3.2%
Singapore	2.7%
Russian Federation	2.7%
Dominican Republic	2.7%

In addition, an indexing approach was used to represent specific countries' EFs in relation to the global average. Each country's EF was scaled in proportion to the calculated global average, thereby creating a relative index to the global average set at a baseline of 1.0.

Table 10 shows the relative index of 20 countries' EFs based on the global average. The table is ordered by ranking the countries with the highest number of international tourist arrivals for the 2022 year.

Table 10 Relative Index of Top 20 Countries by International Tourist Arrivals in 2019 & 2022

Country	2019 Relative Index	2021 Relative Index	2022 Relative Index	2023 Relative Index
Global Average*	1.00	1.00	1.00	1.00
France	0.13	0.11	0.12	0.14
Spain	0.54	0.42	0.37	0.42
United States	0.79	0.77	0.78	0.80
Turkey	0.86	0.87	0.86	0.87
Italy	0.61	0.47	0.45	0.52
Mexico	0.89	0.85	0.90	0.90
United Kingdom	0.48	0.43	0.40	0.43
Germany	0.78	0.69	0.65	0.76
Greece	0.99	1.22	0.94	0.86
Austria	0.30	0.18	0.16	0.20
United Arab Emirates	1.23	1.01	1.10	0.98
Portugal	0.67	0.51	0.42	0.36
Saudi Arabia	1.33	1.24	1.27	1.27
Netherlands	0.82	0.79	0.69	0.66
Poland	1.33	1.49	1.48	1.38
Croatia	0.39	0.33	0.32	0.28

Country	2019 Relative Index	2021 Relative Index	2022 Relative Index	2023 Relative Index
Canada	0.24	0.24	0.23	0.23
Romania	0.64	0.58	0.53	0.51
Hungary	0.50	0.46	0.45	0.37
Egypt	0.83	1.01	0.80	0.83

**Global average was set as the baseline with a relative index of 1.0.*

MITIGATION MEASURES

Lastly, hotels can improve their own sustainability performance by embarking on mitigation measures at a portfolio- or property-level. This section provides examples of common mitigation measures for hotels to consider implementing, which were tracked as part of the GLTR 2022.

The most popular carbon reduction initiative is the promotion of sustainable transportation options, which has been implemented by over 95% of hotels. Globally, over 60% of hotels plan and implement carbon reduction initiatives, and about 20% purchase renewable energy from the market, such as RECs, green tariffs, feed-in tariffs, and power purchase agreements. Less than a quarter of hotels worldwide generate renewable energy onsite. (More details in Table 11.)

Further details on the uptake of mitigation measures by various segments are available in the GLTR report[13]. We invite all hotels to participate in the 2024 edition of the report, which will be published by end-2024.

Table 11 *shows the uptake rate of various carbon reduction initiatives globally, as identified in the GLTR 2022. These are categorised into two segments (full-service and limited-service). Full-service hotels generally saw higher rates of uptake than limited-service hotels for these practices, with the exception of sustainable transportation.*

Table 11 Carbon Reduction Initiatives Uptake Rate Globally

Best Practice	Global	Full-Service	Limited-Service
Carbon Reduction Plan	60.9%	89.2%	52.6%
Carbon Footprint Tracking	43.1%	72.3%	34.5%
On-Site Renewable Energy	22.7%	27.4%	19.0%
Renewable Electricity	13.0%	19.3%	7.6%
Renewable Energy Certificates	20.9%	22.6%	19.3%

[13] Report available at https://greenview.sg/services/green-lodging-trends-report/.

Best Practice	Global	Full-Service	Limited-Service
Sustainable Transportation	95.6%	91.7%	99.0%
Electric Vehicle Charging Stations	29.2%	49.9%	20.0%

*Source: Green Lodging Trends Report 2022

Table 12 *shows the uptake rate of various carbon reduction initiatives by hotel type. Extended Stay hotels had the highest rates of having a carbon reduction plan, tracking their carbon footprint and having electric vehicle charging stations, while Resorts had the highest rates of renewable energy-related practices.*

Table 12 Carbon Reduction Initiatives Uptake Rate by Hotel Type

Best Practice	Convention	Extended Stay	Non-Resorts	Resorts
Carbon Reduction Plan	71.3%	91.7%	57.6%	80.1%
Carbon Footprint Tracking	38.1%	87.2%	41.8%	59.2%
On-Site Renewable Energy	36.3%	35.6%	18.3%	44.8%
Renewable Electricity	14.0%	7.5%	13.8%	19.5%
Renewable Energy Certificates	11.7%	-	19.6%	22.7%
Sustainable Transportation	98.7%	93.8%	95.3%	98.6%
Electric Vehicle Charging Stations	48.7%	65.3%	25.4%	54.9%

*Source: Green Lodging Trends Report 2022

LIMITATIONS

Data for hotel supply (UNWTO, STR and Expedia databases)

- Hotel supply data was obtained primarily from the STR and Expedia datasets, with UNWTO tourism arrival data as a proxy for estimating the 2017 and 2018 supply. Between STR and Expedia, there were instances where the supply data was significantly different for the same country but was not uniformly disparate in every situation. This indicates a lack of consistency in hotel supply data.
- The UNWTO hotel supply dataset had several data gaps for years 2021 and 2022. This was likely due to the UNWTO's voluntary reporting mechanism, wherein some countries may not have reported their data accurately or did not submit reports at all.

- The COVID-19 pandemic had a substantial impact on the statistics, since there were frequent hotel closures owing to pandemic-related limitations across 2020 and 2021. As a result, the accuracy of reporting and operational status may have been compromised.
- The analysis is based on hotel count and room count, which are used as proxies for quantifying industry growth. The true driver of carbon emissions in hotels, however, is floor area, since rooms vary in size, with luxury rooms often being much larger than economy rooms. Therefore, without being able to derive the total floor area accurately based on the supply of hotels and rooms, the analysis may misrepresent the growth or changes in hotel supply composition. To address this, the basic segmentation of full vs. limited service and resort vs. non-resort categories was used and based on floor area intensity metrics for energy in order to maintain some level of consistency. This is aligned to the methodology for the CHSB Index, whereby floor area for hotels is used as proxy to develop the estimations for other countries.
- The limitations surrounding the hotel supply data are further discussed in Appendix 1: Methodology for Hotel Supply.

Data for hotels' sustainability performance (CHSB)

- The CHSB dataset consisted of approximately 16,000 to 18,000 hotels over the period with complete data received and which passed corresponding validity tests. This is a sample of less than 5% of the estimated hotel count. However, the coverage is estimated to be much higher in terms of the percentage of rooms represented. In high-level analysis of Expedia data, hotels with at least 15 rooms represented over 96% of the total room count. This is due primarily to the larger representation of full-service hotels which tend to have more rooms. The 2021 calendar year CHSB dataset comprised 4.6 million rooms, which was approximately 22% of the global total supply.
- For 2017 and 2018, hotels were only segmented into two categories – full service and limited service. From 2019 onwards, this was expanded into the current three categories. Therefore, year-on-year analysis was limited for the full service resorts and non-resorts before 2019.
- The public CHSB dataset utilizes location-based emission factors and as a result, renewable energy purchases may not be reflected in the performance. However, as noted in the report, there were generally low rates of renewable energy purchases across the dataset, thus this is unlikely to have a significant impact on the findings.
- The CHSB dataset has a bias toward branded and brand-affiliated hotels as the participants are mostly large hotel chains.
- As data for the lower-end of the limited service segment (i.e. 1-2 stars or economy) tend to be franchised or unaffiliated, the CHSB data set tends to skew toward the higher tier of the limited service segment.
- The CHSB dataset only covers 64 countries globally, leaving a significant portion of countries without specific coefficients. In such cases, global averages were used as proxy coefficients, introducing potential underestimation or overestimation in the analysis, though

the 64 countries represent the vast majority of the total international and domestic tourism arrivals.

Data for occupancy and guest numbers

- While we note that it would be useful to consider hotel occupancy data and guest numbers as part of the analysis of hotel supply and intensity measures, these are currently excluded from this analysis. Though occupancy figures are tracked through CHSB, these are not representative of all hotel types and geographies, and the data is confidential. Nevertheless, more comprehensive insights into global and regional occupancy trends can be obtained through STR.

Mitigation measures

- The main objective of this report is to analyze and report on the hotel industry's GHG emissions baseline and progress since 2017. As it is not intended to provide a full decarbonization pathway plan for the hotel industry, the mitigation measures discussed in this report are highlighted as samples of best practices for hotels to consider.
- The mitigation measures discussed in this report are as identified in the Green Lodging Trends Report 2022 and thus do not cover all possible mitigation measures for hotels.
- For further information on a decarbonization pathway for hotels, please refer to the Net Zero Methodology for Hotels[14] guidance.

OUTLOOK

As hotels worldwide navigate their recovery from the COVID-19 pandemic with the resumption of global travel, it is imperative that they remain steadfast in their commitment to sustainability efforts. Tracking and reducing their carbon footprint, introducing renewable energy, and promoting sustainable transportation not only contribute to decarbonization, but will also resonate with an increasingly environmentally conscious clientele. By continuing to invest in sustainability amidst recovery efforts, hotels can strengthen their resilience and competitiveness in a rapidly evolving industry landscape.

The data presented here seeks to quantify the industry's overall impact and serves as a useful basis to track the industry's decarbonization pathways and progress across hotel segments and geographies. The key sustainability performance dataset used in this analysis, the CHSB Index, will continue to be expanded annually. With more and more hotels from various countries participating and adding their data to the cumulative dataset, we will be able to derive further insights on the year-on-year progress of the industry's performance.

[14] The guidance document can be found at https://greenview.sg/services/netzerohotels/.

Future editions of this report can build on these baseline findings and analyze the trends on a more granular level.

In terms of hotel supply, there is potential to verify the country-level statistics for hotel and room count by delving deeper to find the most reliable data sources for each of the prioritized countries which are large contributors of rooms to the global room supply. For example, each country's governmental tourism agency would likely license and track the hotels operating within their jurisdiction.

As earlier acknowledged, the landscape of accommodation options is rapidly evolving beyond the traditional consensus of what constitutes a "hotel". To fully account for the footprint of travel accommodation, we could consider including alternative forms of accommodation such as serviced apartments, homestays (e.g. Airbnb) and hostels.

In terms of environmental performance, a key trend to continue monitoring would be the adoption of renewable energy, since this is the most significant variable for decarbonization. Such analysis would be critical as we continue to benchmark the industry's sustainability performance against our target decarbonization pathways.

APPENDIX 1: METHODOLOGY FOR HOTEL SUPPLY

Three sources of hotel supply data were analyzed:

1. **UNWTO** – The World Tourism Organization is the United Nations agency responsible for the promotion of responsible, sustainable and universally accessible tourism. The UN Tourism Data Dashboard provides statistics and insights on key indicators for inbound and outbound tourism at the global, regional and national levels. Data covers tourist arrivals, tourism share of exports and contribution to GDP, source markets, seasonality and accommodation (data on number of rooms, guests and nights).
2. **STR** – STR provides premium data benchmarking, analytics and marketplace insights for the global hospitality industry. STR currently collects data for more than 77,000 hotels around the world, including rooms available, rooms sold and net room revenue on a monthly, weekly and daily basis.
3. **Expedia** – Expedia Group, Inc. is an online travel company which engages in the provision of travel products and services to leisure and corporate travelers. It operates through the following segments: B2C, B2B, and Trivago. The B2C segment offers a full range of travel and advertising services to worldwide customers through a variety of consumer brands. The B2B segment refers to a wide range of travel and non-travel companies including airlines, offline travel agents, online retailers, corporate travel management, and financial institutions. The Trivago segment generates advertising revenue primarily from sending referrals to online travel companies and travel service providers from hotel metasearch websites.

OVERALL GLOBAL SUPPLY IN 2022

- The total hotel supply was determined based on a general estimate for the industry of 25,000,000 rooms by end of 2022.
- Based on comparisons of datasets, we estimated that STR's data does not have representative coverage of smaller hotels that have fewer than 15 rooms each. These hotels represent approximately 4% of the global room supply based on an analysis of the total amount of rooms derived from hotels with less than 15 rooms in comparison to the overall total roomcount when aggregating data from Expedia. To account for these smaller hotels, we assume that a count of 25 million represents 96% of the global room supply. Therefore, the global room supply was estimated at: 25,000,000 / 0.96 = 25,773,196.
- Based on the above calculations, we assumed that the global room supply amounts to approximately 26 million.

SUPPLY BY COUNTRY

- Of the 222 countries in the dataset, we prioritized the top countries that were large contributors of rooms to the global room supply. Further analysis was done for these priority countries.

- The priority countries were identified with the following steps:
    a. The sum of the room counts of these countries would represent minimally 90% of the total global room supply, for both the STR and Expedia datasets. Since the remaining countries would account for less than 10% of the total global room supply, it was assessed that these countries should be de-prioritized.
        i. For the 2021 STR dataset, the top 45 countries by room count represented 92.7% of the total room supply.
        ii. For the 2021 Expedia dataset, the top 40 countries by room count represented 90.6% of the total room supply.
    b. After merging the lists of the top countries from the STR and Expedia datasets and removing the duplicated countries, we arrived at a total of 45 unique countries who were deemed large contributors of rooms to the global room supply.
    c. Note: An exception was made for Cuba, which due to restrictions in business activities, is likely under-reported. Therefore, Cuba was added to the list of priority countries because their actual hotel and room counts are likely to be higher.

- As a result, 46 countries were found to represent 93% of the total global supply of rooms for 2021 (based on the STR dataset). These 46 countries were prioritized in the subsequent estimation and interpretation of the data.

- Based on the analysis, we decided to exclude the UNWTO hotel supply dataset for the following reasons:
    - 3 countries from our list of 46 priority countries did not have any entries in the UNWTO datasets across years 2017 to 2022. Given that these countries (Brazil, Canada and the United Kingdom) were assessed to be large contributors of rooms to the global room supply, these gaps had the potential to skew our findings significantly.
    - Upon comparing the UNWTO data across years 2017 to 2022, it was found that there were several data gaps for years 2021 and 2022.
        - Of the 222 countries listed, 76 countries had a 100% drop in their hotel count between 2019 and 2021, recording zero hotels in 2021. 18 of these 76 countries were on our list of priority countries, including historically large markets like the United States and China.
        - A further 10 countries were shown to have a 100% drop in their hotel count between 2021 and 2022, recording zero hotels in 2022. 2 of these 10 countries were on our list of priority countries.
    - These gaps are likely due to the UNWTO's voluntary reporting mechanism, wherein some countries may not have reported their data accurately or did not submit reports at all.

- The STR and Expedia datasets were both assessed to be generally reliable, though there were differences in their data across the various countries. Some possible reasons for the

discrepancies are listed in the subsequent sections. Thus, we came up with an approach to reconcile STR data vs. Expedia data, using STR as the base dataset, to arrive at the total hotel and rooms supply for each year. Adjustments were also made based on estimations of penetration rates and nuances in country segmentation. This approach was used to calculate the data for the reference year of 2019.

CALCULATING TOTAL SUPPLY

2019 as Reference Year

- After consolidating the hotel supply data, we concluded that the 2019 data was likely the most representative of the actual supply figures. By using a combination of STR and Expedia's datasets, we assessed that this would cover the global industry reasonably accurately.
- 2019 is most suitable as a reference year since this was the last year before the COVID-19 pandemic. From 2020 onwards, the hotel supply would have been affected by changes in travel restrictions related to the impact of COVID-19.

- Methodology
  1. Calculations were performed to adjust the STR and Expedia figures based on estimations of penetration rates and nuances in country segmentation. Countries were each assigned one of the four scenarios below, based on which data source had recorded the most hotels and/or rooms for that country. Working from the STR data as a starting point, each country's hotel and room counts were adjusted based on the assigned action for each scenario.
     a. For countries where STR recorded the most hotels and rooms: STR figures were used directly.
     b. For countries where Expedia recorded the most hotels and STR recorded the most rooms: To account for the additional hotels recorded by Expedia, the STR hotel count was adjusted by adding the difference between Expedia and STR's hotel counts.
     c. For countries where Expedia recorded the most hotels and rooms: To account for the additional hotels and rooms recorded by Expedia, the STR hotel and room counts were adjusted by adding the difference between Expedia and STR's hotel and room counts respectively.
     d. For countries where both STR and Expedia recorded zero hotels and rooms: Assumed no hotel supply for these countries.
  2. The hotel and room counts were further uplifted by 3% to align with the Expedia hotel count.

2017-2018: Based on UNWTO Tourism Arrivals

- To estimate the hotel supply in 2017 and 2018, the UNWTO tourism arrival data was used as a proxy, working off the 2019 hotel supply (reference year).
- The UNWTO hotel supply data was not used because there were significant gaps in the data, as earlier described. In contrast, inbound tourist arrivals are generally well-tracked by the majority of countries' governmental aviation and tourism bodies and hence the numbers for overnight visitors (tourists) would serve as a more reliable proxy of hotel supply.
- The hotel supply data from STR and Expedia were not used because we assessed that there were some inconsistencies in the figures due to changes in market penetration and coverage as opposed to changes in actual hotel supply, so it is difficult to identify which dataset is more accurate in specific years.

- Methodology
    1. From the UNWTO database, we extracted the "Overnight visitors (tourists)" figures from the "Inbound Tourism – Arrivals" table for 2017 to 2019.
    2. We calculated the year-on-year percentage change in the number of overnight visitors for each country between 2017 and 2018, and between 2018 and 2019.
    3. The year-on-year percentage change was then applied to the 2019 hotel count to calculate the 2018 and 2017 hotel counts.
    4. The same steps were taken to calculate the 2018 and 2017 room counts.
    - *E.g.*
        - *Year-on-year percentage change in the number of overnight visitors for Country A between 2019 and 2018 = (Overnight visitors for Country A in 2018 – Overnight visitors for Country A in 2019) / (Overnight visitors for Country A in 2019) = 10%*
        - *2018 hotel count in Country A = 2019 hotel count in Country A * (100%+10%)*

2021-2022: Based on Percentage Change in STR Hotel Supply

- To estimate the hotel supply in 2021 and 2022, the growth rates in STR hotel supply figures were used, working off the 2019 hotel supply (reference year).
- The hotel supply data from STR was used because it was assessed to be the most reliable source for estimating hotel supply. The STR dataset showed an increasing trend for hotel and room supply across 2017 to 2022, which is aligned to our expectations. Even though these hotels may have been unoccupied or only partially occupied, it is critical to account for them in the hotel supply calculations given that they still have a base load of energy and water usage. This would portray a more accurate landscape of the hotel industry over the years.

- The hotel supply data from Expedia was not used because as a travel company, it would logically only include operational hotels which had rooms available for bookings. The hotels which were not in operation during the pandemic years would not be listed on Expedia.
- The hotel supply data from UNWTO was not used because there were significant data gaps as earlier described. For example, the hotel and room counts in 2021 and 2022 were extraordinarily low compared to the 2017 to 2019 data, with many countries recording zero hotels in 2021.
- Even though the STR dataset was assessed to be the most representative, we acknowledge that changes in the hotel supply could be due to a combination of factors – (a) increased penetration by STR in various countries, and/or (b) actual growth in supply. Hence, an adjustment factor was applied to determine how much of the change in STR hotel supply was due to increased penetration or actual growth.

- Methodology
    1. From the STR hotel supply database, we extracted the hotel and room count figures for 2019, 2021 and 2022.
    2. We calculated the change in hotel and room counts between 2019 – 2021, and between 2021 – 2022. If the change in the absolute number of hotels was less than 500, there was no adjustment factor applied (i.e. default of 100%, whereby we assumed that any change in the hotel supply was solely due to actual growth).
    3. Based on the percentage change in hotel and room counts, an adjustment factor was applied to account for actual growth in supply.
    4. Further adjustments were made for certain countries after reviewing the supply data at country-level, in order to ensure that hotel supply was on an increasing trend from 2017 to 2022.

Overall Review of Supply Trends

- We then reviewed the global and regional hotel and room counts to ensure that the figures and trends made sense, in accordance with the following broad principles:
    - Supply should have generally increased over the years, though growth was likely tempered between 2019 and 2021.
    - Hotels and room counts should have increased in tandem.
    - Regionally, the hotel supply in North America should have recovered to 2019 levels by 2022. In comparison, for Asia, the bounce-back from COVID-19 should not have been as high, since many of the hotels in China (which form the majority of hotel supply in Asia) were operating at reduced capacity or remained closed due to travel restrictions and lockdowns.

LIMITATIONS OF DATA SOURCES

UNWTO

- There were several data gaps in UNWTO hotel supply data, particularly for 2021 and 2022. These gaps are likely due to the UNWTO's voluntary reporting mechanism, wherein some countries may not have reported their data accurately or did not submit reports at all.

STR

- STR's census does not capture all hotels. It is estimated to cover about 93% of the global room supply.
- STR has more accurate and complete data on the hotels with which it has good working relationships, which are mainly the hotels located in stronger markets such as the United States and Canada.
- STR's market penetration has increased over the years as their business has grown, hence there is a need to determine how much of the change in STR hotel supply was due to increased penetration or actual growth.

Expedia

- Not all hotels are listed on Expedia, since they may choose to list with other Online Travel Agents (OTAs) such as Booking.com, Agoda, etc.
- Listings on Expedia may include smaller-scale travel accommodation types such as home rentals or villas, which fall outside the typical boundary of the hotel model which this study focuses on.
- Since Expedia is based in the United States, its coverage in the US may be more comprehensive than that in other regions.
- The data would have been affected by the COVID-19 pandemic's impact on the hotel industry. The scope of this study includes the years 2020 to 2022 whereby some hotels could have been temporarily closed, operating at very low occupancy, or remained listed on Expedia but with no rooms available. Therefore their actual contribution to the industry footprint is uncertain.

DETERMINING HOTEL AND ROOM COUNT FOR EACH COUNTRY, BY SEGMENT

1. The total count of hotels and rooms globally in the segments of: (i) resorts; (ii) non-resorts; (iii) full-service resorts; (iv) full-service non-resorts; and (v) limited-service hotels were extracted from the CHSB 2023 database. These figures were used to calculate the share of each segment type as a percentage of the overall count of hotels and rooms.

- *E.g. Percentage of hotels globally that are resorts = No. of resorts (2,113) / All hotels (25,576) = 8%*

2. Each country's count of hotels and rooms for each segment was determined by multiplying their hotel and room count by the percentages from the above step.

- *E.g. Number of resorts in Country A = Hotel Count of Country A * Percentage of hotels globally that are resorts*

APPENDIX 2: METHODOLOGY FOR SUSTAINABILITY PERFORMANCE

Environmental performance metrics were extracted from the Cornell Hotel Sustainability Benchmarking Index (CHSB) datasets from calendar years 2017[15], 2018[16], 2019[17], 2021[18] and 2022. More details on the CHSB can be found in Appendix 6: CHSB Index.

The CHSB tracks 12 metrics which encompass participating hotels' carbon footprint, energy usage, and water usage, among others. For this report, the following four metrics were used:

- Hotel Carbon Footprint Per Room Per Year (Measure 2)
- Hotel Carbon Footprint Per Square Meter Per Year (Measure 4)
- Hotel Energy Usage Per Square Meter Per Year (Measure 6)
- Hotel Water Usage Per Square Meter Per Year (Measure 9)

The sections below present the methodology used to translate each of these metrics into aggregated values for two levels of analysis:

A. **Geographical level** – by country, sub-region, region and globally; and
B. **Hotel segments** – full service resorts, full service non-resorts, and limited service.

Energy Consumption

The total energy consumption from hotels in each country was calculated by multiplying the country's median energy consumption per room intensity by its total number of rooms.

As the energy consumption per room intensity was not available from CHSB, this metric was estimated using each country's median for energy consumption per sqm (i.e. Measure 6), outlined in the following steps:

1. The ratio of rooms to floor area for each country was first calculated by dividing the median of Measure 2 by the Median of Measure 4 of each country.
    a. E.g. *Ratio of rooms to floor area of all hotels in Country A (room/sqm) = Median of Measure 2 of all hotels in Country A (kgCO2e/room)) / Median of Measure 4 for all hotels in Country A (kgCO2e/sqm)*
2. The energy consumption per room of each country was then estimated by dividing its median energy consumption per sqm from CHSB (i.e. Measure 6) by the ratio of rooms to floor area from the previous step.

[15] Source publication can be found at: https://ecommons.cornell.edu/items/2c504c68-e355-4b04-aea7-42d9a0ca2df8
[16] Source publication can be found at: https://ecommons.cornell.edu/items/bbe4c82c-6701-4167-a8da-1e95e7564ea7
[17] Source publication can be found at: https://ecommons.cornell.edu/items/eeeb23fe-76d1-4db2-a0bb-61447b56810a
[18] Source publication can be found at: https://ecommons.cornell.edu/items/f50b30f1-40ea-4c87-95d0-83c8009f6497

   a. E.g. *Median energy consumption per room of all hotels in Country A (kWh/room) = Median of Measure 6 of all hotels in Country A (kWh/sqm) / Ratio of rooms to floor area of all hotels in Country A (room/sqm)*

3. The estimated median energy consumption per room for each country was then multiplied with the number of hotel rooms in that country to obtain its total energy consumption. This same method was applied to calculate the total energy consumption for specific hotel segments.

   a. E.g. *Total energy consumption for all hotels in Country A (mWh) = Median energy consumption per room of all hotels in Country A (kWh/room) * Room Count of Country A*

4. If there were insufficient data points for that country and/or segment to calculate their median energy consumption per room, the global average energy consumption per room for that segment was used as the proxy.

5. The respective country totals were then aggregated by sub-regions, regions and globally[19].

Carbon Emissions

This section provides details of how Measures 2 and 4 were calculated as part of the CHSB Index.

1. The greenhouse gas emissions for each energy type in each hotel were calculated by multiplying their energy usage with energy-type-specific emission factors.

2. When the energy usage data was provided in other units such as volume or mass units, an energy conversion factor was included in the emissions calculation to convert the energy data to kilowatt hours.

3. The carbon emissions figures from each energy source were then summed up to arrive at the estimated carbon emissions intensity of each property.

4. The carbon emissions for each property were then divided by its room count or conditioned space area to get the carbon footprint per room or per square meter. For more information on the methods for calculating carbon emissions, please refer to the CHSB guidance document. More information on the CHSB can be found in Appendix 6: CHSB Index.

5. The total carbon emissions from hotels in each country was calculated by multiplying the country's median carbon footprint per room[20] by its total number of rooms. This same method was applied to calculate the total emissions for specific hotel segments.

[19] Countries were assigned regions and sub-regions based on the UN's definitions as listed in the World Population Prospects 2022.
[20] Each country's median carbon footprint per room was based on data from participating hotels in the CHSB Index. More information on the CHSB can be found in Appendix 6: CHSB Index.

a. E.g. *Total carbon emissions for all hotels in Country A (mtCO2e) = Median carbon emissions per room of all hotels in Country A (kgCO2e/room) * Room Count of Country A*

6. If there were insufficient data points for that country and/or segment to calculate their median carbon emissions per room, the global average carbon emissions per room for that segment was used as the proxy.

7. The respective country totals were then aggregated by sub-regions, regions and globally.

Water Consumption

The total water consumption from hotels in each country was calculated by multiplying the country's median water consumption per room intensity by its total number of rooms.

As the water consumption per room intensity was not available from CHSB, this metric was estimated using each country's median for water consumption per sqm (i.e. Measure 9), outlined in the following steps:

1. The ratio of rooms to floor area for each country was first calculated by dividing the median of Measure 2 by the Median of Measure 4 of each country.

    a. E.g. *Ratio of rooms to floor area of all hotels in Country A (room/sqm) = Median of Measure 2 of all hotels in Country A (kgCO2e/room)) / Median of Measure 4 for all hotels in Country A (kgCO2e/sqm)*

2. The water consumption per room of each country was then estimated by dividing its median water consumption per sqm from CHSB (i.e. Measure 9) by the ratio of rooms to floor area from the previous step.

    a. E.g. *Median water consumption per room of all hotels in Country A (liters/room) = Median of Measure 9 of all hotels in Country A (liters/sqm) / Ratio of rooms to floor area of all hotels in Country A (room/sqm)*

3. The estimated median water consumption per room for each country was then multiplied with the number of hotel rooms in that country to obtain its total water consumption. This same method was applied to calculate the total water consumption for specific hotel segments.

    a. E.g. *Total water consumption for all hotels in Country A (liters) = Median water consumption per room of all hotels in Country A (liters/room) * Room Count of Country A*

4. If there were insufficient data points for that country and/or segment to calculate their median water consumption per room, the global average water consumption per room for that segment was used as the proxy.

5. The respective country totals were then aggregated by sub-regions, regions and globally.

APPENDIX 3: SUPPLEMENTARY TABLES

SUSTAINABILITY PERFORMANCE DATA

Carbon Emissions

Table 13 *shows the carbon emissions trends from 2017 to 2022 by region. Global carbon emissions were on an increasing trend between 2017 and 2019, driven mainly by Asia. As expected, emissions dropped in 2021 across all regions, and have since increased slightly through 2022 for all regions except Europe.*

In terms of emissions intensity, all regions showed a decreasing trend in carbon emissions per room from 2017 to 2021. For Africa and Europe, that decreasing trend has continued into 2022, while all other regions have seen an increase in 2022 with the recovery of the travel industry.

Table 13 Carbon Emissions Trends by Region from 2017 to 2022 (kgCO2e)

Region	Metric	2017	2018	2019	2021	2022
Global	Total	194,088,553	196,309,887	198,734,417	144,099,753	161,870,416
	% Change	-	1.14%	1.24%	-27.49%	12.33%
	Per Room	8,850	8,624	8,186	5,721	6,226
	% Change	-	-2.56%	-5.07%	-30.11%	8.83%
Africa	Total	9,084,040	9,713,341	9,627,591	7,756,241	7,827,195
	% Change	-	6.93%	-0.88%	-19.44%	0.91%
	Per Room	12,974	12,535	11,269	8,659	8,612
	% Change	-	-3.38%	-10.10%	-23.16%	-0.55%
Asia	Total	112,904,220	117,741,051	120,420,198	90,029,547	104,272,774
	% Change	-	4.28%	2.28%	-25.24%	15.82%
	Per Room	13,918	13,956	13,187	9,372	10,228
	% Change	-	0.27%	-5.51%	-28.93%	9.13%
Europe	Total	31,369,099	29,886,379	29,599,517	19,988,652	16,795,109
	% Change	-	-4.73%	-0.96%	-32.47%	-15.98%
	Per Room	5,551	5,102	4,746	3,122	2,568
	% Change	-	-8.09%	-6.97%	-34.22%	-17.75%
Latin America and the Caribbean	Total	9,507,607	9,238,751	8,888,560	6,522,972	7,385,112
	% Change	-	-2.83%	-3.79%	-26.61%	13.22%
	Per Room	6,845	6,438	5,756	4,161	4,691
	% Change	-	-5.94%	-10.60%	-27.70%	12.73%
Northern America	Total	27,183,387	25,679,175	26,348,464	17,339,857	22,795,118
	% Change	-	-5.53%	2.61%	-34.19%	31.46%

Region	Metric	2017	2018	2019	2021	2022
	Per Room	4,805	4,400	4,342	2,764	3,602
	% Change	-	-8.42%	-1.34%	-36.33%	30.31%
Oceania	**Total**	4,040,201	4,051,190	3,850,087	2,462,485	2,795,108
	% Change	-	0.27%	-4.96%	-36.04%	13.51%
	Per Room	9,603	9,558	8,721	5,546	6,188
	% Change	-	-0.46%	-8.76%	-36.40%	11.56%

Table 14 shows the changes in carbon emissions by region, over the three time periods of analysis. Europe, Oceania, and Latin America and the Caribbean recorded the largest decreases in emissions between 2017 and 2022 in terms of total emissions. Asia had the smallest decrease in total emissions between 2017 and 2022 (-7.64%). In terms of emissions intensity, North America recorded the smallest decrease in per-room emissions between 2017 and 2022 (-25.03%), followed closely by Asia (-26.51%).

Between 2017 to 2019, Asia was responsible for the largest increase in total carbon emissions, and had the smallest decrease in its emissions intensity. Between 2019 and 2022, while all regions experienced decreases in both total emissions and emissions intensity, Europe saw the largest decrease in both total emissions and emissions intensity, while Asia, Northern America, and Latin America and the Caribbean had the smallest decreases.

Table 14 Changes in Carbon Emissions by Region between 2017, 2019 and 2022

Region	Metric	Change between 2017 and 2019	Change between 2019 and 2022	Change between 2017 and 2022
Global	**Total**	2.39%	-18.55%	-16.60%
	Per Room	-7.50%	-23.94%	-29.65%
Africa	**Total**	5.98%	-18.70%	-13.84%
	Per Room	-13.14%	-23.58%	-33.62%
Asia	**Total**	6.66%	-13.41%	-7.64%
	Per Room	-5.25%	-22.44%	-26.51%
Europe	**Total**	-5.64%	-43.26%	-46.46%
	Per Room	-14.50%	-45.89%	-53.74%
Latin America and the Caribbean	**Total**	-6.51%	-16.91%	-22.32%
	Per Room	-15.91%	-18.50%	-31.46%
Northern America	**Total**	-3.07%	-13.49%	-16.14%
	Per Room	-9.65%	-17.03%	-25.03%
Oceania	**Total**	-4.71%	-27.40%	-30.82%
	Per Room	-9.18%	-29.05%	-35.56%

Table 15 *shows the carbon emissions trends from 2017 to 2022 by sub-region. In terms of total emissions, Eastern Asia recorded by far the highest carbon emissions (46.2 mil kgCO2e in 2022), followed by South-Eastern Asia (26.9 mil kgCO2e) and Northern America (22.8 mil kgCO2e).*

In terms of emissions intensity, the sub-regions in Asia and Africa generally had higher emissions per room, while those in Europe and the Americas had lower emissions per room. For 2022, Western Europe performed the best at 1,193 kgCO2e per room, while Southern Asia performed the worst at 13,509 kgCO2e per room.

Table 15 Carbon Emissions Trends by Sub-Region from 2017 to 2022 (kgCO2e)

Year	Metric	2017	2018	2019	2021	2022
Global	Total	194,088,553	196,309,887	198,734,417	144,099,753	161,870,416
	% Change	-	1.14%	1.24%	-27.49%	12.33%
	Per Room	8,850	8,624	8,186	5,721	6,226
	% Change	-	-2.56%	-5.07%	-30.11%	8.83%
Australia/ New Zealand	Total	3,614,386	3,619,527	3,390,214	2,151,911	2,410,660
	% Change	-	0.14%	-6.34%	-36.53%	12.02%
	Per Room	9,399	9,354	8,448	5,312	5,846
	% Change	-	-0.48%	-9.68%	-37.13%	10.05%
Caribbean	Total	3,972,388	3,931,625	3,441,855	2,657,132	2,921,291
	% Change	-	-1.03%	-12.46%	-22.80%	9.94%
	Per Room	16,085	15,254	12,452	9,868	10,786
	% Change	-	-5.16%	-18.37%	-20.76%	9.31%
Central America	Total	2,280,577	2,343,170	2,689,634	2,037,302	2,558,521
	% Change	-	2.74%	14.79%	-24.25%	25.58%
	Per Room	4,769	4,681	4,811	3,617	4,561
	% Change	-	-1.86%	2.78%	-24.81%	26.09%
Central Asia	Total	356,583	354,623	431,946	337,170	363,284
	% Change	-	-0.55%	21.80%	-21.94%	7.75%
	Per Room	11,764	11,699	13,752	9,892	9,861
	% Change	-	-0.55%	17.54%	-28.07%	-0.31%
Eastern Africa	Total	1,871,191	1,967,758	1,892,979	1,418,010	1,509,941
	% Change	-	5.16%	-3.80%	-25.09%	6.48%
	Per Room	11,764	11,699	10,560	7,802	8,195
	% Change	-	-0.55%	-9.74%	-26.12%	5.04%
Eastern Asia	Total	56,772,080	60,444,959	57,715,671	44,533,418	46,221,729
	% Change	-	6.47%	-4.52%	-22.84%	3.79%
	Per Room	13,577	14,130	12,671	9,616	9,465
	% Change	-	4.08%	-10.33%	-24.11%	-1.57%
	Total	6,559,545	6,058,400	6,026,603	4,056,035	3,725,733

Year	Metric	2017	2018	2019	2021	2022
Eastern Europe	*% Change*	-	-7.64%	-0.52%	-32.70%	-8.14%
	Per Room	9,606	8,612	8,152	5,440	4,973
	% Change	-	-10.34%	-5.34%	-33.26%	-8.60%
Melanesia	Total	192,426	194,808	227,015	140,321	178,200
	% Change	-	1.24%	16.53%	-38.19%	26.99%
	Per Room	11,764	11,699	12,512	7,802	10,067
	% Change	-	-0.55%	6.94%	-37.64%	29.04%
Micronesia	Total	162,016	161,125	157,788	108,941	127,270
	% Change	-	-0.55%	-2.07%	-30.96%	16.82%
	Per Room	11,764	11,699	10,560	7,802	8,551
	% Change	-	-0.55%	-9.74%	-26.12%	9.60%
Middle Africa	Total	229,648	228,385	217,702	162,932	178,305
	% Change	-	-0.55%	-4.68%	-25.16%	9.44%
	Per Room	11,764	11,699	10,560	7,802	8,551
	% Change	-	-0.55%	-9.74%	-26.12%	9.60%
Northern Africa	Total	3,484,005	4,247,068	4,450,916	3,719,192	3,264,989
	% Change	-	21.90%	4.80%	-16.44%	-12.21%
	Per Room	12,567	12,564	11,413	8,877	7,672
	% Change	-	-0.03%	-9.16%	-22.22%	-13.57%
Northern America	Total	27,183,387	25,679,175	26,348,464	17,339,857	22,795,118
	% Change	-	-5.53%	2.61%	-34.19%	31.46%
	Per Room	4,805	4,400	4,342	2,764	3,602
	% Change	-	-8.42%	-1.34%	-36.33%	30.31%
Northern Europe	Total	6,422,250	6,243,091	5,978,791	3,981,653	2,465,479
	% Change	-	-2.79%	-4.23%	-33.40%	-38.08%
	Per Room	6,120	5,875	5,296	3,603	2,214
	% Change	-	-3.99%	-9.87%	-31.96%	-38.54%
Polynesia	Total	71,373	75,731	75,070	61,312	78,978
	% Change	-	6.11%	-0.87%	-18.33%	28.81%
	Per Room	11,764	11,699	10,560	8,875	11,711
	% Change	-	-0.55%	-9.74%	-15.95%	31.95%
South America	Total	3,254,642	2,963,956	2,757,071	1,828,538	1,905,300
	% Change	-	-8.93%	-6.98%	-33.68%	4.20%
	Per Room	4,902	4,380	3,890	2,488	2,566
	% Change	-	-10.65%	-11.19%	-36.04%	3.15%
South-Eastern Asia	Total	25,006,007	24,075,434	29,417,347	20,661,055	26,878,664
	% Change	-	-3.72%	22.19%	-29.77%	30.09%
	Per Room	13,044	12,039	13,305	8,498	10,033
	% Change	-	-7.71%	10.51%	-36.13%	18.07%

Year	Metric	2017	2018	2019	2021	2022
Southern Africa	Total	2,176,696	1,928,364	1,746,324	1,381,553	1,382,479
	% Change	-	-11.41%	-9.44%	-20.89%	0.07%
	Per Room	16,496	14,343	12,519	10,131	10,299
	% Change	-	-13.05%	-12.71%	-19.08%	1.66%
Southern Asia	Total	15,930,304	16,272,860	15,553,215	12,500,921	15,668,687
	% Change	-	2.15%	-4.42%	-19.62%	25.34%
	Per Room	17,263	17,350	15,885	11,203	13,509
	% Change	-	0.50%	-8.44%	-29.48%	20.59%
Southern Europe	Total	13,169,828	12,537,873	12,732,332	8,936,852	8,238,570
	% Change	-	-4.80%	1.55%	-29.81%	-7.81%
	Per Room	6,055	5,494	5,195	3,409	3,056
	% Change	-	-9.27%	-5.45%	-34.38%	-10.34%
Western Africa	Total	1,322,500	1,341,766	1,319,671	1,074,554	1,491,481
	% Change	-	1.46%	-1.65%	-18.57%	38.80%
	Per Room	11,764	11,699	10,560	7,802	10,359
	% Change	-	-0.55%	-9.74%	-26.12%	32.77%
Western Asia	Total	14,839,246	16,593,176	17,302,019	11,996,984	15,140,411
	% Change	-	11.82%	4.27%	-30.66%	26.20%
	Per Room	13,994	13,931	12,766	8,607	10,544
	% Change	-	-0.45%	-8.36%	-32.58%	22.51%
Western Europe	Total	5,217,477	5,047,016	4,861,791	3,014,112	2,365,327
	% Change	-	-3.27%	-3.67%	-38.00%	-21.52%
	Per Room	2,992	2,789	2,536	1,562	1,193
	% Change	-	-6.80%	-9.05%	-38.41%	-23.60%

Note: The number of international tourist arrivals was extracted from Statista (https://www.statista.com/statistics/261726/countries-ranked-by-number-of-international-tourist-arrivals/).

Table 16 *shows the changes in carbon emissions by sub-region, over the three time periods of analysis. Between 2017 and 2022, Europe generally had the largest decreases in emissions (ranging from -37.44% in Southern Europe to -61.61% in Northern Europe). Western Africa had the largest increase in emissions of 12.78%, followed closely by Central America at 12.19%. Between 2017 and 2019, Northern Africa recorded the largest increase in total carbon emissions (27.75%), followed by Central Asia (21.13%) and Melanesia (17.98%). Between 2019 and 2022, while most sub-regions saw decreases in their emissions, Western Africa had an increase in emissions of 13.02%, followed by Polynesia at 5.21%.*

In terms of intensity changes over 2017 to 2022, Europe similarly topped the chart with per room decreases in emissions ranging from -48.23% to -63.81%. Polynesia had the smallest decrease of -0.45%, followed by Central America (-4.37%) and Western Africa (-11.95%).

Table 16 Changes in Carbon Emissions by Sub-Region between 2017, 2019 and 2022

Year	Metric	Change between 2017 and 2019	Change between 2019 and 2022	Change between 2017 and 2022
Global	Total	2.39%	-18.55%	-16.60%
	Per Room	-7.50%	-23.94%	-29.65%
Australia/ New Zealand	Total	-6.20%	-28.89%	-33.30%
	Per Room	-10.12%	-30.81%	-37.81%
Caribbean	Total	-13.36%	-15.12%	-26.46%
	Per Room	-22.58%	-13.38%	-32.94%
Central America	Total	17.94%	-4.87%	12.19%
	Per Room	0.87%	-5.20%	-4.37%
Central Asia	Total	21.13%	-15.90%	1.88%
	Per Room	16.90%	-28.29%	-16.17%
Eastern Africa	Total	1.16%	-20.23%	-19.31%
	Per Room	-10.23%	-22.40%	-30.34%
Eastern Asia	Total	1.66%	-19.91%	-18.58%
	Per Room	-6.67%	-25.30%	-30.29%
Eastern Europe	Total	-8.12%	-38.18%	-43.20%
	Per Room	-15.13%	-39.00%	-48.23%
Melanesia	Total	17.98%	-21.50%	-7.39%
	Per Room	6.36%	-19.54%	-14.42%
Micronesia	Total	-2.61%	-19.34%	-21.45%
	Per Room	-10.23%	-19.02%	-27.31%
Middle Africa	Total	-5.20%	-18.10%	-22.36%
	Per Room	-10.23%	-19.02%	-27.31%
Northern Africa	Total	27.75%	-26.64%	-6.29%
	Per Room	-9.18%	-32.78%	-38.95%
Northern America	Total	-3.07%	-13.49%	-16.14%
	Per Room	-9.65%	-17.03%	-25.03%
Northern Europe	Total	-6.91%	-58.76%	-61.61%
	Per Room	-13.47%	-58.18%	-63.81%
Polynesia	Total	5.18%	5.21%	10.66%
	Per Room	-10.23%	10.90%	-0.45%
South America	Total	-15.29%	-30.89%	-41.46%
	Per Room	-20.65%	-34.03%	-47.65%
South-Eastern Asia	Total	17.64%	-8.63%	7.49%
	Per Room	2.00%	-24.59%	-23.08%
Southern Africa	Total	-19.77%	-20.83%	-36.49%
	Per Room	-24.11%	-17.74%	-37.57%
Southern Asia	Total	-2.37%	0.74%	-1.64%

Year	Metric	Change between 2017 and 2019	Change between 2019 and 2022	Change between 2017 and 2022
	Per Room	-7.98%	-14.95%	-21.74%
Southern Europe	**Total**	-3.32%	-35.29%	-37.44%
	Per Room	-14.21%	-41.16%	-49.52%
Western Africa	**Total**	-0.21%	13.02%	12.78%
	Per Room	-10.23%	-1.91%	-11.95%
Western Asia	**Total**	16.60%	-12.49%	2.03%
	Per Room	-8.77%	-17.41%	-24.65%
Western Europe	**Total**	-6.82%	-51.35%	-54.67%
	Per Room	-15.24%	-52.94%	-60.11%

Table 17 shows the carbon emissions trends from 2017 to 2022 of the top 20 countries by their tourist arrivals. The table is ordered by ranking the countries with the highest number of international tourist arrivals for the 2022 year.

France, which had the highest number of international tourist arrivals for the 2022 year, recorded by far the lowest per-room emissions in 2022 at 568 kgCO2e. This represented a drop of 43.24% from their 2021 per-room emissions. The countries with the highest per-room emissions in 2022 were Saudi Arabia (16,810 kgCO2e), the UAE (14,359 kgCO2e) and Egypt (9,295 kgCO2e).

Table 17 Carbon Emissions of Top 20 Countries by International Tourist Arrivals from 2017 – 2022 (kgCO2e)

Country	Metric	2017	2018	2019	2021	2022
France	**Total**	1,087,644	1,028,099	1,056,913	753,093	451,078
	% Change		-5.47%	2.80%	-28.75%	-40.10%
	Per Room	1,546	1,419	1,383	1,001	568
	% Change		-8.19%	-2.53%	-27.66%	-43.24%
Spain	**Total**	3,900,737	3,149,290	2,727,277	1,850,620	1,735,531
	% Change		-19.26%	-13.40%	-32.14%	-6.22%
	Per Room	4,693	3,746	3,104	1,860	1,673
	% Change		-20.18%	-17.13%	-40.08%	-10.05%
United States	**Total**	25,897,583	24,549,824	25,139,903	16,319,275	21,650,935
	% Change		-5.20%	2.40%	-35.09%	32.67%
	Per Room	4,955	4,546	4,493	2,795	3,668
	% Change		-8.25%	-1.18%	-37.80%	31.24%
Turkey	**Total**	3,526,207	3,620,636	4,783,186	2,935,925	4,557,509
	% Change		2.68%	32.11%	-38.62%	55.23%
	Per Room	7,507	6,332	7,217	4,433	6,588
	% Change		-15.64%	13.98%	-38.57%	48.59%
Italy	**Total**	2,758,751	2,993,140	3,631,144	2,419,831	2,712,080

Country	Metric	2017	2018	2019	2021	2022
	% Change		8.50%	21.32%	-33.36%	12.08%
	Per Room	3,717	3,815	4,263	2,708	2,999
	% Change		2.66%	11.72%	-36.46%	10.74%
Mexico	**Total**	1,791,602	1,812,120	2,200,120	1,612,299	2,093,891
	% Change		1.15%	21.41%	-26.72%	29.87%
	Per Room	4,568	4,395	4,724	3,419	4,441
	% Change		-3.81%	7.51%	-27.64%	29.90%
United Kingdom	**Total**	2,648,327	2,407,279	2,220,721	1,234,858	1,494,603
	% Change		-9.10%	-7.75%	-44.39%	21.03%
	Per Room	3,973	3,612	3,154	1,832	2,196
	% Change		-9.10%	-12.68%	-41.92%	19.92%
Germany	**Total**	2,709,034	2,605,470	2,363,025	1,370,133	1,152,888
	% Change		-3.82%	-9.31%	-42.02%	-15.86%
	Per Room	4,199	3,890	3,346	1,932	1,625
	% Change		-7.36%	-13.99%	-42.25%	-15.91%
Greece	**Total**	3,335,308	3,218,606	3,177,963	2,319,355	1,932,222
	% Change		-3.50%	-1.26%	-27.02%	-16.69%
	Per Room	11,764	10,249	9,383	6,946	5,707
	% Change		-12.88%	-8.44%	-25.98%	-17.84%
Austria	**Total**	312,778	329,323	307,652	176,879	179,530
	% Change		5.29%	-6.58%	-42.51%	1.50%
	Per Room	2,792	2,810	2,448	1,180	1,154
	% Change		0.66%	-12.87%	-51.80%	-2.19%
United Arab Emirates	**Total**	3,534,139	4,676,759	3,917,305	2,707,490	2,779,442
	% Change		32.33%	-16.24%	-30.88%	2.66%
	Per Room	22,215	27,877	21,125	13,942	14,359
	% Change		25.48%	-24.22%	-34.00%	2.99%
Portugal	**Total**	913,918	709,863	705,454	460,846	343,349
	% Change		-22.33%	-0.62%	-34.67%	-25.50%
	Per Room	7,266	5,381	4,832	2,926	2,150
	% Change		-25.95%	-10.19%	-39.44%	-26.54%
Saudi Arabia	**Total**	4,596,287	4,391,820	4,504,385	3,163,564	3,630,794
	% Change		-4.45%	2.56%	-29.77%	14.77%
	Per Room	27,833	26,595	23,029	14,598	16,810
	% Change		-4.45%	-13.41%	-36.61%	15.16%
Netherlands	**Total**	699,684	651,221	668,075	386,456	335,246
	% Change		-6.93%	2.59%	-42.15%	-13.25%
	Per Room	6,098	5,417	5,003	2,931	2,601
	% Change		-11.17%	-7.64%	-41.42%	-11.24%

Country	Metric	2017	2018	2019	2021	2022
Poland	Total	890,199	760,872	833,886	514,919	550,616
	% Change		-14.53%	9.60%	-38.25%	6.93%
	Per Room	10,102	8,034	7,880	4,678	4,657
	% Change		-20.47%	-1.92%	-40.64%	-0.44%
Croatia	Total	1,015,856	1,078,434	1,051,620	768,477	204,610
	% Change		6.16%	-2.49%	-26.92%	-73.37%
	Per Room	11,764	11,699	10,560	7,802	2,004
	% Change		-0.55%	-9.74%	-26.12%	-74.32%
Canada	Total	1,253,196	1,097,057	1,181,242	997,080	1,118,436
	% Change		-12.46%	7.67%	-15.59%	12.17%
	Per Room	2,925	2,530	2,509	2,314	2,649
	% Change		-13.50%	-0.84%	-7.77%	14.45%
Romania	Total	513,481	301,098	328,410	147,971	179,617
	% Change		-41.36%	9.07%	-54.94%	21.39%
	Per Room	11,764	6,898	7,261	2,866	3,256
	% Change		-41.36%	5.25%	-60.52%	13.60%
Hungary	Total	533,198	589,630	551,510	271,103	134,335
	% Change		10.58%	-6.47%	-50.84%	-50.45%
	Per Room	11,764	11,699	10,560	5,132	2,461
	% Change		-0.55%	-9.74%	-51.40%	-52.05%
Egypt	Total	1,588,485	2,156,653	2,377,870	2,051,477	1,726,017
	% Change		35.77%	10.26%	-13.73%	-15.86%
	Per Room	13,681	13,533	12,520	11,089	9,295
	% Change		-1.08%	-7.48%	-11.43%	-16.18%

Note: The number of international tourist arrivals was extracted from Statista (https://www.statista.com/statistics/261726/countries-ranked-by-number-of-international-tourist-arrivals/).

Energy Usage

Table 18 *shows the energy usage from 2017 to 2022 by region. Energy usage in 2022 had generally bounced back to 2017 levels for Africa, Latin America and the Caribbean, and Oceania. Asia's total energy usage for 2022 was almost on par with its 2017 levels, though still significantly below 2018 and 2019 levels. Europe was the only region which recorded a consistent decrease in energy usage from 2018 to 2022.*

On a per-room level, all regions recorded a dip in energy intensity in 2021 corresponding to the impact of the pandemic followed by a slight increase in 2022, except for Europe whose energy usage per room continued to decrease slightly in 2022.

Table 18 Energy Usage by Region from 2017 to 2022

Region	Metric	2017	2018	2019	2021	2022
Global	Total	478,885,981	502,799,485	521,595,280	393,342,385	446,581,575
	% Change	-	4.99%	3.74%	-24.59%	13.54%
	Per Room	21,837	22,087	21,485	15,616	17,178
	% Change	-	1.15%	-2.73%	-27.32%	10.00%
Africa	Total	18,263,313	21,206,377	21,888,594	16,916,304	19,716,813
	% Change	-	16.11%	3.22%	-22.72%	16.56%
	Per Room	26,083	27,367	25,621	18,886	21,694
	% Change	-	4.92%	-6.38%	-26.29%	14.87%
Asia	Total	245,731,442	261,278,464	276,803,964	206,260,413	240,070,894
	% Change	-	6.33%	5.94%	-25.49%	16.39%
	Per Room	30,292	30,969	30,312	21,471	23,548
	% Change	-	2.23%	-2.12%	-29.17%	9.67%
Europe	Total	102,325,402	102,933,295	101,925,719	75,715,317	72,514,250
	% Change	-	0.59%	-0.98%	-25.72%	-4.23%
	Per Room	18,107	17,571	16,344	11,827	11,088
	% Change	-	-2.96%	-6.98%	-27.64%	-6.25%
Latin America and the Caribbean	Total	25,629,500	27,566,379	28,607,674	20,961,340	24,686,458
	% Change	-	7.56%	3.78%	-26.73%	17.77%
	Per Room	18,451	19,209	18,525	13,373	15,681
	% Change	-	4.11%	-3.56%	-27.81%	17.26%
Northern America	Total	78,623,128	81,289,844	84,334,721	67,669,486	83,187,869
	% Change	-	3.39%	3.75%	-19.76%	22.93%
	Per Room	13,898	13,930	13,896	10,788	13,146
	% Change	-	0.23%	-0.24%	-22.37%	21.86%
Oceania	Total	8,313,196	8,525,125	8,034,608	5,819,526	6,405,292
	% Change	-	2.55%	-5.75%	-27.57%	10.07%
	Per Room	19,758	20,114	18,199	13,107	14,180
	% Change	-	1.80%	-9.52%	-27.98%	8.18%

Note: Total energy is reported in megawatt-hours and energy per room is reported in kilowatt-hours.

Table 19 shows the changes in energy usage by region, over the three time periods of analysis. In terms of total energy usage, Africa had the greatest increase between 2017 and 2022 (7.96%) while Europe had the largest decrease (-29.13%). Between 2017 and 2019, the largest increases in energy usage came from Africa, followed by Asia and Latin America and the Caribbean. Between 2019 and 2022, energy usage dropped across all regions, primarily led by Europe (-28.86%) and then Oceania (-20.28%).

In terms of energy intensity, Europe again performed the best with the largest decrease in energy usage per room (-38.77%) between 2017 and 2022. North America had the smallest decrease (-5.41%), followed by Latin America and the Caribbean (-15.01%).

Table 19 Changes in Energy Usage Trends by Region between 2017, 2019 and 2022

Region	Metric	Change between 2017 and 2019	Change between 2019 and 2022	Change between 2017 and 2022
Global	**Total**	8.92%	-14.38%	-6.75%
	Per Room	-1.61%	-20.05%	-21.34%
Africa	**Total**	19.85%	-9.92%	7.96%
	Per Room	-1.77%	-15.33%	-16.83%
Asia	**Total**	12.64%	-13.27%	-2.30%
	Per Room	0.07%	-22.31%	-22.26%
Europe	**Total**	-0.39%	-28.86%	-29.13%
	Per Room	-9.74%	-32.16%	-38.77%
Latin America and the Caribbean	**Total**	11.62%	-13.71%	-3.68%
	Per Room	0.40%	-15.35%	-15.01%
Northern America	**Total**	7.26%	-1.36%	5.81%
	Per Room	-0.01%	-5.40%	-5.41%
Oceania	**Total**	-3.35%	-20.28%	-22.95%
	Per Room	-7.89%	-22.09%	-28.23%

Note: Total energy is reported in megawatt-hours and energy per room is reported in kilowatt-hours.

Table 20 shows the energy usage from 2017 to 2022 by sub-region. In terms of total energy usage, Eastern Asia recorded by far the highest carbon emissions (117.8 mil kWh in 2022), followed by Northern America (83.2 mil kWh) and South-Eastern Asia (52.4 mil kWh).

In terms of intensity, energy usage per room was generally higher among the subregions in Africa and Asia, and lower in Europe, the Americas and Australia/New Zealand. For 2022, Western Africa had the highest energy usage per room at 27,735 kWh, followed by Central Asia at 27,619 kWh.

Table 20 Energy Usage by Sub-Region from 2017 to 2022

Year	Metric	2017	2018	2019	2021	2022
Global	**Total**	478,885,981	502,799,485	521,595,280	393,342,385	446,581,575
	% Change	-	4.99%	3.74%	-24.59%	13.54%
	Per Room	21,837	22,087	21,485	15,616	17,178
	% Change	-	1.15%	-2.73%	-27.32%	10.00%
Australia/ New Zealand	**Total**	7,370,345	7,520,541	6,983,096	5,103,664	5,556,180
	% Change	-	2.04%	-7.15%	-26.91%	8.87%
	Per Room	19,166	19,436	17,402	12,598	13,473
	% Change	-	1.40%	-10.46%	-27.61%	6.95%

Year	Metric	2017	2018	2019	2021	2022
Caribbean	Total	7,712,136	8,053,292	7,013,001	5,051,447	5,962,343
	% Change	-	4.42%	-12.92%	-27.97%	18.03%
	Per Room	31,227	31,246	25,372	18,759	22,014
	% Change	-	0.06%	-18.80%	-26.06%	17.35%
Central America	Total	6,612,421	6,608,589	7,924,043	6,594,443	8,010,688
	% Change	-	-0.06%	19.91%	-16.78%	21.48%
	Per Room	13,829	13,201	14,174	11,708	14,280
	% Change	-	-4.54%	7.37%	-17.39%	21.96%
Central Asia	Total	789,556	825,291	1,022,098	939,150	1,017,435
	% Change	-	4.53%	23.85%	-8.12%	8.34%
	Per Room	26,049	27,227	32,540	27,552	27,619
	% Change	-	4.53%	19.51%	-15.33%	0.24%
Eastern Africa	Total	4,143,248	4,579,440	4,616,205	3,372,113	4,234,502
	% Change	-	10.53%	0.80%	-26.95%	25.57%
	Per Room	26,049	27,227	25,752	18,554	22,982
	% Change	-	4.53%	-5.42%	-27.95%	23.87%
Eastern Asia	Total	138,724,878	149,135,538	144,246,591	112,510,399	117,774,693
	% Change	-	7.50%	-3.28%	-22.00%	4.68%
	Per Room	33,175	34,863	31,668	24,293	24,117
	% Change	-	5.09%	-9.17%	-23.29%	-0.73%
Eastern Europe	Total	15,044,946	17,011,592	16,955,147	12,684,707	12,121,548
	% Change	-	13.07%	-0.33%	-25.19%	-4.44%
	Per Room	22,032	24,183	22,934	17,014	16,178
	% Change	-	9.76%	-5.16%	-25.82%	-4.91%
Melanesia	Total	426,075	453,364	483,667	333,692	351,157
	% Change	-	6.40%	6.68%	-31.01%	5.23%
	Per Room	26,049	27,227	26,657	18,554	19,839
	% Change	-	4.53%	-2.09%	-30.40%	6.93%
Micronesia	Total	358,740	374,976	384,782	259,068	330,689
	% Change	-	4.53%	2.61%	-32.67%	27.65%
	Per Room	26,049	27,227	25,752	18,554	22,219
	% Change	-	4.53%	-5.42%	-27.95%	19.75%
Middle Africa	Total	508,493	531,507	530,886	387,461	463,295
	% Change	-	4.53%	-0.12%	-27.02%	19.57%
	Per Room	26,049	27,227	25,752	18,554	22,219
	% Change	-	4.53%	-5.42%	-27.95%	19.75%
Northern Africa	Total	8,234,527	10,678,329	11,157,398	8,409,677	9,247,445
	% Change	-	29.68%	4.49%	-24.63%	9.96%
	Per Room	29,702	31,589	28,610	20,072	21,730

Year	Metric	2017	2018	2019	2021	2022
	% Change	-	6.35%	-9.43%	-29.84%	8.26%
Northern America	Total	78,623,128	81,289,844	84,334,721	67,669,486	83,187,869
	% Change	-	3.39%	3.75%	-19.76%	22.93%
	Per Room	13,898	13,930	13,896	10,788	13,146
	% Change	-	0.23%	-0.24%	-22.37%	21.86%
Northern Europe	Total	19,280,411	20,163,227	20,353,764	13,701,284	13,515,962
	% Change	-	4.58%	0.94%	-32.68%	-1.35%
	Per Room	18,372	18,976	18,028	12,398	12,140
	% Change	-	3.29%	-4.99%	-31.23%	-2.08%
Polynesia	Total	158,036	176,243	183,064	123,102	167,267
	% Change	-	11.52%	3.87%	-32.75%	35.88%
	Per Room	26,049	27,227	25,752	17,820	24,802
	% Change	-	4.53%	-5.42%	-30.80%	39.18%
South America	Total	11,304,943	12,904,498	13,670,630	9,315,449	10,713,428
	% Change	-	14.15%	5.94%	-31.86%	15.01%
	Per Room	17,028	19,069	19,287	12,675	14,430
	% Change	-	11.99%	1.14%	-34.28%	13.85%
South-Eastern Asia	Total	48,292,139	48,137,423	60,930,714	39,186,923	52,430,943
	% Change	-	-0.32%	26.58%	-35.69%	33.80%
	Per Room	25,191	24,071	27,557	16,118	19,572
	% Change	-	-4.45%	14.48%	-41.51%	21.43%
Southern Africa	Total	2,448,725	2,294,494	2,365,966	2,191,700	1,778,278
	% Change	-	-6.30%	3.11%	-7.37%	-18.86%
	Per Room	18,557	17,066	16,962	16,072	13,248
	% Change	-	-8.03%	-0.61%	-5.24%	-17.57%
Southern Asia	Total	26,013,764	28,863,036	32,253,568	22,689,246	31,025,098
	% Change	-	10.95%	11.75%	-29.65%	36.74%
	Per Room	28,189	30,773	32,942	20,333	26,750
	% Change	-	9.17%	7.05%	-38.28%	31.56%
Southern Europe	Total	40,369,325	39,592,813	40,591,498	31,500,443	33,333,227
	% Change	-	-1.92%	2.52%	-22.40%	5.82%
	Per Room	18,561	17,349	16,561	12,015	12,366
	% Change	-	-6.53%	-4.54%	-27.45%	2.92%
Western Africa	Total	2,928,320	3,122,607	3,218,139	2,555,352	3,993,293
	% Change	-	6.63%	3.06%	-20.60%	56.27%
	Per Room	26,049	27,227	25,752	18,554	27,735
	% Change	-	4.53%	-5.42%	-27.95%	49.48%
Western Asia	Total	31,911,105	34,317,176	38,350,994	30,934,696	37,822,725
	% Change	-	7.54%	11.75%	-19.34%	22.27%

Year	Metric	2017	2018	2019	2021	2022
	Per Room	30,093	28,811	28,297	22,193	26,340
	% Change	-	-4.26%	-1.78%	-21.57%	18.68%
Western Europe	**Total**	27,630,720	26,165,663	24,025,310	17,828,883	13,543,512
	% Change	-	-5.30%	-8.18%	-25.79%	-24.04%
	Per Room	15,845	14,457	12,533	9,240	6,833
	% Change	-	-8.76%	-13.31%	-26.27%	-26.05%

Note: Total energy is reported in megawatt-hours and energy per room is reported in kilowatt-hours.

Table 21 shows the changes in energy usage by sub-region, over the three time periods of analysis. Between 2017 and 2022, Western Europe decreased their total energy usage by half (-50.98%), followed by Northern Europe (-29.90%) and Southern Africa (-27.38%). In comparison, Western Africa had the highest increase in energy usage (36.37%), followed by Central Asia (28.86%) and Central America (21.15%).

For energy intensity, between 2017 and 2022, Europe (with the exception of Eastern Europe) generally had the largest decreases in energy usage per room, followed by Australia/New Zealand and the Caribbean. Eastern and South-Eastern Asia also recorded larger decreases in energy intensity than the global average, performing much better than the other Asian sub-regions.

Table 21 Changes in Energy Usage by Sub-Region between 2017, 2019 and 2022

Year	Metric	Change between 2017 and 2019	Change between 2019 and 2022	Change between 2017 and 2022
Global	**Total**	8.92%	-14.38%	-6.75%
	Per Room	-1.61%	-20.05%	-21.34%
Australia/ New Zealand	**Total**	-5.25%	-20.43%	-24.61%
	Per Room	-9.21%	-22.58%	-29.70%
Caribbean	**Total**	-9.07%	-14.98%	-22.69%
	Per Room	-18.75%	-13.24%	-29.50%
Central America	**Total**	19.84%	1.09%	21.15%
	Per Room	2.49%	0.75%	3.26%
Central Asia	**Total**	29.45%	-0.46%	28.86%
	Per Room	24.92%	-15.12%	6.03%
Eastern Africa	**Total**	11.42%	-8.27%	2.20%
	Per Room	-1.14%	-10.75%	-11.77%
Eastern Asia	**Total**	3.98%	-18.35%	-15.10%
	Per Room	-4.54%	-23.84%	-27.30%
Eastern Europe	**Total**	12.70%	-28.51%	-19.43%
	Per Room	4.10%	-29.46%	-26.57%
Melanesia	**Total**	13.52%	-27.40%	-17.58%
	Per Room	2.34%	-25.58%	-23.84%

Micronesia	**Total**	7.26%	-14.06%	-7.82%
	Per Room	-1.14%	-13.72%	-14.70%
Middle Africa	**Total**	4.40%	-12.73%	-8.89%
	Per Room	-1.14%	-13.72%	-14.70%
Northern Africa	**Total**	35.50%	-17.12%	12.30%
	Per Room	-3.68%	-24.05%	-26.84%
Northern America	**Total**	7.26%	-1.36%	5.81%
	Per Room	-0.01%	-5.40%	-5.41%
Northern Europe	**Total**	5.57%	-33.59%	-29.90%
	Per Room	-1.87%	-32.66%	-33.92%
Polynesia	**Total**	15.84%	-8.63%	5.84%
	Per Room	-1.14%	-3.69%	-4.78%
South America	**Total**	20.93%	-21.63%	-5.23%
	Per Room	13.27%	-25.18%	-15.26%
South-Eastern Asia	**Total**	26.17%	-13.95%	8.57%
	Per Room	9.39%	-28.98%	-22.31%
Southern Africa	**Total**	-3.38%	-24.84%	-27.38%
	Per Room	-8.60%	-21.90%	-28.61%
Southern Asia	**Total**	23.99%	-3.81%	19.26%
	Per Room	16.86%	-18.80%	-5.11%
Southern Europe	**Total**	0.55%	-17.88%	-17.43%
	Per Room	-10.77%	-25.33%	-33.37%
Western Africa	**Total**	9.90%	24.09%	36.37%
	Per Room	-1.14%	7.70%	6.47%
Western Asia	**Total**	20.18%	-1.38%	18.53%
	Per Room	-5.97%	-6.92%	-12.47%
Western Europe	**Total**	-13.05%	-43.63%	-50.98%
	Per Room	-20.91%	-45.48%	-56.88%

Table 22 shows the energy consumption from 2017 to 2022 of the top 20 countries by their tourist arrivals. The table is ordered by ranking the countries with the highest number of international tourist arrivals for the 2022 year. France, which had the highest number of international tourist arrivals for the 2022 year, recorded the lowest per-room energy consumption in 2022 at 5,438kWh. This represented a drop of 41.49% from their 2021 per-room energy consumption. The countries with the highest per-room energy consumption in 2022 were the UAE (34,359kWh), Saudia Arabia (29,312kWh), Egypt (29,203kWh), Turkey (20,377kWh) and Canada (20,112kWh).

Table 22 Energy Consumption of Top 20 Countries by International Tourist Arrivals from 2017 to 2022

Country	Metric	2017	2018	2019	2021	2022
France	**Total**	12,757,564	10,705,268	9,636,549	6,995,730	4,319,538

Country	Metric	2017	2018	2019	2021	2022
	% Change	-	-16.09%	-9.98%	-27.40%	-38.25%
	Per Room	18,130	14,776	12,611	9,295	5,438
	% Change	-	-18.50%	-14.65%	-26.30%	-41.49%
Spain	**Total**	14,687,039	12,590,567	10,437,384	8,502,636	9,131,908
	% Change	-	-14.27%	-17.10%	-18.54%	7.40%
	Per Room	17,669	14,975	11,879	8,545	8,802
	% Change	-	-15.25%	-20.67%	-28.07%	3.01%
United States	**Total**	70,190,700	72,700,570	74,784,998	61,256,826	74,642,178
	% Change	-	3.58%	2.87%	-18.09%	21.85%
	Per Room	13,429	13,463	13,365	10,490	12,644
	% Change	-	0.25%	-0.73%	-21.51%	20.53%
Turkey	**Total**	10,821,179	10,319,745	13,347,574	9,781,016	14,097,229
	% Change	-	-4.63%	29.34%	-26.72%	44.13%
	Per Room	23,036	18,049	20,140	14,770	20,377
	% Change	-	-21.65%	11.59%	-26.66%	37.96%
Italy	**Total**	10,274,071	11,620,291	14,629,567	11,527,861	12,971,198
	% Change	-	13.10%	25.90%	-21.20%	12.52%
	Per Room	13,841	14,812	17,174	12,902	14,344
	% Change	-	7.01%	15.94%	-24.87%	11.17%
Mexico	**Total**	5,051,806	4,810,497	6,040,453	5,119,436	6,091,394
	% Change	-	-4.78%	25.57%	-15.25%	18.99%
	Per Room	12,882	11,666	12,971	10,855	12,918
	% Change	-	-9.44%	11.19%	-16.32%	19.01%
United Kingdom	**Total**	9,856,867	10,172,701	10,220,056	6,272,207	8,052,384
	% Change	-	3.20%	0.47%	-38.63%	28.38%
	Per Room	14,788	15,262	14,513	9,303	11,834
	% Change	-	3.20%	-4.91%	-35.90%	27.20%
Germany	**Total**	8,633,942	8,595,033	7,579,131	5,937,951	4,877,128
	% Change	-	-0.45%	-11.82%	-21.65%	-17.87%
	Per Room	13,384	12,834	10,732	8,375	6,874
	% Change	-	-4.11%	-16.37%	-21.97%	-17.92%
Greece	**Total**	7,385,140	7,385,633	7,120,564	4,954,318	4,893,299
	% Change	-	0.01%	-3.59%	-30.42%	-1.23%
	Per Room	26,049	23,517	21,024	14,837	14,453
	% Change	-	-9.72%	-10.60%	-29.43%	-2.59%
Austria	**Total**	1,704,828	1,869,902	1,735,533	1,355,030	1,428,415
	% Change	-	9.68%	-7.19%	-21.92%	5.42%
	Per Room	15,215	15,954	13,811	9,040	9,183
	% Change	-	4.86%	-13.43%	-34.55%	1.58%

Country	Metric	2017	2018	2019	2021	2022
United Arab Emirates	Total	6,497,134	7,625,631	7,768,657	6,973,684	6,650,602
	% Change	-	17.37%	1.88%	-10.23%	-4.63%
	Per Room	40,840	45,454	41,894	35,910	34,359
	% Change	-	11.30%	-7.83%	-14.28%	-4.32%
Portugal	Total	3,016,449	2,255,087	2,330,683	2,030,133	1,618,825
	% Change	-	-25.24%	3.35%	-12.90%	-20.26%
	Per Room	23,981	17,093	15,965	12,891	10,135
	% Change	-	-28.72%	-6.60%	-19.25%	-21.38%
Saudi Arabia	Total	7,570,145	7,304,752	7,429,011	5,616,754	6,331,173
	% Change	-	-3.51%	1.70%	-24.39%	12.72%
	Per Room	45,841	44,234	37,982	25,917	29,312
	% Change	-	-3.51%	-14.13%	-31.76%	13.10%
Netherlands	Total	2,314,965	2,294,328	2,135,541	1,361,366	1,315,069
	% Change	-	-0.89%	-6.92%	-36.25%	-3.40%
	Per Room	20,175	19,084	15,993	10,325	10,204
	% Change	-	-5.41%	-16.20%	-35.44%	-1.17%
Poland	Total	1,553,268	1,579,259	1,485,009	1,114,683	1,247,287
	% Change	-	1.67%	-5.97%	-24.94%	11.90%
	Per Room	17,627	16,676	14,034	10,126	10,550
	% Change	-	-5.39%	-15.85%	-27.84%	4.19%
Croatia	Total	2,249,340	2,509,772	2,564,472	1,827,483	1,312,167
	% Change	-	11.58%	2.18%	-28.74%	-28.20%
	Per Room	26,049	27,227	25,752	18,554	12,850
	% Change	-	4.53%	-5.42%	-27.95%	-30.74%
Canada	Total	8,369,138	8,523,141	9,494,091	6,368,012	8,493,178
	% Change	-	1.84%	11.39%	-32.93%	33.37%
	Per Room	19,534	19,657	20,166	14,780	20,112
	% Change	-	0.63%	2.59%	-26.71%	36.08%
Romania	Total	1,136,965	1,189,485	1,215,933	639,809	788,228
	% Change	-	4.62%	2.22%	-47.38%	23.20%
	Per Room	26,049	27,252	26,883	12,393	14,288
	% Change	-	4.62%	-1.35%	-53.90%	15.29%
Hungary	Total	1,180,622	1,372,209	1,344,908	1,272,115	646,460
	% Change	-	16.23%	-1.99%	-5.41%	-49.18%
	Per Room	26,049	27,227	25,752	24,080	11,841
	% Change	-	4.53%	-5.42%	-6.49%	-50.83%
Egypt	Total	4,037,410	5,813,437	6,700,345	5,102,830	5,422,884
	% Change	-	43.99%	15.26%	-23.84%	6.27%
	Per Room	34,773	36,479	35,279	27,582	29,203

Country	Metric	2017	2018	2019	2021	2022
	% Change	-	4.91%	-3.29%	-21.82%	5.88%

Note: Total energy is reported in megawatt-hours and energy per room is reported in kilowatt-hours. The number of international tourist arrivals was extracted from Statista (https://www.statista.com/statistics/261726/countries-ranked-by-number-of-international-tourist-arrivals/).

APPENDIX 4: WATER CONSUMPTION

Between 2017 and 2022, there was an overall decrease in global water consumption of 13.62%, largely owing to the significant drop in water consumption (-19.64%) between 2019 and 2021 as a result of the COVID-19 pandemic. Prior to that, global water consumption had been steadily rising, recording an increase of 7.49% between 2017 and 2019. (See Table 23 and Table 24.)

Delving further into the hotel segments, it is useful to note that water consumption in limited-service hotels in fact decreased by 10.57% between 2018 and 2019, despite an increase in room count for this segment of 6.64% over the same period. (See Table 23 and Table 1.) This improvement may have been due to adoption of water efficiency technologies and practices.

In terms of water intensity, global water consumption per room had been steadily decreasing between 2017 and 2019 (-2.9%), before a sharp drop in 2021 due to the pandemic. Although there was a slight uptick in water intensity between 2021 and 2022 of 7.38%, the overall water intensity in 2022 was still 24.96% lower than that in 2019, which is a positive sign. (See Table 24.)

Table 23 *shows the overall water consumption from 2017 to 2022 and the breakdown of data for the three hotel segments (full service resorts, full service non-resorts and limited service hotels).*

Table 23 Global Water Consumption from 2017 to 2022

Segment	Metric	2017	2018	2019	2021	2022
All Hotels	Total	3,974,500,364	4,096,093,524	4,272,215,023	3,097,471,550	3,433,140,337
	% Change	-	3.06%	4.30%	-27.50%	10.84%
	Per Room	181,234	179,934	175,978	122,973	132,054
	% Change	-	-0.72%	-2.20%	-30.12%	7.38%
Full Service Resorts	Total	-	-	407,011,784	319,833,665	341,977,854
	% Change	-	-	-	-21.42%	6.92%
	Per Room	-	-	335,307	253,955	263,081
	% Change	-	-	-	-24.26%	3.59%
Full Service Non-resorts	Total	-	-	471,064,432	327,067,816	405,207,242
	% Change	-	-	-	-30.57%	23.89%
	Per Room	-	-	194,037	129,850	155,861
	% Change	-	-	-	-33.08%	20.03%
Limited-Service Hotels	Total	2,403,161,469	2,462,910,041	2,202,678,782	1,778,824,556	1,802,323,181
	% Change	-	2.49%	-10.57%	-19.24%	1.32%
	Per Room	128,920	127,284	106,742	83,084	81,560
	% Change	-	-1.27%	-16.14%	-22.16%	-1.83%

Note: Total water is reported in cubic meters and water per room is reported in liters.

Table 24 *shows the changes in global water consumption over the three time periods of analysis.*

Table 24 Changes in Global Water Consumption between 2017, 2019 and 2022

Segment	Metric	Change between 2017 and 2019	Change between 2019 and 2022	Change between 2017 and 2022
All Hotels	Total	7.49%	-19.64%	-13.62%
	Per Room	-2.90%	-24.96%	-27.14%
Full Service Resorts	Total	-	-15.98%	-
	Per Room	-	-21.54%	-
Full Service Non-resorts	Total	-	-13.98%	-
	Per Room	-	-19.67%	-
Limited-Service Hotels	Total	-8.34%	-18.18%	-25.00%
	Per Room	-17.20%	-23.59%	-36.74%

Table 25 *shows the water consumption from 2017 to 2022 by region. Asia accounted for more than half of the global water consumption in 2022 (55.6%), even though it contributed to only one-third of the global hotel count in 2022. Northern America accounted for 19.5% of global water consumption in 2022, followed by Europe at 14.2%.*

Asia also had the highest water intensity (measured in water consumption per room) across all years, followed by Africa. Europe and Oceania were the best performing regions with the lowest water intensity in 2022.

Table 25 Water Consumption by Region from 2017 to 2022

Year	Metric	2017	2018	2019	2021	2022
Global	Total	3,974,500,364	4,096,093,524	4,272,215,023	3,097,471,550	3,433,140,337
	% Change	-	3.06%	4.30%	-27.50%	10.84%
	Per Room	181,234	179,934	175,978	122,973	132,054
	% Change	-	-0.72%	-2.20%	-30.12%	7.38%
Africa	Total	158,504,539	175,007,328	196,026,547	145,484,310	133,690,128
	% Change	-	10.41%	12.01%	-25.78%	-8.11%
	Per Room	226,374	225,849	229,454	162,425	147,095
	% Change	-	-0.23%	1.60%	-29.21%	-9.44%
Asia	Total	2,159,551,270	2,308,399,111	2,400,665,206	1,657,970,849	1,909,054,791
	% Change	-	6.89%	4.00%	-30.94%	15.14%
	Per Room	266,213	273,608	262,890	172,590	187,254
	% Change	-	2.78%	-3.92%	-34.35%	8.50%
Europe	Total	733,826,064	666,698,730	714,312,583	441,810,219	487,281,600
	% Change	-	-9.15%	7.14%	-38.15%	10.29%
	Per Room	129,856	113,809	114,541	69,013	74,507
	% Change	-	-12.36%	0.64%	-39.75%	7.96%

Year	Metric	2017	2018	2019	2021	2022
Latin America and the Caribbean	Total	196,115,641	228,070,406	231,993,479	170,734,285	197,567,826
	% Change	-	16.29%	1.72%	-26.41%	15.72%
	Per Room	141,188	158,927	150,227	108,923	125,496
	% Change	-	12.56%	-5.47%	-27.49%	15.22%
Northern America	Total	666,323,306	655,424,174	669,154,698	648,465,203	669,648,825
	% Change	-	-1.64%	2.09%	-3.09%	3.27%
	Per Room	117,785	112,314	110,262	103,378	105,823
	% Change	-	-4.64%	-1.83%	-6.24%	2.36%
Oceania	Total	60,179,543	62,493,775	60,062,511	33,006,683	35,897,167
	% Change	-	3.85%	-3.89%	-45.05%	8.76%
	Per Room	143,032	147,445	136,048	74,342	79,468
	% Change	-	3.09%	-7.73%	-45.36%	6.90%

Note: Total water is reported in cubic meters and water per room is reported in liters.

Table 26 shows the changes in water consumption by region, over the three time periods of analysis. Between 2017 and 2019, global water consumption rose by 7.49%, which was led by Africa, Latin America and the Caribbean, and Asia. Europe notably recorded a decrease in water consumption of 2.66% in the same period. Between the pandemic years of 2019 and 2022, water consumption fell across the board, with the exception of Northern America recording a 0.07% increase. Overall between 2017 and 2022, Oceania had the largest decrease in water consumption of 40.35% while Latin America and the Caribbean had the largest increase of 0.74%.

Global water intensity decreased slightly between 2017 and 2019 (-2.9%), led by Europe, Northern America and Oceania. This may have been due to increased water efficiency. On the contrary, Latin America and the Caribbean and Africa recorded increases in their water intensity in that period. Between 2019 and 2022, water intensity fell sharply, though the decrease in Northern America (-4.03%) lagged significantly behind the other regions. Overall between 2017 and 2022, Oceania again had the largest decrease in water intensity of 44.44%, followed closely by Europe at 42.62%, while Northern America had the smallest decrease of 10.16%.

Table 26 Changes in Water Consumption by Region between 2017, 2019 and 2022

Region	Metric	Change between 2017 and 2019	Change between 2019 and 2022	Change between 2017 and 2022
Global	Total	7.49%	-19.64%	-13.62%
	Per Room	-2.90%	-24.96%	-27.14%
Africa	Total	23.67%	-31.80%	-15.66%
	Per Room	1.36%	-35.89%	-35.02%
Asia	Total	11.17%	-20.48%	-11.60%
	Per Room	-1.25%	-28.77%	-29.66%
Europe	Total	-2.66%	-31.78%	-33.60%
	Per Room	-11.79%	-34.95%	-42.62%

Region	Metric	Change between 2017 and 2019	Change between 2019 and 2022	Change between 2017 and 2022
Latin America and the Caribbean	Total	18.29%	-14.84%	0.74%
	Per Room	6.40%	-16.46%	-11.11%
Northern America	Total	0.42%	0.07%	0.50%
	Per Room	-6.39%	-4.03%	-10.16%
Oceania	Total	-0.19%	-40.23%	-40.35%
	Per Room	-4.88%	-41.59%	-44.44%

Table 27 *shows the water consumption from 2017 to 2022 by sub-region. Eastern Asia accounted for the greatest total water consumption across the regions for all years, followed by Northern America and then South-Eastern Asia. The best-performing regions were Polynesia, followed by Micronesia and Middle Africa.*

In terms of water intensity, sub-regions in Asia generally had the highest water consumption per room, and sub-regions in Europe generally performed the best, alongside Australia/New Zealand.

Table 27 Water Consumption by Sub-Region from 2017 to 2022

Year	Metric	2017	2018	2019	2021	2022
Global	Total	3,974,500,364	4,096,093,524	4,272,215,023	3,097,471,550	3,433,140,337
	% Change	-	3.06%	4.30%	-27.50%	10.84%
	Per Room	181,234	179,934	175,978	122,973	132,054
	% Change	-	-0.72%	-2.20%	-30.12%	7.38%
Australia/ New Zealand	Total	52,188,062	54,038,578	50,390,185	26,983,982	27,886,987
	% Change	-	3.55%	-6.75%	-46.45%	3.35%
	Per Room	135,714	139,653	125,571	66,606	67,622
	% Change	-	2.90%	-10.08%	-46.96%	1.53%
Caribbean	Total	78,636,357	82,175,611	75,095,055	55,872,949	61,385,391
	% Change	-	4.50%	-8.62%	-25.60%	9.87%
	Per Room	318,406	318,830	271,685	207,491	226,644
	% Change	-	0.13%	-14.79%	-23.63%	9.23%
Central America	Total	56,266,377	59,297,180	65,664,065	53,538,220	62,100,724
	% Change	-	5.39%	10.74%	-18.47%	15.99%
	Per Room	117,672	118,451	117,453	95,055	110,701
	% Change	-	0.66%	-0.84%	-19.07%	16.46%
Central Asia	Total	6,692,170	6,946,159	4,856,694	4,878,048	6,314,242
	% Change	-	3.80%	-30.08%	0.44%	29.44%
	Per Room	220,784	229,163	154,621	143,110	171,403
	% Change	-	3.80%	-32.53%	-7.44%	19.77%

Year	Metric	2017	2018	2019	2021	2022
Eastern Africa	Total	35,117,608	38,543,379	38,799,953	26,760,307	33,876,312
	% Change	-	9.76%	0.67%	-31.03%	26.59%
	Per Room	220,784	229,163	216,448	147,239	183,861
	% Change	-	3.80%	-5.55%	-31.97%	24.87%
Eastern Asia	Total	1,226,243,008	1,317,190,962	1,254,728,275	889,032,256	916,611,618
	% Change	-	7.42%	-4.74%	-29.15%	3.10%
	Per Room	293,251	307,918	275,464	191,961	187,697
	% Change	-	5.00%	-10.54%	-30.31%	-2.22%
Eastern Europe	Total	103,828,030	107,401,208	108,875,968	69,346,141	61,554,250
	% Change	-	3.44%	1.37%	-36.31%	-11.24%
	Per Room	152,044	152,674	147,272	93,014	82,155
	% Change	-	0.41%	-3.54%	-36.84%	-11.67%
Melanesia	Total	3,611,356	3,815,793	4,899,490	2,648,099	5,097,377
	% Change	-	5.66%	28.40%	-45.95%	92.49%
	Per Room	220,784	229,163	270,033	147,239	287,980
	% Change	-	3.80%	17.83%	-45.47%	95.59%
Micronesia	Total	3,040,631	3,156,032	3,234,152	2,055,903	2,331,211
	% Change	-	3.80%	2.48%	-36.43%	13.39%
	Per Room	220,784	229,163	216,448	147,239	156,635
	% Change	-	3.80%	-5.55%	-31.97%	6.38%
Middle Africa	Total	4,309,915	4,473,490	4,462,183	3,074,799	3,266,026
	% Change	-	3.80%	-0.25%	-31.09%	6.22%
	Per Room	220,784	229,163	216,448	147,239	156,635
	% Change	-	3.80%	-5.55%	-31.97%	6.38%
Northern Africa	Total	74,964,255	88,479,117	107,278,009	84,824,163	73,633,657
	% Change	-	18.03%	21.25%	-20.93%	-13.19%
	Per Room	270,400	261,740	275,083	202,456	173,030
	% Change	-	-3.20%	5.10%	-26.40%	-14.53%
Northern America	Total	666,323,306	655,424,174	669,154,698	648,465,203	669,648,825
	% Change	-	-1.64%	2.09%	-3.09%	3.27%
	Per Room	117,785	112,314	110,262	103,378	105,823
	% Change	-	-4.64%	-1.83%	-6.24%	2.36%
Northern Europe	Total	139,095,912	143,920,543	145,099,838	93,346,300	80,431,566
	% Change	-	3.47%	0.82%	-35.67%	-13.84%
	Per Room	132,542	135,444	128,519	84,470	72,243
	% Change	-	2.19%	-5.11%	-34.27%	-14.47%
Polynesia	Total	1,339,494	1,483,372	1,538,684	1,318,699	581,592
	% Change	-	10.74%	3.73%	-14.30%	-55.90%

Year	Metric	2017	2018	2019	2021	2022
	Per Room	220,784	229,163	216,448	190,894	86,239
	% Change	-	3.80%	-5.55%	-11.81%	-54.82%
South America	**Total**	61,212,907	86,597,614	91,234,360	61,323,116	74,081,711
	% Change	-	41.47%	5.35%	-32.79%	20.81%
	Per Room	92,201	127,968	128,714	83,437	99,778
	% Change	-	38.79%	0.58%	-35.18%	19.59%
South-Eastern Asia	**Total**	511,973,733	532,831,728	662,991,893	389,098,096	542,460,721
	% Change	-	4.07%	24.43%	-41.31%	39.41%
	Per Room	267,067	266,446	299,854	160,041	202,493
	% Change	-	-0.23%	12.54%	-46.63%	26.53%
Southern Africa	**Total**	19,292,718	17,229,557	18,437,417	10,546,358	12,305,793
	% Change	-	-10.69%	7.01%	-42.80%	16.68%
	Per Room	146,206	128,152	132,177	77,338	91,674
	% Change	-	-12.35%	3.14%	-41.49%	18.54%
Southern Asia	**Total**	237,986,560	243,540,561	244,295,661	196,176,349	246,541,745
	% Change	-	2.33%	0.31%	-19.70%	25.67%
	Per Room	257,891	259,658	249,506	175,801	212,567
	% Change	-	0.68%	-3.91%	-29.54%	20.91%
Southern Europe	**Total**	317,954,780	244,349,981	312,290,545	194,907,791	254,896,224
	% Change	-	-23.15%	27.80%	-37.59%	30.78%
	Per Room	146,187	107,073	127,415	74,345	94,565
	% Change	-	-26.76%	19.00%	-41.65%	27.20%
Western Africa	**Total**	24,820,043	26,281,785	27,048,985	20,278,684	10,608,341
	% Change	-	5.89%	2.92%	-25.03%	-47.69%
	Per Room	220,784	229,163	216,448	147,239	73,678
	% Change	-	3.80%	-5.55%	-31.97%	-49.96%
Western Asia	**Total**	176,655,800	207,889,701	233,792,683	178,786,101	197,126,465
	% Change	-	17.68%	12.46%	-23.53%	10.26%
	Per Room	166,592	174,531	172,503	128,265	137,280
	% Change	-	4.77%	-1.16%	-25.64%	7.03%
Western Europe	**Total**	172,947,342	171,026,999	148,046,231	84,209,987	90,399,561
	% Change	-	-1.11%	-13.44%	-43.12%	7.35%
	Per Room	99,180	94,493	77,227	43,643	45,611
	% Change	-	-4.73%	-18.27%	-43.49%	4.51%

Note: Total water is reported in cubic meters and water per room is reported in liters.

Table 28 *shows the changes in water consumption by sub-region, over the three time periods of analysis. Between 2017 and 2019, South America greatly increased their total water consumption by 49.04%, followed by Northern Africa at 43.11%. On the other end of the spectrum, Central Asia's water consumption decreased by 27.43% in that time period. Between 2019 and 2022*

however, Central Asia surprisingly recorded the largest increase in water consumption of 30.01%. Most other regions had decreases in their water consumption owing to the impact of the pandemic.

In terms of water intensity, Central America again performed the best between 2017 and 2019 with a decrease in water consumption per room of 29.97%. Overall, between 2017 and 2022, the majority of sub-regions recorded decreases in water intensity.

Table 28 Changes in Water Consumption by Sub-Region between 2017, 2019 and 2022

Year	Metric	Change between 2017 and 2019	Change between 2019 and 2022	Change between 2017 and 2022
Global	Total	7.49%	-19.64%	-13.62%
	Per Room	-2.90%	-24.96%	-27.14%
Australia/ New Zealand	Total	-3.44%	-44.66%	-46.56%
	Per Room	-7.47%	-46.15%	-50.17%
Caribbean	Total	-4.50%	-18.26%	-21.94%
	Per Room	-14.67%	-16.58%	-28.82%
Central America	Total	16.70%	-5.43%	10.37%
	Per Room	-0.19%	-5.75%	-5.92%
Central Asia	Total	-27.43%	30.01%	-5.65%
	Per Room	-29.97%	10.85%	-22.37%
Eastern Africa	Total	10.49%	-12.69%	-3.53%
	Per Room	-1.96%	-15.06%	-16.72%
Eastern Asia	Total	2.32%	-26.95%	-25.25%
	Per Room	-6.07%	-31.86%	-35.99%
Eastern Europe	Total	4.86%	-43.46%	-40.72%
	Per Room	-3.14%	-44.22%	-45.97%
Melanesia	Total	35.67%	4.04%	41.15%
	Per Room	22.31%	6.65%	30.44%
Micronesia	Total	6.36%	-27.92%	-23.33%
	Per Room	-1.96%	-27.63%	-29.06%
Middle Africa	Total	3.53%	-26.81%	-24.22%
	Per Room	-1.96%	-27.63%	-29.06%
Northern Africa	Total	43.11%	-31.36%	-1.77%
	Per Room	1.73%	-37.10%	-36.01%
Northern America	Total	0.42%	0.07%	0.50%
	Per Room	-6.39%	-4.03%	-10.16%
Northern Europe	Total	4.32%	-44.57%	-42.18%
	Per Room	-3.04%	-43.79%	-45.49%
Polynesia	Total	14.87%	-62.20%	-56.58%
	Per Room	-1.96%	-60.16%	-60.94%
South America	Total	49.04%	-18.80%	21.02%

Year	Metric	Change between 2017 and 2019	Change between 2019 and 2022	Change between 2017 and 2022
	Per Room	39.60%	-22.48%	8.22%
South-Eastern Asia	**Total**	29.50%	-18.18%	5.95%
	Per Room	12.28%	-32.47%	-24.18%
Southern Africa	**Total**	-4.43%	-33.26%	-36.22%
	Per Room	-9.60%	-30.64%	-37.30%
Southern Asia	**Total**	2.65%	0.92%	3.59%
	Per Room	-3.25%	-14.80%	-17.57%
Southern Europe	**Total**	-1.78%	-18.38%	-19.83%
	Per Room	-12.84%	-25.78%	-35.31%
Western Africa	**Total**	8.98%	-60.78%	-57.26%
	Per Room	-1.96%	-65.96%	-66.63%
Western Asia	**Total**	32.34%	-15.68%	11.59%
	Per Room	3.55%	-20.42%	-17.60%
Western Europe	**Total**	-14.40%	-38.94%	-47.73%
	Per Room	-22.13%	-40.94%	-54.01%

Table 29 shows the water consumption from 2017 to 2022 of the top 20 countries by their tourist arrivals. The table is ordered by ranking the countries with the highest number of international tourist arrivals for the 2022 year. The United States, ranked #3 by international tourist arrivals, recorded by far the highest water consumption across all years.

In terms of water intensity, Egypt had the highest water consumption per room in 2022, followed by Croatia, the UAE and Saudi Arabia.

Table 29 Water Consumption of Top 20 Countries by International Tourist Arrivals from 2017 to 2022

Country	Metric	2017	2018	2019	2021	2022
France	**Total**	79,992,560	67,341,458	59,869,638	35,662,296	34,291,961
	% Change	-	-15.82%	-11.10%	-40.43%	-3.84%
	Per Room	113,676	92,951	78,349	47,381	43,171
	% Change	-	-18.23%	-15.71%	-39.53%	-8.89%
Spain	**Total**	99,326,850	86,773,008	78,219,983	45,349,419	64,913,411
	% Change	-	-12.64%	-9.86%	-42.02%	43.14%
	Per Room	119,497	103,210	89,027	45,576	62,569
	% Change	-	-13.63%	-13.74%	-48.81%	37.29%
United States	**Total**	615,761,866	604,426,926	613,766,868	612,937,017	623,040,607
	% Change	-	-1.84%	1.55%	-0.14%	1.65%
	Per Room	117,812	111,932	109,684	104,964	105,540
	% Change	-	-4.99%	-2.01%	-4.30%	0.55%

Country	Metric	2017	2018	2019	2021	2022
Turkey	Total	57,605,942	60,806,484	82,815,271	62,379,717	83,877,518
	% Change	-	5.56%	36.19%	-24.68%	34.46%
	Per Room	122,633	106,347	124,961	94,198	121,239
	% Change	-	-13.28%	17.50%	-24.62%	28.71%
Italy	Total	82,324,344	92,401,278	117,674,757	80,511,471	100,559,031
	% Change	-	12.24%	27.35%	-31.58%	24.90%
	Per Room	110,909	117,784	138,140	90,109	111,199
	% Change	-	6.20%	17.28%	-34.77%	23.41%
Mexico	Total	45,587,363	43,704,721	48,999,930	40,974,713	46,872,031
	% Change	-	-4.13%	12.12%	-16.38%	14.39%
	Per Room	116,244	105,989	105,220	86,877	99,404
	% Change	-	-8.82%	-0.73%	-17.43%	14.42%
United Kingdom	Total	67,168,572	66,352,355	66,447,729	40,287,016	47,609,881
	% Change	-	-1.22%	0.14%	-39.37%	18.18%
	Per Room	100,770	99,546	94,360	59,756	69,969
	% Change	-	-1.22%	-5.21%	-36.67%	17.09%
Germany	Total	56,170,396	62,078,877	47,253,454	26,086,173	28,553,242
	% Change	-	10.52%	-23.88%	-44.80%	9.46%
	Per Room	87,071	92,694	66,914	36,791	40,244
	% Change	-	6.46%	-27.81%	-45.02%	9.39%
Greece	Total	62,595,443	-	48,124,674	22,700,067	36,069,785
	% Change	-	-100.00%	-	-52.83%	58.90%
	Per Room	220,784	-	142,094	67,980	106,536
	% Change	-	-100.00%	-	-52.16%	56.72%
Austria	Total	10,936,343	11,641,526	13,022,701	6,327,657	9,463,100
	% Change	-	6.45%	11.86%	-51.41%	49.55%
	Per Room	97,606	99,328	103,632	42,213	60,835
	% Change	-	1.76%	4.33%	-59.27%	44.12%
United Arab Emirates	Total	28,520,175	41,183,295	39,550,886	32,911,662	29,588,238
	% Change	-	44.40%	-3.96%	-16.79%	-10.10%
	Per Room	179,275	245,479	213,284	169,473	152,860
	% Change	-	36.93%	-13.12%	-20.54%	-9.80%
Portugal	Total	31,272,666	16,853,933	17,224,062	10,750,989	13,199,052
	% Change	-	-46.11%	2.20%	-37.58%	22.77%
	Per Room	248,618	127,747	117,986	68,268	82,638
	% Change	-	-48.62%	-7.64%	-42.14%	21.05%
Saudi Arabia	Total	31,993,665	36,568,933	38,114,714	36,225,196	32,113,928
	% Change	-	14.30%	4.23%	-4.96%	-11.35%

Country	Metric	2017	2018	2019	2021	2022
	Per Room	193,737	221,442	194,868	167,154	148,682
	% Change	-	14.30%	-12.00%	-14.22%	-11.05%
Netherlands	**Total**	10,854,887	13,108,022	12,008,893	6,120,370	7,222,828
	% Change	-	20.76%	-8.39%	-49.03%	18.01%
	Per Room	94,602	109,031	89,932	46,418	56,046
	% Change	-	15.25%	-17.52%	-48.39%	20.74%
Poland	**Total**	7,707,924	8,119,957	9,724,830	5,033,528	6,875,839
	% Change	-	5.35%	19.76%	-48.24%	36.60%
	Per Room	87,472	85,742	91,901	45,726	58,158
	% Change	-	-1.98%	7.18%	-50.24%	27.19%
Croatia	**Total**	19,065,099	21,123,785	21,554,807	14,502,485	16,145,320
	% Change	-	10.80%	2.04%	-32.72%	11.33%
	Per Room	220,784	229,163	216,448	147,239	158,112
	% Change	-	3.80%	-5.55%	-31.97%	7.38%
Canada	**Total**	49,915,906	50,322,196	54,791,659	35,033,869	46,067,011
	% Change	-	0.81%	8.88%	-36.06%	31.49%
	Per Room	116,508	116,061	116,379	81,310	109,090
	% Change	-	-0.38%	0.27%	-30.13%	34.16%
Romania	**Total**	9,636,760	4,737,019	5,778,911	3,535,078	3,798,936
	% Change	-	-50.84%	21.99%	-38.83%	7.46%
	Per Room	220,784	108,528	127,764	68,476	68,865
	% Change	-	-50.84%	17.72%	-46.40%	0.57%
Hungary	**Total**	10,006,793	11,549,356	11,304,167	3,732,990	2,789,092
	% Change	-	15.42%	-2.12%	-66.98%	-25.29%
	Per Room	220,784	229,163	216,448	70,663	51,086
	% Change	-	3.80%	-5.55%	-67.35%	-27.70%
Egypt	**Total**	39,390,067	47,533,194	67,639,326	51,732,971	47,951,229
	% Change	-	20.67%	42.30%	-23.52%	-7.31%
	Per Room	339,254	298,264	356,134	279,630	258,221
	% Change	-	-12.08%	19.40%	-21.48%	-7.66%

Note: Total water is reported in cubic meters and water per room is reported in liters.

APPENDIX 5: LIKE-FOR-LIKE COMPARISON

In the year 2022, the data regarding the number of hotels and rooms has been significantly impacted by the COVID-19 pandemic. The pandemic led to a substantial reduction in the number of operating hotels and available rooms, primarily due to travel restrictions, decreased demand, and the implementation of safety protocols. In tandem with the reduced reporting to UNWTO during the pandemic, the decline in hotel and room counts for 2021 and 2022 has posed a significant challenge to studying trends in overall carbon emissions, energy consumption and water usage within the hospitality sector. Since the data has been heavily influenced by the exceptional circumstances of the pandemic, it is difficult to make meaningful comparisons and analyze patterns effectively.

To address this challenge and ensure a more accurate analysis, a standardization methodology called the "like-for-like approach" was used. In this method, we assumed that the hotel and room counts in 2017 held constant until 2022. As such, the 2017 hotel supply data was multiplied by the corresponding 2022 environmental performance data, to arrive at a simulation of like-for-like performance. By maintaining the 2017 hotel and room count data as a consistent benchmark for both years (2017 and 2022), and applying this to the 2022 environmental performance data, the impact of the pandemic on the hotels' performance can be studied more accurately. This approach allows for a more consistent and reliable comparison of carbon emissions, energy consumption and water usage in this period, providing a clearer understanding of the industry's performance despite the challenges posed by the pandemic.

Table 30 *shows the like-for-like comparison of emissions in 2017 and 2022 and the breakdown of data for the three hotel segments (full service resorts, full service non-resorts and limited service hotels).*

Table 30 Like-for-Like Comparison of Emissions in 2017 & 2022 (MTCO2e)

Segment	2017	2022	% Change
All Hotels	194,088,553	133,116,218	-31.41%
Full Service Resorts	-	11,771,757	-
Full Service Non-resorts	-	16,547,699	-
Limited-Service Hotels	114,326,989	69,824,665	-38.93%

Table 31 *shows the like-for-like comparison of emissions in 2017 and 2022 by region.*

Table 31 Like-for-Like Comparison of Emissions by Region in 2017 & 2022 (MTCO2e)

Region	2017	2022	% Change
Global	194,088,553	133,116,218	-31.41%
Africa	9,084,040	6,068,917	-33.19%

Region	2017	2022	% Change
Asia	112,904,220	83,184,636	-26.32%
Europe	31,369,099	14,363,443	-54.21%
Latin America and the Caribbean	9,507,607	6,580,858	-30.78%
Northern America	27,183,387	20,325,614	-25.23%
Oceania	4,040,201	2,592,749	-35.83%

Table 32 *shows the like-for-like comparison of emissions in 2017 and 2022 by sub-region.*

Table 32 Like-for-Like Comparison of Emissions by Sub-Region in 2017 & 2022 (MTCO2e)

Sub-Region	2017	2022	% Change
Global	194,088,553	133,116,218	-31.41%
Australia/New Zealand	3,614,386	2,240,068	-38.02%
Caribbean	3,972,388	2,664,331	-32.93%
Central America	2,280,577	2,191,706	-3.90%
Central Asia	356,583	300,750	-15.66%
Eastern Africa	1,871,191	1,293,755	-30.86%
Eastern Asia	56,772,080	39,801,283	-29.89%
Eastern Europe	6,559,545	3,396,550	-48.22%
Melanesia	192,426	164,513	-14.51%
Micronesia	162,016	117,768	-27.31%
Middle Africa	229,648	166,930	-27.31%
Northern Africa	3,484,005	2,078,602	-40.34%
Northern America	27,183,387	20,325,614	-25.23%
Northern Europe	6,422,250	2,283,701	-64.44%
Polynesia	71,373	70,399	-1.37%
South America	3,254,642	1,724,821	-47.00%
South-Eastern Asia	25,006,007	19,176,873	-23.31%
Southern Africa	2,176,696	1,359,764	-37.53%
Southern Asia	15,930,304	12,455,839	-21.81%
Southern Europe	13,169,828	6,583,223	-50.01%
Western Africa	1,322,500	1,169,865	-11.54%
Western Asia	14,839,246	11,449,891	-22.84%
Western Europe	5,217,477	2,099,969	-59.75%

Table 33 *shows the like-for-like comparison of emissions in 2017 and 2022 for the top 20 countries by their tourist arrivals. The table is ordered by ranking the countries with the highest average number of international tourist arrivals per year for the 2022 year.*

Table 33 Like-for-Like Comparison of Emissions of Top 20 Countries by Tourist Arrivals in 2017 & 2022 (MTCO2e)

Country	2017	2022	% Change
France	1,087,644	399,605	-63.26%
Spain	3,900,737	1,390,499	-64.35%
United States	25,897,583	19,169,029	-25.98%
Turkey	3,526,207	3,094,470	-12.24%
Italy	2,758,751	2,226,097	-19.31%
Mexico	1,791,602	1,741,474	-2.80%
United Kingdom	2,648,327	1,464,077	-44.72%
Germany	2,709,034	1,048,251	-61.31%
Greece	3,335,308	1,618,027	-51.49%
Austria	312,778	129,317	-58.66%
United Arab Emirates	3,534,139	2,284,359	-35.36%
Portugal	913,918	270,399	-70.41%
Saudi Arabia	4,596,287	2,776,001	-39.60%
Netherlands	699,684	298,490	-57.34%
Poland	890,199	410,395	-53.90%
Croatia	1,015,856	173,029	-82.97%
Canada	1,253,196	1,134,719	-9.45%
Romania	513,481	142,117	-72.32%
Hungary	533,198	111,521	-79.08%
Egypt	1,588,485	1,079,192	-32.06%

Table 34 *shows the like-for-like comparison of energy usage in 2017 and 2022 and the breakdown of data for the three hotel segments (full service resorts, full service non-resorts and limited service hotels).*

Table 34 Like-for-Like Comparison of Energy Usage in 2017 & 2022 (MWH)

Segment	2017	2022	% Change
All Hotels	478,885,981	371,368,026	-22.45%
Full Service Resorts	-	32,105,478	-
Full Service Non-resorts	-	48,048,738	-
Limited-Service Hotels	289,924,977	191,942,737	-33.80%

Table 35 *shows the like-for-like comparison of energy usage in 2017 and 2022 by region.*

Table 35 Like-for-Like Comparison of Energy Usage by Region in 2017 & 2022 (MWH)

Region	2017	2022	% Change
Global	478,885,981	371,368,026	-22.45%
Africa	18,263,313	14,839,223	-18.75%
Asia	245,731,442	191,309,063	-22.15%
Europe	102,325,402	62,552,651	-38.87%
Latin America and the Caribbean	25,629,500	21,962,033	-14.31%
Northern America	78,623,128	74,747,167	-4.93%
Oceania	8,313,196	5,957,891	-28.33%

Table 36 *shows the like-for-like comparison of energy usage in 2017 and 2022 by sub-region.*

Table 36 Like-for-Like Comparison of Energy Usage by Sub-Region in 2017 & 2022 (MWH)

Sub-Region	2017	2022	% Change
Global	478,885,981	371,368,026	-22.45%
Australia/New Zealand	7,370,345	5,177,190	-29.76%
Caribbean	7,712,136	5,436,680	-29.50%
Central America	6,612,421	6,903,076	4.40%
Central Asia	789,556	844,726	6.99%
Eastern Africa	4,143,248	3,653,075	-11.83%
Eastern Asia	138,724,878	100,581,381	-27.50%
Eastern Europe	15,044,946	11,208,614	-25.50%
Melanesia	426,075	324,756	-23.78%
Micronesia	358,740	306,001	-14.70%
Middle Africa	508,493	433,739	-14.70%
Northern Africa	8,234,527	5,873,992	-28.67%
Northern America	78,623,128	74,747,167	-4.93%
Northern Europe	19,280,411	12,675,736	-34.26%
Polynesia	158,036	149,944	-5.12%
South America	11,304,943	9,622,277	-14.88%
South-Eastern Asia	48,292,139	37,256,255	-22.85%
Southern Africa	2,448,725	1,744,218	-28.77%
Southern Asia	26,013,764	24,317,445	-6.52%
Southern Europe	40,369,325	26,797,359	-33.62%
Western Africa	2,928,320	3,134,199	7.03%
Western Asia	31,911,105	28,309,256	-11.29%
Western Europe	27,630,720	11,870,941	-57.04%

Table 37 shows the like-for-like comparison of energy usage in 2017 and 2022 for the top 20 countries by their tourist arrivals.

Table 37 Like-for-Like Comparison of Energy Usage of Top 20 Countries by International Tourist Arrivals in 2017 & 2022 (MWH)

Country	2017	2022	% Change
France	12,757,564	3,826,628	-70.01%
Spain	14,687,039	7,316,441	-50.18%
United States	70,190,700	66,085,739	-5.85%
Turkey	10,821,179	9,571,778	-11.55%
Italy	10,274,071	10,646,864	3.63%
Mexico	5,051,806	5,066,168	0.28%
United Kingdom	9,856,867	7,887,923	-19.98%
Germany	8,633,942	4,434,479	-48.64%
Greece	7,385,140	4,097,609	-44.52%
Austria	1,704,828	1,028,901	-39.65%
United Arab Emirates	6,497,134	5,465,977	-15.87%
Portugal	3,016,449	1,274,877	-57.74%
Saudi Arabia	7,570,145	4,840,633	-36.06%
Netherlands	2,314,965	1,170,886	-49.42%
Poland	1,553,268	929,649	-40.15%
Croatia	2,249,340	1,109,635	-50.67%
Canada	8,369,138	8,616,829	2.96%
Romania	1,136,965	623,664	-45.15%
Hungary	1,180,622	536,671	-54.54%
Egypt	4,037,410	3,390,658	-16.02%

Table 38 *shows the like-for-like comparison of water usage in 2017 and 2022 and the breakdown of data for the three hotel segments (full service resorts, full service non-resorts and limited service hotels).*

Table 38 Like-for-Like Comparison of Water Usage in 2017 & 2022 (CuM)

Year	2017	2022	% Change
All Hotels	3,974,500,364	2,841,519,341	-28.51%
Full Service Resorts	-	287,483,085	-
Full Service Non-resorts	-	336,898,164	-
Limited-Service Hotels	2,403,161,469	1,525,623,677	-36.52%

Table 39 *shows the like-for-like comparison of water usage in 2017 and 2022 by region.*

Table 39 Like-for-Like Comparison of Water Usage by Region in 2017 & 2022 (CuM)

Region	2017	2022	% Change
Global	3,974,500,364	2,841,519,341	-28.51%
Africa	158,504,539	99,628,648	-37.14%
Asia	2,159,551,270	1,517,842,122	-29.71%
Europe	733,826,064	415,796,478	-43.34%
Latin America and the Caribbean	196,115,641	176,079,614	-10.22%
Northern America	666,323,306	598,817,077	-10.13%
Oceania	60,179,543	33,355,402	-44.57%

Table 40 *shows the like-for-like comparison of water usage in 2017 and 2022 by sub-region.*

Table 40 Like-for-Like Comparison of Water Usage by Sub-Region in 2017 & 2022 (CuM)

Sub-Region	2017	2022	% Change
Global	3,974,500,364	2,841,519,341	-28.51%
Australia/New Zealand	52,188,062	25,963,947	-50.25%
Caribbean	78,636,357	55,991,733	-28.80%
Central America	56,266,377	53,562,963	-4.80%
Central Asia	6,692,170	5,216,108	-22.06%
Eastern Africa	35,117,608	29,723,064	-15.36%
Eastern Asia	1,226,243,008	785,673,414	-35.93%
Eastern Europe	103,828,030	56,198,047	-45.87%
Melanesia	3,611,356	4,696,553	30.05%
Micronesia	3,040,631	2,157,175	-29.06%
Middle Africa	4,309,915	3,057,669	-29.06%
Northern Africa	74,964,255	46,741,659	-37.65%
Northern America	666,323,306	598,817,077	-10.13%
Northern Europe	139,095,912	75,084,667	-46.02%
Polynesia	1,339,494	537,727	-59.86%
South America	61,212,907	66,524,918	8.68%
South-Eastern Asia	511,973,733	385,674,364	-24.67%
Southern Africa	19,292,718	12,068,853	-37.44%
Southern Asia	237,986,560	194,554,427	-18.25%
Southern Europe	317,954,780	205,380,615	-35.41%
Western Africa	24,820,043	8,037,404	-67.62%
Western Asia	176,655,800	146,723,810	-16.94%
Western Europe	172,947,342	79,133,149	-54.24%

Table 41 shows the like-for-like comparison of water usage in 2017 and 2022 for the top 20 countries by their tourist arrivals.

Table 41 Like-for-Like Comparison of Water Usage of Top 20 Countries by International Tourist Arrivals in 2017 & 2022 (CuM)

Country	2017	2022	% Change
France	79,992,560	30,378,845	-62.02%
Spain	99,326,850	52,008,314	-47.64%
United States	615,761,866	551,619,738	-10.42%
Turkey	57,605,942	56,951,402	-1.14%
Italy	82,324,344	82,539,661	0.26%
Mexico	45,587,363	38,983,123	-14.49%
United Kingdom	67,168,572	46,637,505	-30.57%
Germany	56,170,396	25,961,746	-53.78%
Greece	62,595,443	30,204,545	-51.75%
Austria	10,936,343	6,816,357	-37.67%
United Arab Emirates	28,520,175	24,317,892	-14.73%
Portugal	31,272,666	10,394,678	-66.76%
Saudi Arabia	31,993,665	24,553,386	-23.26%
Netherlands	10,854,887	6,430,923	-40.76%
Poland	7,707,924	5,124,818	-33.51%
Croatia	19,065,099	13,653,306	-28.39%
Canada	49,915,906	46,737,695	-6.37%
Romania	9,636,760	3,005,806	-68.81%
Hungary	10,006,793	2,315,417	-76.86%
Egypt	39,390,067	29,981,501	-23.89%

APPENDIX 6: CHSB INDEX

The Cornell Hotel Sustainability Benchmarking Index (CHSB) is an industry-led global data initiative. It was started in 2013 to enable any hotel to calculate its carbon footprint and benchmark its energy, water and carbon emissions at low cost, drawing from a dataset of over 27,000 hotels around the world. The study is carried out through a partnership between the Cornell University Center for Hospitality Research, participating hotels, Greenview, and an industry advisory group.

Participants in the CHSB index include major hotel brands, operators and owners, representing a total of 1057 geographies (78 countries, 84 regions, 664 metro areas, 185 climate zones). CHSB2024 included 42 participating companies, including IHG, Hyatt, and Marriott.

The data set is freely available for download from the Cornell Center for Hospitality Research. This year's study presents historical patterns across like-for-like change over the previous year, expands the data set's geographic coverage, and builds upon the existing methodology.

The key findings of CHSB2024 are presented in Table 42 below. There has been a notable decrease in GHG emissions per square meter and energy consumption per square meter, with declines in overall average changes across all hotel segments. The average change in GHG emissions per occupied room also decreased across the board. However, the energy consumption per occupied room increased for full service hotels. In general, limited service hotels have improved across almost all metrics, while performance was more varied for full service non-resorts and resorts.

Table 42 CHSB2024 Findings: Changes in GHG Emissions and Energy Usage between 2019 and 2022

Measure	Metric	Limited Service	Full Service Non-Resort	Full Service Resort
Measure 3: GHG Emissions per Occupied Room	Average of Averages Change	-11.55%	0.13%	15.52%
	Overall Average Change	-13.32%	-3.97%	-3.40%
	Weighted Average Change	-2.66%	3.24%	1.77%
Measure 4: GHG Emissions per Square Meter	Average of Averages Change	-16.46%	-14.55%	-0.79%
	Overall Average Change	-18.36%	-19.77%	-15.52%
	Weighted Average Change	-4.75%	-11.10%	0.23%
	Average of Averages Change	0.90%	6.49%	7.44%

Measure	Metric	Limited Service	Full Service Non-Resort	Full Service Resort
Measure 5: Energy per Occupied Room	Overall Average Change	-1.86%	4.16%	5.54%
	Weighted Average Change	0.60%	7.79%	0.87%
Measure 6: Energy per Square Meter	Average of Averages Change	-4.54%	-10.73%	-6.60%
	Overall Average Change	-7.56%	-12.98%	-7.70%
	Weighted Average Change	-1.66%	-7.48%	-0.45%

Note: The analysis presented in CHSB2024 utilizes the following different types of averages to provide a comprehensive understanding of the changes in energy consumption and GHG emissions across different hotel categories.

- The *weighted average change* is calculated by multiplying the average change of a particular hotel category by the percentage of that hotel's floor area to the total floor area of the data set.
- The *overall average change* considers the average change in the total usage or emissions of the entire data set divided by the total floor area of the like-for-like data set.
- The *average of averages change* is calculated as the mean of the average change of all hotels in the like-for-like data set.

These different averages provide a nuanced and comprehensive understanding of the changes observed in the data set, enabling the identification of trends and patterns that may be missed by simply looking at one type of average.

More details on the CHSB Index can be found at https://greenview.sg/services/chsb-index/. Hotels interested in participating in CHSB2025 and contributing to this valuable industry benchmarking effort can email data@greenview.sg for more information.

GLOSSARY OF TERMS

2-Degree Scenario – Widely accepted as the limitation to global average temperature growth to prevent significant changes to the planet. One of the goals of the 2015 Paris Agreement is to limit global average temperature to well below 2°C above pre-industrial levels, and pursue efforts to limit temperature increase to 1.5°C.

Cornell Hotel Sustainability Benchmarking (CHSB) – The hotel industry's largest annual benchmarking of energy, water, and carbon. Open to hotels and hotel companies of all sizes and published in a freely available index every year.

Emission Factor – A conversion figure used to convert energy consumption into a unit of carbon.

Expedia – Expedia Group, Inc. is an online travel company which engages in the provision of travel products and services to leisure and corporate travelers. It operates through the following segments: B2C, B2B, and Trivago. The B2C segment offers a full range of travel and advertising services to worldwide customers through a variety of consumer brands. The B2B segment refers to a wide range of travel and non-travel companies including airlines, offline travel agents, online retailers, corporate travel management, and financial institutions. The Trivago segment generates advertising revenue primarily from sending referrals to online travel companies and travel service providers from hotel metasearch websites.

Green Lodging Trends Report (GLTR) – The leading global benchmarking study on sustainability best practices in hotels. The GLTR benchmarks hotels from around the world to understand which best practices are in place. 27,000 hotels of all sizes and types across 54 countries participated in the 2022 GLTR and benchmarked their performance against peers.

Greenhouse Gas (GHG) Emissions – Gases that trap heat in the atmosphere are called greenhouse gases. Carbon dioxide (CO2) is the primary greenhouse gas emitted through human activities. Greenhouse gases are measured in 'carbon dioxide-equivalents' (CO2e).

Hotel Carbon Measurement Initiative (HCMI) – A free methodology and tool for hotels to calculate the carbon footprint of hotel stays and meetings in their properties.

Hotel Global Decarbonisation Report – Outlines the hotel sector's decarbonisation pathway and the most impactful actions the sector could take in order to meet the 2-degree Celsius cap set out in the Paris Climate Agreement. This report was created by the Sustainable Hospitality Alliance, in partnership with Greenview.

Intergovernmental Panel on Climate Change (IPCC) – The United Nations body for assessing the science related to climate change, releasing regular scientific assessments on climate change, its implications and potential future risks, and adaptation and mitigation options.

Long-term Decarbonization – Refers to a strategy with a long time horizon towards 2050. Such strategies are needed to achieve the Paris Agreement goal of limiting global average temperature to well below 2°C, and preferably 1.5°C, relative to pre-industrial levels. To do so, there is scientific consensus that carbon emissions have to be reduced by half by 2030 and reach net zero by 2050.

Net-Zero Target – Refers to target set by countries and organizations to reach net-zero carbon emissions by a selected date.

Net-Zero Pathway – Refers to the temporal evolution of natural and/or human systems toward a future net-zero state. The trajectory is modeled based on a set of features such as technological advancement and institutional policy changes, depending on the course of action and strategy set by countries and organizations to achieve net-zero carbon emissions by the selected date.

Paris Agreement - Legally binding international treaty on climate change to limit global warming to well below 2°C, preferably to 1.5°C , compared to preindustrial levels and achieve a net-zero world by 2050.

Science Based Targets initiative (SBTi) – Defines and promotes best practice in emissions reductions through science-based targets which are aligned with what the latest climate science deems necessary to meet the goals of the Paris Agreement – limiting global warming to well below 2°C above pre-industrial levels and pursuing efforts to limit warming to 1.5°C.

STR – STR provides premium data benchmarking, analytics and marketplace insights for the global hospitality industry. STR currently collects data for more than 77,000 hotels around the world, including rooms available, rooms sold and net room revenue on a monthly, weekly and daily basis.

STR Chain Scale – STR groups hotels into Chain Scale segments are grouped primarily according to actual average room rates. An independent hotel, regardless of average room rate, is included as a separate Chain Scale category. The Chain Scale segments are: Luxury, Upper Upscale, Upscale, Upper Midscale, Midscale, Economy and Independent.

UNWTO – The World Tourism Organization is the United Nations agency responsible for the promotion of responsible, sustainable and universally accessible tourism. The UN Tourism Data Dashboard provides statistics and insights on key indicators for inbound and outbound tourism at the global, regional and national levels. Data covers tourist arrivals, tourism share of exports and contribution to GDP, source markets, seasonality and accommodation (data on number of rooms, guests and nights).