AUMA KNOWLEDGE

Guideline for Calculating Emissions at Trade Fairs

1st Edition

AUMA

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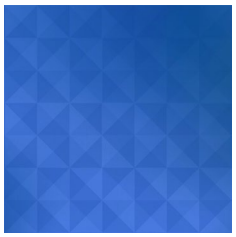

Acknowledgements

This Greenhouse Gas Emissions Guideline, developed by a specific working group under the supervision of the Association of the German Trade Fair Industry (AUMA), adapts the first edition of the Net Zero Carbon Events (NZCE) measurement methodology to the German exhibition context. The guideline is the result of an extensive process that ran from May to November 2024 in which working group members were consulted in a series of feedback rounds via various communication channels. This collaborative process would not have been possible without the substantial contributions of the various stakeholders below to whom AUMA would like to express gratitude.

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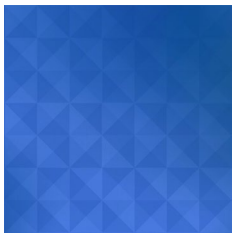


1. Introduction

To further the credibility of greenhouse gas (GHG) emissions accounting in the events industry, it is essential to ensure comparability and transparency across all stakeholders, such as organizers, exhibitors, service providers, and venues. The Net Zero Carbon Events (NZCE) initiative has created a global industry-backed reference for event-level emissions measurement through the first edition of the NZCE measurement methodology. The Association of the German Trade Fair Industry (AUMA) has undertaken a pioneering initiative to adopt this methodology for the German exhibition sector based on stakeholder input. While generally using the same approaches as the NZCE measurement methodology, this national adaptation diverges from the NZCE measurement methodology in several areas, such as assumptions in the absence of primary data and emission sources originally excluded by NZCE at the global level but included for the German context.[1]

Similar to the NZCE measurement methodology for the global context, this guideline aims to fulfill the following objectives for the German exhibition context:

- **Future-proof the German events industry,** which hosts around two thirds of global trade fairs[2], by:
  - Building event-industry stakeholder awareness for event-level carbon calculation
  - Motivating them to begin tracking GHG emissions by offering practical guidance (i) for all levels of experience and data availability as well as (ii) on improving calculation accuracy.
- **Enable standardized event-level measurement,** which is critical for both event-level and corporate carbon footprinting and will allow for the creation of German context-specific coefficients and assumptions in the future.

Measuring and reporting event-level emissions differs from organizational emissions measurement and reporting under the GHG Protocol Corporate Reporting Standard, which categorizes emissions into scopes 1, 2, or 3 depending on their relation to the reporting entity. An event is better understood as a product, as it involves different companies from various industries, each contributing their respective emissions sources, processes, and materials. Therefore, this methodology is based on the GHG Product Life Cycle Accounting and Reporting Standard, which offers a more fitting approach to capturing the full lifecycle of emissions created before, during, and after an event, regardless of who is responsible for those emissions.

The emission source categories in this guideline may also apply to the corporate carbon footprint (CCF) of involved entities. However, as each AUMA member has a unique business model and ownership structure, ownership and materiality of emission sources in line with the GHG Protocol Corporate Accounting Standard can vary significantly. Accordingly, organizations should assess materiality and control of the emission sources in this guideline for their context. Relevant emission sources can then be incorporated into their emissions inventories and disclosures as needed for customer requests or regulatory requirements, such as the Corporate Sustainability Reporting Directive (CSRD).

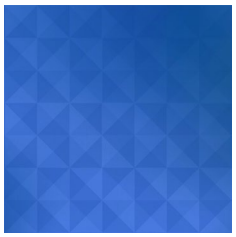
[1] Divergences are footnoted throughout this document and listed in Appendix E.

[2] AUMA-Trends 2024/2025 (2024): Facts and Figures. Trade fair venue Germany: Number one worldwide, https://trends.auma.de/en/2425/facts-and-figures/

Methodologies, protocols, and standards evolve over time. For years, accurate event-level measurement has been inhibited by various factors, including the complexity of event types, data collection challenges, and shared responsibilities between stakeholders, often across sectors. This guideline and the NZCE measurement methodology both aim to create a starting point (i) for industry practitioners to pursue measurement and (ii) for the broader industry to enhance data collection and sharing processes over time. Several issues raised during the development of this guideline remain unresolved and will require further industry progress before approaches can be agreed upon in future guideline versions, including:

- Specific emission sources, such as standing investments[3] in the production and materials category, embodied carbon of the venue, building, or vehicles, emissions resulting from land use changes, scope 1 and 2 of event organizers' workplaces and offices, stopovers and detours for local transportation, emails not sent at mass scale[4], and scope 3 emissions of hotels.
- Apportionment of materials used across multiple events which may span several entities' use, such as carpets, furniture, rental equipment, and shell scheme, etc.
- Timeline considerations for the three measurement tiers of each emission source category (see section 3.1 for more context).
- Coefficients and proxies based on industry data, which can be used in the absence of data for specific emission sources.

Please see Appendix D for more information.



2. Setting Boundaries

2.1 Temporal Boundaries

This guideline divides events into three temporal phases: pre-event, event, and post-event. Measurement needs to account for the full event lifecycle, including activities such as move-in, transport of attendees to the event, operations on the day(s) of the event, move-out and waste disposal. While **it is critical to account for all emission causing activities**, this guideline does not require reporting on them in chronological order. Instead, **reports should be structured according to the ten emission source categories as shown in section 2.2** and aligned with the NZCE measurement methodology, 1st edition December 2023.

[3] Contrary to the NZCE initiative's approach, standing investments are directly excluded from the boundary of included emission sources. Please see more context in Appendix E.

[4] Contrary to the NZCE initiative's approach, emails not sent at mass scale are directly excluded from the boundary of included emission sources. Please see more context in Appendix E.

2.2 Sources and Boundaries of Event Emissions

1. Production and Materials
2. Freight and Logistics
3. Food and Beverage
4. Travel to and from the Destination
5. Local transportation
6. Accommodation
7. Energy
8. Water[5]
9. Waste
10. Digital Content and Communication

Not all emission source categories as outlined above will apply to every event. After identifying the relevant emission source categories and activities for their event, organizations should measure their emissions in accordance with the individual emission source category subchapters of section 4.

2.3 Materiality

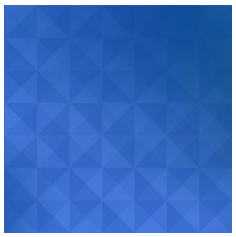
All ten emission source categories should be quantified and reported as part of the carbon footprint of any event-level reporting. **Event emission sources may be assessed for materiality against the total event footprint, allowing for the exclusion of immaterial sources up to a set threshold.** If the sum of individually excluded sources exceeds this threshold, some emission sources must be added back in until the total excluded emissions fall within the limit. While a 5% threshold has been agreed upon in the global corporate emissions accounting context to strike a balance between completeness and emissions impact, this has not yet happened in the global events context. Therefore, a 5% threshold or another alternative may be selected, as long as it is transparently disclosed.

2.4 Stakeholders Control and Responsibility on the Emission Sources

This guideline restricts its focus on "how" to quantify event-level emissions. **Control and responsibility of these categories vary depending on the organizations involved in each event and their business models.** Accordingly, each stakeholder should identify material emission sources to their organization (not to the event) as per their reporting approach (financial or operational) and report on these in line with applicable regulations.

[5] Contrary to the NZCE initiative's approach, water is included as an emission source category in this guideline. Please see more context in the water section and Appendix E.

Responsibility for emission sources refers to both the reporting of emissions and related data collection. The NZCE Roadmap outlines which stakeholders are best positioned to access data for each emission source category. **These stakeholders should ensure that systems are in place to collect and share relevant data**, enabling cohesive emission measurement and reporting across the value chain.



3. Methodology Approaches and Considerations

3.1 Three Tiers of Quantification and Progression

While calculating emissions using primary data yields the most accurate results, it may not always be possible for events to obtain all the primary data for each of the ten categories. The capacity to collect primary data also varies widely between events that are just starting out on their net zero and measurement journey as compared to those with established practices. This guideline outlines a three-tier system for each emission source category, enabling events to start calculating their GHG emissions regardless of their data collection and emissions measurement maturity: Basic, Intermediate and Advanced. **Over time, events should progress through the tiers as capacities increase and may already implement higher-tier steps whenever feasible[6].**

3.2 Hierarchy of Selection of Emission Factors

Several emission factor (EF) databases exist globally for the same emission sources. This guideline uses German databases wherever possible to better reflect the regional context. For some emission source categories, international databases may offer more detail or suitability than current German databases. Here, government-issued databases are given priority. Each section specifies the recommended EF database for each emission source category. While the guideline refers to the latest available database versions at time of publication, **guideline users should ensure that they use the latest version of each EF database if updates occur**.

[6] For example, an event reporting at the basic tier for Energy may implement a step from the Intermediate tier or from the Advanced tier, if it is already able to.

3.3 Assumptions, Coefficients, and Proxy Data Are Essential

For most events, primary data is not available for all emission sources, making the use of proxy and secondary data essential. Therefore, the guideline provides guidance on how to support the most basic level of measurement and reporting based on the NZCE measurement methodology and supplemented for the German context based on input from the corresponding AUMA working group. Data collection for assumptions should be expanded in future guideline versions to ensure the most accurate representation. **Wherever more accurate, context-specific assumptions are available, they should take precedence**. Proxy data can be applied based on direct emissions or on activity data from similar events. They should ideally be extrapolated using intensity metrics, such as number of attendees, or overall event floor area (m^2). Users should transparently disclose their assumptions and coefficients used.

3.4 General Approach to Apportionment

Apportionment of shared emissions to different stakeholders or activities, is fundamental to any carbon calculation methodology. In the events industry, apportionment becomes critical when multiple events occur in parallel in the same venue, or share materials, logistics, or waste disposal services.

The general proposed apportionment approach is illustrated in the formula below with further instructions for each emission source provided in the corresponding sections. The apportionment approaches outlined in this document represent the current recommended approaches based on industry feedback and might be updated in future guideline versions. **Events may choose other apportionment methods as long as they are disclosed transparently**.

General apportionment formula:

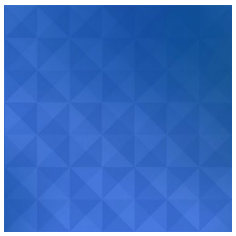
> Apportioned figure = Total figure * (event's share of chosen apportionment metric / total of chosen apportionment metric)

Different apportionment metrics can be used for different emission source categories, including:

- the number of attendees
- occupied floor area
- duration of event

The table below illustrates an example of apportionment by the number of attendees for two events that generated 1,000 tons of total waste. Users should refer to this example for all emission source categories even when using the other metrics mentioned above. Only the *Production and Materials and Energy* categories use different approaches. Please refer to the respective sections for more context.

	Event 1	Event 2
Number of attendees	120	280
% share of attendees	30%	70%
Apportioned waste	300 tonnes	700 tonnes



4. Measuring Event Emissions

4.1 Production and Materials

4.1.1 What this source contains

Ideally, all materials purchased for the event should eventually be accounted for in this category. This may include materials in categories such as stand materials/construction elements, signage materials, marketing materials, furniture, A.V. & I.T. equipment, and other materials. For a more comprehensive list of individual materials, refer to Appendix C. Since data collection for some materials may be difficult, section 4.1.7 provides further guidance on the materials to prioritize.

Standing investments (such as furniture or A.V/I.T. equipment) may be excluded. It is assumed that the expected high level of reuse for such items would result in immaterial emissions when apportioned to each event[7]. For other items, the amount of expected reuse and resulting immateriality remains unclear. The industry will be further consulted on this (including through the NZCE initiative)[8].

Emissions from this category reflect the embodied carbon of each item, accounting for the emissions across the item's lifecycle up until the point of sale (including stages such as extraction of the raw materials, processing, and production of the final product, as well as transport of the materials to the point of sale).

4.1.2 Primary data to be collected

- Materials purchased for the event (including type and total weight)
- Furniture items and A.V./I.T. equipment rented or purchased for the event (including type and quantity)

4.1.3 Secondary data and assumptions to use

Just like the NZCE measurement methodology, this guideline version was not able to identify assumptions for this emission source category. When industry progress is made, assumptions will be included in future guideline versions. Events may use their own assumptions as long as they are transparently disclosed.

[7] Contrary to NZCE's approach, standing investments are directly excluded from the boundary of included emission sources based on their assumed immateriality and high level of reuse. Please see more context in Appendix E.

[8] See Appendix D for more context.

If primary data or assumptions cannot be obtained, use data from a similar event as a proxy. Ensure that event types align closely: exhibitions with elaborate single use stands generally use more materials than events with no or only limited stand use or reusable stands, for example. If data from a similar event is unavailable, industry level coefficients, such as those currently being developed by the NZCE initiative, may also be used.

If weight-based data is difficult to access for materials, databases such as the Plastics measurement methodology for Accommodation Providers by the Global Tourism Plastics Initiative (GTPI) can be used to convert quantity-based data into weight. Additional databases will be included in future versions of this guideline.

4.1.4 Emission factors to use

As it is unlikely that one database covers all materials used by an event, multiple databases may be used for this category. Use the databases below in the order prescribed. This means the Umweltbundesamt database should be consulted first for the desired EF, followed by DESNZ database if the Umweltbundesamt database does not contain the desired EF, and so on. If required EFs are unavailable in these databases, other databases may be used, as long as they are transparently disclosed.

	Database	Latest Published Dataset	Relevant Location in Dataset
1	Umweltbundesamt – Germany, Probas	2024	Sections: Herstellung von Rohmaterialien, Herstellung von verarbeiteten Produkten
2	Department for Energy Security and Net Zero (DESNZ) - UK, Greenhouse Gas Reporting: Conversion Factors	2023	Tab: Material use
3	Agence de la transition écologique (ADEME) – France, Base Carbone	2024	Sections: Achats de matière et de biens
4	Circular Economy and University of Bath, Inventory of Carbon and Energy (ICE) Database	2019	Full dataset
5	NZCE initiative, Materials Library	To be finalized by NZCE	

4.1.5 Calculation formula to use

When primary data on materials is available:

1. Collect weight of each material type and calculate emissions per material using the following formula:

GHG emissions of material = Weight of material (kg) * EF of material ($kgCO_2e/kg$)

2. Collect quantity of each furniture item and A.V. and I.T. equipment type and calculate the emissions per item or equipment using the following formula:

GHG emissions of furniture item or AV and IT equipment = Quantity of furniture item or AV and IT equipment * EF of furniture item or AV and IT equipment ($kgCO_2e/unit$)

3. Use the following formula to calculate the total emissions for the category.

GHG emissions of all materials, furniture, and AV and IT equipment ($kgCO_2e$) = sum of GHG emissions of all materials + sum of GHG emissions of all furniture, and A.V. and I.T. equipment

4.1.6 Apportionment to use

Apportionment of materials and furniture emissions should be conducted when the same materials, furniture, or A.V. and I.T. equipment are reused for multiple events. To do so, collect data on the number of events a particular item is planned to be reused at.

Use the following formula to apportion the emissions from one reused material:

GHG emissions for event's item use = Total GHG emissions for reused item / total number of events where item is planned to be reused

4.1.7 Measurement expectations for each tier

Tier	Expectations
Basic	– Collect primary data for materials of categories with the highest impact (in the exhibition context, these usually include stands, carpets and signage); include other materials if material amounts are used. – Use secondary data, assumptions, or industry coefficients to determine the emissions associated with other materials and materials that primary data isn't available for.
Intermediate	– Expand primary data collection to include other significant event materials, such as furniture, AV and IT equipment (if rented or bought specifically for the event and not planned to be reused), catering-related materials, and marketing materials. – Use secondary data, industry coefficients or assumptions to determine the emissions associated with other materials and materials that primary data isn't available for.
Advanced	– Further expand primary data collection to include supplier specific data for the embodied carbon of materials used (using a lifecycle assessment). – Apportion emissions for reuseable materials in line with the "Apportionment" section.

4.2 Freight and Logistics

4.2.1 What this source contains

This category includes emissions from freight and transportation of goods and materials before, during and after an event. It covers emissions from fuels used in freight vehicles, as well as the upstream emissions from fuel production and transportation[9]. Transportation of waste after the event should be accounted for in the *Waste* section.

4.2.2 Primary data to be collected

- Total number of trips per transportation type
- Round-trip distance (i.e., total distance from the shipment's origin to event venue and back)
- Weight of shipment
- Type of transportation
- Fuel consumption of vehicle

4.2.3 Secondary data and assumptions to use

Just like the NZCE measurement methodology, this guideline version was not able to identify assumptions for this emission source category. When industry progress is made, assumptions will be included in future guideline versions. Events may use their own assumptions as long as they are transparently disclosed.

If primary data cannot be collected, use the average freight emissions from a similar event (e.g. similar organization, destination and/or event type) as a proxy.

4.2.4 Emission factors to use

Database	Latest Published Dataset	Relevant Location in Dataset
Global Logistics Emissions Council, GLEC Framework as found in Umweltbundesamt & DSLV (2024), Treibhausgasemissionen im Transportsektor Leitfaden zur ISO 14083	2023	Chapter 3 Data, Module 2 Default fuel efficiency and GHG emission intensity values

[9] Emissions from fuel usage or distance travelled by onsite logistic vehicles such as forklifts are generally very small but should be included if material. Therefore, materiality should be assessed for such onsite logistics vehicles.

4.2.5 Calculation formula to use

1. Use one of the following formulas to calculate emissions separately for each transport type.
2. If multiple shipments use the same transport type, first calculate the tonne-kilometer separately for each shipment using the formula: Weight of shipment (t) * Distance shipment travelled (km). Then, sum the tonne-kilometers of all shipments of the same type and multiply by the relevant EF[10].

Mobile combustion (in GLEC referred to as Tank-to-Wheel/TTW)

GHG emissions for each transport type = Weight of shipment (t) * Distance shipment travelled (km) * TTW EF for transportation type (g CO_2e/t-km)

Well-to-Wheel (WTW) emissions (only required for the advanced tier)

GHG emissions for each transportation type = Weight of shipment (t) * Distance shipment travelled (km) * WTW EF for transportation type (g CO_2e/t-km)

For multiple shipments using the same transport type

GHG emissions for each transport type = sum of [Weight of shipment (t) * Distance shipment travelled (km) for each shipment] * TTW or WTW EF for transportation type (g CO_2e/t-km)

4.2.6 Apportionment to use

Apportionment is needed if a freight load contains logistics for multiple events (which can be used to save on logistics cost). To do so, collect data on the weight of the freight load transported as well as the event's share of the load. If data on the total weight is not available, events can use an estimate figure, provided it is transparently disclosed as such. Events may use the carrying capacity categories of the DESNZ database as estimates (use to the "Freighting goods" tab and the "Type" or "Size" column depending on the transport type).

Use the following formula to apportion the emissions from one freight load:

GHG emissions for event's freight load = Total GHG emissions for freight load * (Event's share of weight / Total weight)

4.2.7 Measurement expectations for each tier

Tier	Expectations
Basic	– Use secondary data and assumptions to calculate emissions.
Intermediate	– Collect primary data from logistics partners, carriers and suppliers to calculate emissions. – Use industry coefficients only where primary data is not available.
Advanced	– Collect primary data from logistics partners, carriers and suppliers to calculate emissions. – Use apportionment where needed. – Include upstream emissions of fuels used by using the WTW EFs.

[10] An example calculation can be found in Appendix A.

4.3 Food and Beverage

4.3.1 What this source contains

This category covers emissions resulting from food and beverage (F&B) items purchased for the event. This guideline recommends EFs that adopt a cradle-to-retail lifecycle approach to ingredient-level measurement[11]. Retail-to-grave activities[12] are excluded from this category, as they are already covered by other emission source categories (i.e., *Freight and Transportation, Energy*, and Waste).

4.3.2 Primary data to be collected

- Food items purchased for the event (total weight per item type)
- Beverage items purchased for the event (total weight per item type)

4.3.3 Secondary data and assumptions to use

If primary data on individual F&B items is unavailable, use meal-based EFs to calculate emissions as outlined in section 4.3.5. For beverage-related emissions, estimate the average beverages served per person and apply the corresponding EFs.

If meal proxies cannot be obtained, use total F&B data from a similar event as a proxy. It is critical to use a similar event type; for instance, an exhibition centered around F&B likely has more catered food than an automotive exhibition.

4.3.4 Emission factors to use

Database	Latest Published Dataset	Relevant Location in Dataset
Reinhardt, G., Gärtner, S., Wagner, T., Ökologische Fußabdrücke von Lebensmitteln und Gerichten in Deutschland.	2020	Section: 4.1 Ergebnisse: CO_2-Fußabdrücke

4.3.5 Calculation formula to use

When primary data on F&B items is available:

1. Collect the total weight of each F&B item used.
2. Use the following formula to calculate the total emissions of the F&B purchased for the event:

GHG emissions of all F&B items = Weight of F&B item 1 (kg) * EF of F&B item 1 ($kgCO_2e/kg$) + Weight of F&B item 2 (kg) * EF of F&B item 2 ($kgCO_2e/kg$), etc.

[11] The cradle-to-retail lifecycle of F&B ingredients generally includes the agricultural production, transport, processing, packaging, and ultimately sale of the products.

[12] Retail-to-grave activities of F&B include any transport, processing, and discarding of products after the original point of sale

When primary data on F&B items is not available:

1. Select the meals that most closely resemble those served at the event on p. 18 of the "Ökologische Fußabdrücke von Lebensmitteln und Gerichten in Deutschland" document. If no meal proxy closely matches the meals served, use the proxy with the highest estimated emissions for the respective meal category (e.g., beef, chicken, fish, vegetarian, or vegan meal). F&B-related emissions in the Freight and Logistics, Energy, and Waste sections should still be calculated as outlined in the respective sections of this guideline.
2. Use the following formula to calculate the total emissions of meals purchased for the event:

GHG emissions of all meals = Meal type 1 * EF of meal type 1 ($kgCO_2e$/portion) + Meal type 2 * EF of meal type 2 ($kgCO_2e$/portion), etc.

4.3.6 Apportionment to use

If F&B items are purchased in bulk for multiple events, and primary data on the quantity of items used for each event is not available, **apportionment may be done using the number of attendees for each event using the following formula**:

GHG emissions for event's F&B items = Total GHG emissions for F&B items * (Percentage of event's attendees across all events considered / Total attendees of all events considered)

In some cases, such as for beverages, F&B items not used in one event are stored for use at another event. Exclude the emissions of these "transferred" items from the original event's footprint and add them to the new event's footprint.

4.3.7 Measurement expectations for each tier

Tier	Expectations
Basic	– Use assumptions to estimate beverage related emissions – Use meal-based EFs to calculate food related emissions
Intermediate	– Start collecting primary data for ingredient-level emissions calculations – Use estimations and meal-based EFs where primary data is not yet available
Advanced	– Work with catering providers to collect ingredient-level primary data on all F&B items purchased – Include data related to F&B sold in venue cafes, kiosks, or food trucks (see Appendix E for more details)[13]

[13] Contrary to NZCE's approach, F&B items from venue cafes, kiosks, and food trucks are included emission sources in this guideline based on the assumed level of control of event organizers and materiality of the source in the German context. Please see more context in Appendix E.

4.4 Travel To and From Destination

4.4.1 What this source contains

This category refers to emissions resulting from the travel of all stakeholders attending the event from their destination of origin, including exhibitors, organizers, service providers, and attendees, throughout all event stages. This includes the emissions from fuels used, as well as upstream WTT emissions.

Travel emissions of local attendees residing in the same destination as the event are also included in this category because – like non-local attendees – they are also arriving from their point of origin (even if it is in the same destination). However, non-local attendees' travel within the destination, such as from their hotel to the event venue, should be accounted for in the *Local Transportation* section.

4.4.2 Primary data to be collected

- Each mode of transport (e.g. plane, rail, bus, car)
- Distance traveled for each mode of transport
- Number of total attendees for each mode of transport
- For flights: Travel class

Note that travel class data should be aligned with DESNZ categories. Refer to the table below for how travel class data should be structured.

DESNZ Category	Class
Short-haul, to/from UK (for flights within Europe, including domestic flights within Germany)	Economy class
	Business class
Long-haul, to/from UK (for flights between Germany and countries outside of Europe)	Economy class
	Premium economy class
	Business class
	First class

4.4.3 Secondary data and assumptions to use[14]

If primary data is not available, use the following assumptions:

– Assume all attendees travel round-trip (twice the one-way distance from their destination of origin).

– Refer to the flow chart below for assumptions based on different levels of data availability.

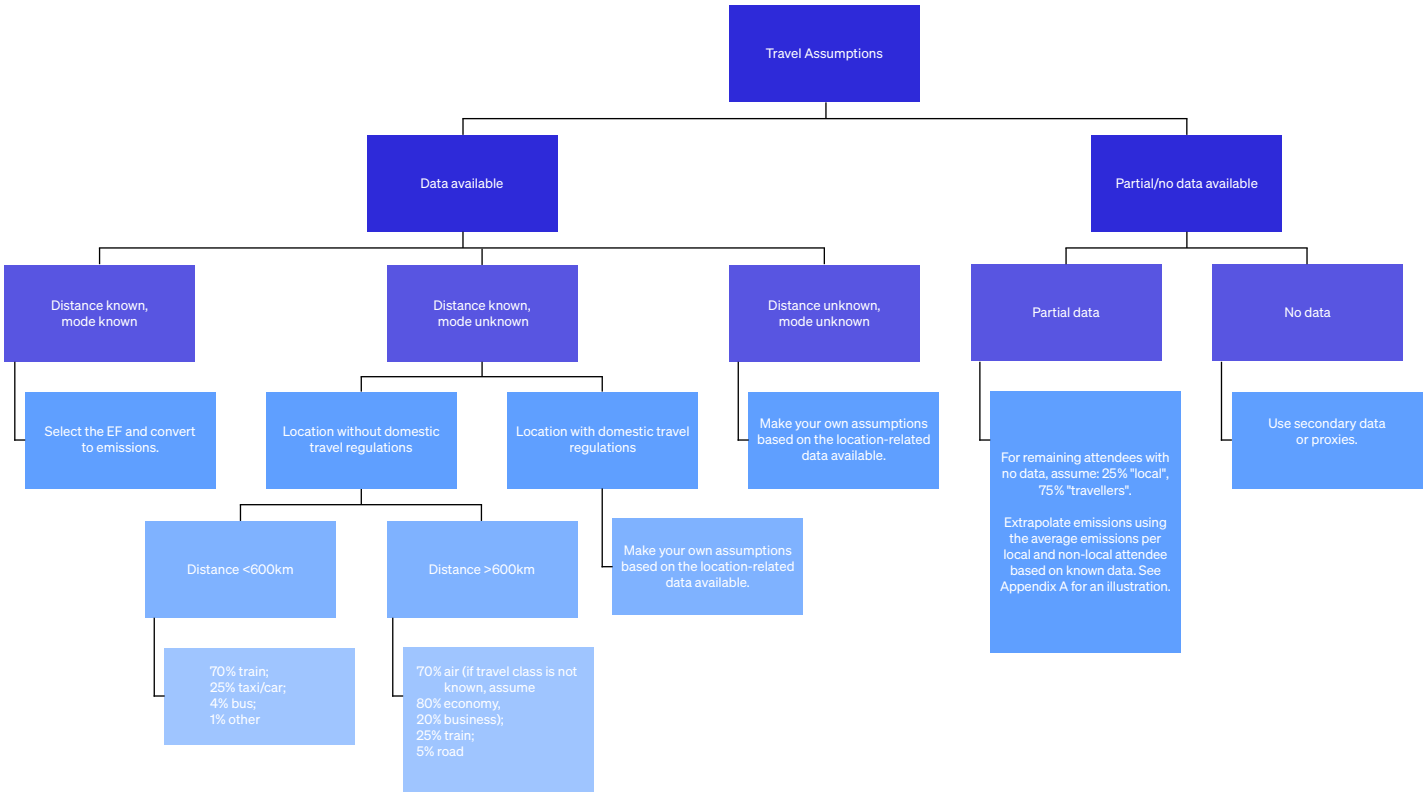


Figure 1: Travel to and from destination assumptions (own compilation)

If assumptions cannot be applied, use a similar event's primary data or total emissions for this category as a proxy. Alternatively, use an industry coefficient for the average carbon intensity per attendee.

4.4.4 Emission factors to use

Scope	Database	Latest Published Dataset	Relevant Location in Dataset
Flights	Department for Energy Security and Net Zero (DESNZ) - UK, Greenhouse Gas Reporting: Conversion Factors	2023	Tabs: Business travel – air, WTT – business travel – air
Non-flights	Umweltbundesamt – Germany, Probas	2024	Section: Transportprozesse
WTT emissions for all modes	Department for Energy Security and Net Zero (DESNZ) - UK, Greenhouse Gas Reporting: Conversion Factors	2023	Tabs: Business travel – air, WTT – business travel – air

[14] Note that the assumptions provided are based on information from AUMA stakeholders and from industry research conducted for the NZCE methodology.

4.4.5 Calculation formula to use

Calculate the emissions for each transportation type (i.e. flights, train, bus, etc.) using the formula below:

Mobile combustion

- GHG emissions for flights, buses, and rail = Distance travelled (km) * Number of passengers * EF ($kgCO_2e$/passenger.km)
- GHG emissions for each transportation type (except flights, buses, and rail) = Distance travelled (km) * EF ($kgCO_2e$/km)

Upstream (WTT) emissions (only required in the advanced tier)

- GHG emissions for flights, buses, and rail = GHG emissions for mobile combustion + [Distance travelled (km) * Number of passengers * WTT EF ($kgCO_2e$/passenger.km)]
- GHG emissions for each transportation type (except flights, buses, and rail) = GHG emissions for mobile combustion + [Distance travelled (km) * WTT EF ($kgCO_2e$/km)]

4.4.6 Apportionment to use

Apportionment is recommended if an attendee travels to the destination to attend multiple different events. While this information is not practically easy to obtain, when available, apportionment may be conducted based on the number of days of the events, using the formula below.

GHG emissions for event = Total GHG emissions from travel * (Number of days of event / Total number of days of all events)

4.4.7 Disclosure expectations for radiative forcing of aviation emissions

In line with the NZCE methodology, **this guideline strongly recommends but does not mandate the inclusion of radiative forcing from flights**. To account for radiative forcing, select the relevant EF in the DESNZ database under the “With RF” columns.

This guideline **requires** the disclosure of the following information on radiative forcing:

- Whether radiative forcing is included or excluded in their calculations and figures.
  - If excluded, the rationale for not including radiative forcing.
  - If included, the factor applied and the database used.
- Whether the company commits or plans to publicly report on radiative forcing in the future.

In addition, this guideline notes that companies that currently exclude radiative forcing now may have to recalculate and re-baseline their targets in the future, potentially doubling their past footprint.

4.4.8 Measurement expectations for each tier

Tier	Expectations
Basic	– Use information from attendee registration forms to make assumptions about travel distance and mode. – Use assumptions or secondary data from other events as proxy.
Intermediate	– Design and implement attendee registration forms to collect primary data on transport mode, destination of origin, and travel class (for flights). – Use assumptions, secondary data, or industry coefficients to fill in data gaps.
Advanced	– Enhance attendee registration forms to collect all relevant primary data. – Use improved industry coefficients to fill in any gaps. – Include the effects of radiative forcing for flights. – Include upstream (WTT) emissions of fuels used.

4.5 Local Transportation

4.5.1 What this source contains

This source covers emissions from transporting attendees within the destination specifically for the event, including transportation between hotels and the venue, as well as between the airport or railway station and the venue or hotels. Detours taken by attendees are excluded. Upstream (WTT) emissions from fuels used should be included.

4.5.2 Primary data to be collected

- Mode of transport (e.g., bus, rail, taxi)
- Distance travelled (use a mapping tool, such as google maps, to determine the distance between hotel and venue, train station, or airport)
- Type of transport (e.g., small car, SUV, luxury)[15]
- Number of passengers per transport type
- For event-owned or managed vehicles: amount of fuel used

4.5.3 Secondary data and assumptions to use

If primary data on attendees' travel within the destination is unavailable, use the following assumptions:

- Assume all attendees travel to and from the event venue only once a day.
- If the attendee's length of hotel stay is equivalent to the number of days of the event, assume that the attendee attended the entire event. Therefore, the total distance travelled should be:

Total distance per trip = Number of days of event * two-way distance (km)

If the attendee's length of stay and attendance is not available, assume the following:

- Visitors:
  - for a one-day event: 1 day
  - for a multi-day event: 50% of the event duration[16]
- Exhibitors: entire length of event, plus 1 day each before and after the event[17]
- Organizers: entire length of venue tenancy period, including the entire length of event, setting up and dismantling
- Service providers: entire length of service contract

[15] This information may be required depending on the EFs used.

[16] For example, for a 3-day event, assume for calculation purposes that each visitor attends the event for 1.5 days.

[17] For example, for a 3-day event, assume that each exhibitor travels to the venue for 5 days. However, if exhibitors work with external partners for construction, assume that each exhibitor travels to the venue for only the length of the event (e.g. 3 days, using the same example). This is because, in this case, they are not involved in person for setting up or dismantling.

- If a hotel is located in the same building complex as the venue, assume that the emissions from local transportation is zero.
- If attendees' hotel information is unavailable, assume the distance between the airport/ train station, hotel, and event venue as follows:
  - Each attendee's two-way travel distance between the airport or railway station and hotel equals the distance between the nearest airport/ train station and the event venue. Each event should define this distance for their specific venue.
  - Each attendee's average two-way travel distance between the hotel and venue is 20km.
- If carpooling data is not available, assume a carpooling factor of 1.5.[18]
- If local transport mode data is unavailable, assume the mode as follows:

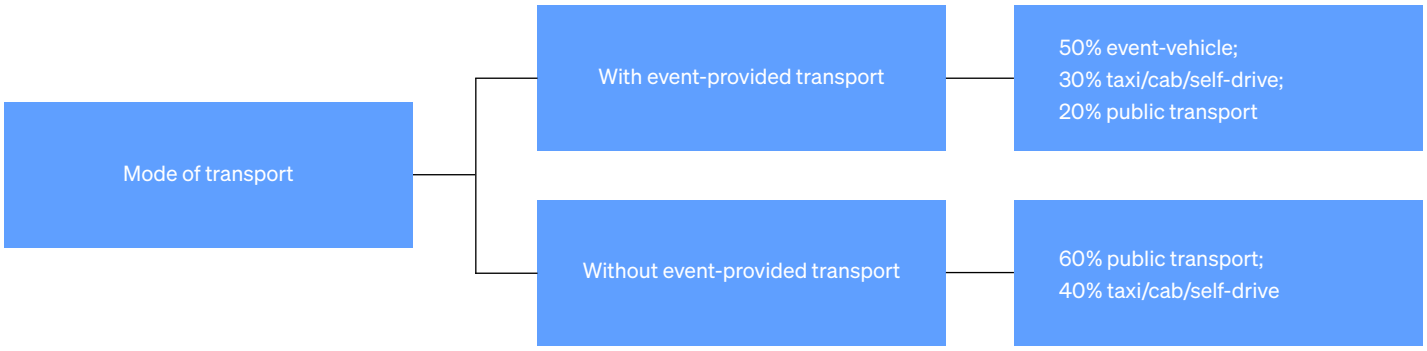


Figure 2: Local transportation assumptions (own compilation)

If assumptions cannot be applied, use the GHG emissions or primary data (e.g. average distance travelled per attendee) from a similar event (e.g., an event of the same type in Germany) as a proxy.

4.5.4 Emission factors to use

Scope	Database	Latest Published Dataset	Relevant Location in Dataset
Mobile combustion	Umweltbundesamt – Germany, Probas	2024	Section: Transportprozesse
WTT emissions	Department for Energy Security and Net Zero (DESNZ) - UK, Greenhouse Gas Reporting: Conversion Factors	2023	Tabs: WTT- pass vehs & travel- land; WTT- fuels

[18] To use the carpooling factor, divide the total number of cars and taxis by 1.5. Refer to Appendix A for an illustration of the calculation.

4.5.5 Calculation formula to use

Mobile combustion

- GHG emissions for public transportation = Distance travelled (km) * no. of passengers * EF ($kgCO_2e$/passenger.km)
- GHG emissions for private transportation = Distance travelled (km) * EF ($kgCO_2e$/km)
- GHG emissions for event-owned or managed vehicles = Mobile fuel consumed (kg) * EF ($kgCO_2e$/kg)

WTT emissions (only required in the advanced tier)

- GHG emissions for public transportation = GHG emissions from mobile combustion + [Distance travelled (km) * no. of passengers * WTT EF ($kgCO_2e$/passenger.km)]
- GHG emissions for private transportation = GHG emissions from mobile combustion + [Distance travelled (km) * WTT EF ($kgCO_2e$/km)]
- GHG emissions for event-owned or managed vehicles = GHG emissions from mobile combustion + [Mobile fuel consumed (kg) * WTT EF ($kgCO_2e$/kg)]

4.5.6 Apportionment to use

If an attendee travels to the same venue to attend multiple different events, apportionment can improve GHG accounting accuracy. However, as this information is challenging to obtain and the associated emissions are likely not significant, apportionment is not required, and double counting may occur between events.

4.5.7 Measurement expectations for each tier

Tier	Expectations
Basic	– Calculate GHG emissions from transportation with event-owned or managed vehicles using primary data. – For other transportation types, estimate GHG emissions using secondary data or assumptions.
Intermediate	– Design and implement attendee registration forms to collect primary data for mode of transport, hotel location, and preferred transportation type. – Use secondary data and assumptions to fill data gaps.
Advanced	– Enhance attendee registration forms to collect all relevant primary data. – Use improved industry coefficients to fill in any gaps. – Include upstream (WTT) emissions of fuels used.

4.6 Accommodation

4.6.1 What this source contains

This category includes emissions from hotel stays of event attendees (**excluding local attendees** which are assumed not to use accommodations). Events should include emissions in line with the Hotel Carbon Measurement Initiative (HCMI) methodology[19]. This includes emissions from the hotel's energy use due to the attendee's stay (Hotel's scope 1 and 2 emissions), as well as outsourced laundry where applicable (Hotel's scope 3 emissions)[20].

4.6.2 Primary data to be collected

– Emission figures provided by the hotel(s) in alignment with the HCMI methodology

If this data is not available for the relevant hotels:

– Total room nights[21]

– Hotel information (hotel name, location, stars)

4.6.3 Secondary data and assumptions to use[22]

If primary data for calculating total room nights is not available, use the following assumptions depending on the stakeholder type (for any non-local stakeholders). These assumptions are based on stakeholders arriving the night before their first day of attendance (resulting in a room night) but leave the last day of their attendance.

– Visitors:
  – For a one-day event: 1 room night
  – For a multi-day event: 50% of the event duration[23]
– Exhibitors: Entire length of event, plus 2 additional room nights for setting up and dismantling[24]
– Organizers: Entire length of venue tenancy period[25]
– Service providers: Entire length of service period as stated in the contract[26]

If unable to calculate total room nights using assumptions, use total room nights from a similar event as a proxy.

4.6.4 Emission factors to use

Usually, hotels will be able to provide emissions figures based on the HCMI methodology. If they do not, the EF database below should be used to calculate emissions based on proxy data. This database uses actual HCMI aligned data of 30,000 hotels globally and calculates ranges for different markets and segments.

Database	Latest Published Dataset	Relevant Location in Dataset
Greenview, Hotel Footprinting Tool (HFT)	2024	Full dataset

[19] World Sustainable Hospitality Alliance (2022): Hotel Carbon Measurement Initiative, v2.0, https://sustainablehospitalityalliance.org/resource/hotel-carbon-measurement-initiative

[20] Emissions from all other Scope 3 categories of the hotel, such as the hotel's business travel, employee commute etc. is excluded from this guideline.

[21] A room night refers to one hotel room that is used for one overnight stay.

[22] Note that the assumptions provided are based on information from AUMA stakeholders and from industry research conducted for the NZCE Methodology.

[23] For example, for a 3-day event, assume for calculations that visitors attend the event for 1.5 days and therefore use 2 room nights.

[24] For example, for a 3-day event, assume that exhibitors attend the event for 5 days and use 5 room nights. However, if exhibitors work with external partners for construction, assume that each exhibitor travels to the venue for only the length of the event (e.g. 3 days, using the same example, resulting in 3 room nights). This is because they are not involved in person for setting up or dismantling.

[25] For example, for a 3-day event with a 7-day venue tenancy period, assume that each organizer stays for 7 room nights.

[26] For example, for a 3-day event with a 7-day service period, assume that each service provider employee stays for 7 room nights.

4.6.5 Calculation formula to use

For hotels that do not provide emission data, collect or calculate the total room nights per hotel where attendees are staying[27].

1. Collect information on the hotel location (country, city, state, etc.) and hotel stars (2-5 stars).
2. Use the latest HFT to calculate the emissions coefficient per room night using the most detailed geographic location data available. If the hotel stars are not known or cannot be estimated, use the “All Stars” option.

GHG emissions of each hotel = Room nights * HFT emissions coefficient ($kgCO_2e$)

4.6.6 Apportionment to use

Apportionment should be considered when an event attendee attends multiple events in the same destination, while staying at the same hotel. However, as this is difficult to track, not using apportionment and resulting double counting between events is likely and accepted.

4.6.7 Measurement expectations for each tier

Tier	Expectations
Basic	– Use assumptions to estimate total room nights – Use HFT to estimate emissions from accommodations.
Intermediate	– Collect data on room nights and attendee hotel choice using attendee registration forms. – Request HCMI emissions figures from hotels. – For hotels not providing HCMI emissions figures, use HFT to estimate emissions.
Advanced	– Collect room night data and data on attendee hotel choice using attendee registration forms. – Work with hotels and partners to determine if attendees are attending multiple events, possibly through attendee registration forms or additional surveys. – Use apportionment where needed.

[27] Emissions per room night should be calculated separately for each hotel using the HFT, as estimations are based on the hotel’s location and type.

4.7 Energy

4.7.1 What this source contains

This category includes emissions from energy used at the event, including onsite and offsite venues (both owned and rented). Emissions from energy used at attendees' hotels, by event-owned or managed vehicles, or for logistics should be accounted for in the *Accommodation, Local Transportation*, and *Freight and Logistics* sections respectively.

Energy is used by events in three main ways:

1. Fuels: Typically used by appliances such as generators, heating and cooling systems (that use e.g., natural gas or propane), cooking equipment, and lighting towers.
2. Purchased electricity, cooling and heating: Energy sourced from utilities instead of using fuel onsite.
3. Refrigerants: Emissions from chemicals or gases released from air conditioning, refrigeration, and fire suppression equipment[28].

4.7.2 Primary data to be collected

In general:

– With sub-metering: Collect meter specific data from start to end of lease for the event area.

– Without sub-metering: Collect actual data from start to end of lease for the entire area. Apportionment is then necessary for the specific event area leased. See Section 4.7.6 for further guidance.

For fuels:

– Amount of fuel used per fuel type

For purchased electricity, cooling, and heating:

– Total electricity used

– Total purchased heating

– Total purchased cooling

– Amount of purchased electricity in the form of Renewable Energy Certificates (RECs) or Energy Attribute Certificates (EACs)

– Amount of renewable electricity generated onsite

For refrigerants:

– Type of refrigerant gas used in each refrigeration system

– Amount of refrigerant gas leaked from each system[29]

[28] Note that refrigerants are not an energy source but rather associated with energy use.

[29] This data can be obtained by checking the amount of gas that was topped up based on the event's use.

4.7.3 Secondary data and assumptions to use

Just like the NZCE measurement methodology, this guideline version was not able to identify assumptions for this emission source category. When industry progress is made, assumptions will be included in future guideline versions. Events may use their own assumptions as long as they are transparently disclosed. Secondary data may be used according to the following points:

- *For fuels:* Use the average fuel use from a similar event as a proxy.
- *For purchased electricity*, heating and cooling: No secondary data should be used as collecting primary data for these sources should generally be straightforward.
- *For refrigerants:* Apply default leakage rates of refrigerant emissions based on global estimates, or a proxy percentage of total emissions.

4.7.4 Emission factors to use

Energy Type	Database	Latest Published Dataset	Relevant Location in Dataset
Fuels	Umweltbundesamt – Germany, CO_2 Emission Factors for Fossil Fuels	2022	Table 23: CO_2 emission factors – fuel-related emission factors (excerpt; last revision: 15 February 2022)
Purchased electricity, heating and cooling (location based)	Umweltbundesamt - Germany, Entwicklung der spezifischen Treibhausgas-Emissionen des deutschen Strommix	2023	Table 1: Gerundete Ausgangsgrößen und Berechnungsergebnis: Emissionen der Stromerzeugung, Stromverbrauch und Emissionsfaktor des Stroms Use the "THG Emissionsfaktor ohne Vorketten [g CO_2- Äquivalente / kWh]" value for the respective year if excluding upstream (WTT) emissions; otherwise use the "THG Emissionsfaktor mit Vorketten [g CO_2- Äquivalente /kWh]" value.
Purchased electricity (market-based)	Association of Issuing Bodies, European Residual Mixes	2023	Table 2: Residual Mixes 2022 (in the PDF Report)
Refrigerants	Department for Energy Security and Net Zero (DESNZ) – UK, Greenhouse gas reporting: conversion factors	2023	Tab: Refrigerant & other

Note that for purchased electricity, EFs for both location-based and market-based calculations are provided. In general, **location-based** emissions reflect the average emissions intensity of the grid where the event venue is located, **while market-based** emissions reflect the emissions intensity of electricity based on specific purchase contract agreements.

For market-based calculations: If the event cannot obtain EFs directly from the electricity supplier, use the provided EF for the residual mix.

4.7.5 Calculation formula to use

For fuels:

GHG emissions per fuel type = Amount of fuel consumed (kg) * EF ($kgCO_2e/kg$)

For purchased electricity, heating, and cooling:

- GHG emissions for purchased electricity (location-based) = Amount of total electricity consumed (kWh) * Location-based grid EF ($kgCO_2e/kWh$)
- GHG emissions for purchased electricity (market-based) = (Amount of total electricity purchased – Amount of renewable electricity purchased in form of RECs or EACs) * Market-based grid EF ($kgCO_2e/kWh$)
- GHG emissions for heating/cooling = Amount of heating/cooling purchased (kWh) * EF ($kgCO_2e/kWh$)

For refrigerants:

- GHG emissions per refrigerant gas type = Amount of refrigerant leaked (kg) * EF ($kgCO_2e/kg$)

For upstream (WTT) emissions:

- Upstream emissions of fuel = Amount of fuel used (kg) * Upstream fuel EF ($kgCO_2e/kg$)
- Upstream emissions of purchased electricity = Amount of electricity used (kWh) * Upstream electricity EF ($kgCO_2e/kWh$)
- Transmission and distribution (T&D) loss emissions of purchased electricity = Amount of electricity used (kWh) * Grid loss EF ($kgCO_2e/kWh$)

4.7.6 Apportionment to use

Apportionment is necessary if multiple events are taking place at the same venue without sub-metering of the specific areas. **Apportionment for energy should be calculated based on both floor area used and duration of event** (in number of days or hours)[30]**, using the formula below:**

Energy used for event (kWh) = Total energy used (kWh) * [duration of event (hours) * floor area used (m^2)] / [sum of duration of event (hours) * floor area used (m^2) for all events]

Below is an illustration of how apportionment can be calculated for two events that consumed 10,000 kWh of purchased electricity in total:

	Event A	Event B
Duration of event	8 hours	16 hours
Floor area used	20,000 m^2	30,000 m^2
Duration of event * Area used	160,000	480,000
Apportionment ratio	160,000 / (160,000 + 480,000) = 0.25	480,000 / (160,000 + 480,000) = 0.75
Apportioned kWh	2,500 kWh	7,500 kWh

[30] Contrary to the NZCE initiative's approach, apportionment recommended in this guideline includes both duration of the event and floor area used. Please see more context in Appendix E.

4.7.7 Measurement expectations for each tier

Tier	Expectations
Basic	– Calculate emissions from purchased electricity, heating and cooling using primary data. Use apportionment if sub-metering is not available. – If primary data for fuels and refrigerants cannot be collected, use secondary data to estimate emissions. – Data collection in external venues (especially of international partners) may be more difficult. In this case, secondary data may also be used for purchased electricity, heating and cooling in the basic tier.
Intermediate	– Work with venues to implement sub-metering to collect primary energy data apportioned for the event. – Use secondary data to estimate emissions for any fuels or refrigerants that cannot be measured onsite.
Advanced	– Work with venues to collect complete energy data usage during the event. – Use improved industry coefficients to fill in any gaps. – Include upstream (WTT) emissions of fuels used.

4.8 Water

4.8.1 What this source contains

Although water consumption itself does not typically produce GHG emissions, indirect emissions arise from the energy used in water distribution and transportation within the network.

This category includes emissions from water used at an event, including onsite and offsite venues (both owned and rented). This excludes bottled water served for drinking purposes, but includes tab water and water used in sanitary, cooling, or related systems. Water used at attendees' hotels is outside the scope of this guideline.

While not part of the NZCE measurement methodology, this category has been included in this guideline given that the EF for water is easily available through the Probas database and consumption data is also easily accessible via meter readings or invoices.

4.8.2 Primary data to be collected

– Purchased water (in liters)

– Groundwater withdrawn e.g., from on-site wells (in liters)

– Any other water used for the purposes mentioned in the section above (in liters)

With sub-metering: Collect meter specific data from start to end of lease for the event area

Without sub-metering: Collect actual data from start to end of lease for the entire area. Apportionment is then necessary for the specific event area leased. Refer to "Apportionment" below for further guidance.

4.8.3 Secondary data and assumptions to use

This guideline version was not able to identify assumptions for this emission source category. If data is not available, use the average amount of water used from a similar event (e.g., an event of the same type in Germany) as a proxy. However, water data should be easily available through invoices or meter readings.

4.8.4 Emission factors to use

Database	Latest Published Dataset	Relevant Location in Dataset
Umweltbundesamt – Germany, Probas	2024	Section: Trinkwasser

Note that this database only provides an EF for purchased water. In the case of water being sourced differently, this EF should still be used rather than excluding emissions of other water sources.

4.8.5 Calculation formula to use

Emissions of water used at event = Volume of water used (l) * EF of water ($kgCO_2e/l$)

4.8.6 Apportionment to use

Apportionment is necessary if multiple events are taking place at the same venue without sub-metering of the specific areas. Users may apportion emissions from water using any one of the following appropriate metrics:

- Duration of event
- Area used

Using the duration of event as the sample apportionment metric, the following formula should be used:

Water used for event (l) = Total water used (l) * [duration of event (hours) / total duration of all events (hours)]

4.8.7 Measurement expectations for each tier

Tier	Expectations
Basic	– Calculate water emissions using primary data. Use apportionment if sub-metering is not available. – Data collection in external venues (especially of international partners) may be more difficult. In this case, secondary data may be used for calculating water emission in the basic tier.
Intermediate	– Calculate water emissions using primary data. Use apportionment if sub-metering is not available. – Work with venues to implement sub-metering to collect primary water data apportioned for the event.
Advanced	– Calculate emissions from water using primary data based on implemented submetering.

4.9 Waste

4.9.1 What this source contains

This category includes emissions resulting from the collection, transportation and disposal of all event-related waste (including wastewater). Waste can be categorized by disposal method and material type. Relevant types for events include landfilled, incinerated, recycled (usually split into metals, plastics, paper, and e-waste), composted waste (including food and yard waste), as well as donated items that would otherwise be waste.

4.9.2 Primary data to be collected

– Weight (or volume) of waste generated for each waste type

– Total volume of wastewater discharged

4.9.3 Secondary data and assumptions to use

If primary waste data is not available, conduct waste audits with representative sampling or attendee and vendor surveys to estimate the total event waste. If primary wastewater data is not available, assume it is 90% of the amount of purchased water used at the event venue, to account for tap water being used for consumption.

If unable to apply these assumptions, use total waste and waste water data from a similar event as a proxy. If no similar event has occurred, use industry coefficients to estimate average waste.

4.9.4 Emission factors to use

Database	Latest Published Dataset	Relevant Location in Dataset
Department for Energy Security and Net Zero (DESNZ) – UK, Greenhouse gas reporting: conversion factors	2023	Tabs: Waste Disposal, Water treatment

4.9.5 Calculation formula to use

When weight-based waste data is available:

1. Collect total weight of each waste type
2. Use the following formula to calculate the total emissions of the event-related waste:

Emissions of all waste = Weight of waste type 1 (t) * EF of waste type 1 ($kgCO_2e/t$) + Weight of waste type 2 (t) * EF of waste type 2 ($kgCO_2e/t$), etc.

When weight-based waste data is not available:

1. Collect total volume of each waste type (volume of containers may be used).
2. Convert total volume of each waste type into total weight using the "Umrechnungsfaktoren zu den Abfallarten des Europäischen Abfallverzeichnisses Bayerische Landesamt für Statistik und Datenverarbeitung".
3. Use the formula above for calculating the weight-based emissions of the event's total waste.

For wastewater-related emissions:

1. Collect total volume of wastewater discharged
2. Use the following formula to calculate the total emissions of the wastewater related to the event

Emissions of all wastewater = Volume of wastewater (m3) * EF of wastewater($kgCO_2e/m^3$)

4.9.6 Apportionment to use

Apportionment of waste generation may be required if multiple events contract the same vendor in the same timeframe. The same is applicable for wastewater, if multiple events are connected to the same sewage collection system and treatment plant. Users may apportion emissions from waste generation and wastewater discharge using any one of the following appropriate metrics:

– Number of attendees

– Duration of event

– Area used

Using the number of attendees as the sample apportionment metric, the following formula should be used:

Waste generated by event = Total waste generated (kg) * [number of attendees for event / total number of attendees]

4.9.7 Measurement expectations for each tier

Tier	Expectations
Basic	– Estimate emissions from waste generated at the event using industry coefficients to fill gaps. – Where possible, use primary data. Focus primary data collection on events that are more likely to generate waste, such as food shows, etc.
Intermediate	– Work with vendors/waste haulers to collect primary data on waste generation and disposal methods. – Determine the emissions apportioned for the event. Use industry coefficients to fill gaps.
Advanced	– Conduct waste audits and track primary waste data in real-time. – Collaborate with vendors to determine confirm the waste disposal methods. – Include wastewater emissions in calculations.

4.10 Digital Content and Communication

4.10.1 What this source contains

This category includes emissions from digital activities before, during, and after the event. These activities can include virtual event components (e.g., video conferences or video streaming), and pre-event communications (e.g., websites created, or emails)[31].

Calculating emissions related to digital content is challenging as coefficients vary widely across databases since no shared methodology has been agreed upon by the involved industries. In alignment with the NZCE measurement methodology, this guideline offers a selection of databases for estimating emissions related to digital event activities. Users may use other databases but should disclose their methodology transparently.

4.10.2 Primary data to be collected

I.T. equipment, such as computers, is already covered in the production and materials chapter if it is rented or purchased specifically for an event and not planned to be reused (see section 4.1.2 for more context).

- **Video conferences:** Numbers of servers used (Based on research, it is typically found that only 1 server is used for a Zoom meeting with hundreds of participants[31]), duration of conference, server power rating (this varies based on location and other context, but based on research, an average power rating for 1 server is around 0.594 kWh/server[32]), and electricity emissions factor
- **Video streaming: Number of hours of videos streamed**
- **Website visits:** Number of website visits for each website
- **Emails:** Number of emails sent and received (This guideline recommends only the inclusion of emails sent out at a mass scale (such as registration emails, marketing emails, etc.) in the carbon footprint of the event.)[33]

[31] Faber, G. (2021): A framework to estimate emissions from virtual conferences, International Journal of Environmental Studies, 78, 4, DOI: https://doi.org/10.1080/00207233.2020.1864190

[32] Contrary to the NZCE initiative's approach, search engine queries and cloud usage are directly excluded from the boundary of included emission sources. Please see more context in Appendix E.

[33] See Appendix D for more context.

4.10.3 Calculation formula and assumptions to use

Given the measurement challenges of this category as outlined above, this section provides the EF database and assumptions to be made in the absence of EFs for each item (video conferences, video streaming, website visits, emails) individually.

1. Collect primary data as outlined above
2. Use the following formula to calculate the total emissions related to video conferences for the event:

Emissions of video conference = Electricity EF of server location ($kgCO_2e$/kWh) * Number of servers * Duration of conference * Server power rating (kWh)

3. Use the following guidance to calculate the total emissions related to video streaming for the event:

Emissions of video streaming = Electricity EF ($kgCO_2e$/time streamed) * time streamed

For video streaming, reliable EFs are currently limited. If videos are streamed at the event, the IEA average EF originally calculated for videos on Netflix (0.018$kgCO_2e$/30 min)[34] may be used. While factors, such as device type used, bitrate (SD, HD, Ultra/4k), and network type impact the EF applicable, there are currently no databases outlining the respective values and they may therefore be excluded.

4. Use the following guidance to calculate the total emissions related to website visits for the event:

Website Carbon was found to generate easy outputs and provided a transparent and consistent methodology for their assumptions and references. This database requires users to enter the URLs of the websites visited and provides the emissions coefficient per visit. Users can multiply the coefficient with the estimated number of times the website was accessed for each website.

5. Use the following guidance to calculate the emissions related to emails sent and received for the event:

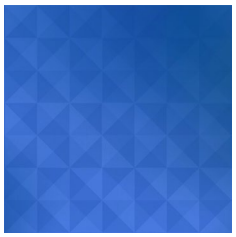
The article "The Carbon Cost of an Email: Update!". Is one of the most frequently cited references for the carbon footprint of emails. It provides estimates of emissions coefficients per email based on the type of email (i.e., whether short or long email, etc.), ranging from 0.03 gCO_2e to 26 gCO_2e per email.

[34] Kamiya, G. (2020): The carbon footprint of streaming video: fact-checking the headlines, https://www.iea.org/commentaries/the-carbon-footprint-of-streaming-video-fact-checking-the-headlines

4.10.4 Measurement expectations for each tier

Tier	Expectations
Basic	– Screen for potential emission sources from digital content to identify those material to the event. – Implement programs for data collection of the identified material sources.
Intermediate	– Use external tools/databases for high level calculations[35] of at least servers and video streaming platforms used in tech-heavy events.
Advanced	– Work with data center or video streaming providers to obtain usage emissions. Engage with IT companies in the value chain to understand impacts and to improve data quality and accuracy.

[35] Calculations may exclude impact factors if they are not available.



Appendices

A Full Event Calculation Example

This section presents a full example of calculating GHG emissions for an event. To allow for more realistic representation, this sample event collected partial data and relied on assumptions or proxies to estimate emissions where primary data was not available. Note that the figures and calculations used are simplified for illustrative purposes.

Sample Event Details

Item	Information
Event Type	Exhibition
Duration	2 days (venue tenancy period: 6 days)
City / Country	Berlin /Germany
Venue	Exhibition Centre
Total Attendees	1,000 (including 800 visitors, 160 exhibitors, 40 organizers[36])[37]
Length of Stay for Non-Local Attendees	1 night
Event Area (m^2)	8,000
Event Transport Provided?	No

1. Production and Materials

The event organizer was able to receive full data about the materials used for stands and carpets.

Primary data collected:

- Timber-MDF for stands: 1,500 m^2 = 18,900 kg (used standard conversion of 12.60 kg/m^2)
- Timber-plywood for stands: 2,000 m^2 = 14,500 kg (used standard conversion of 7.25 kg/m^2)
- Flat glass for stands: 1,200 m^2 = 9360 kg (used standard conversion of 7.80 kg/m^2)
- Carpet: 2000 m^2 = 1,400 kg (assuming pile weight 700 g/m^2)

Emission factors and databases used:

- Timber-MDF: 0.856 $kgCO_2e$/kg (ICE Database V3.0)
- Timber-plywood: 0.681 $kgCO_2e$/kg (ICE Database V3.0)
- Flat glass: 1.09 $kgCO_2e$/kg (Probas 2024)
- Carpet: 12.7 $kgCO_2e/m^2$ (ICE Database V3.0)

[36] Staff of the event organizer.

[37] In accordance with the NZCE Methodology, the definition of "attendee" includes all stakeholders that are involved in the event. This includes not only visitors, but also organiser staff, contractor staff, exhibitor staff, etc.

Emissions calculation:

– Timber-MDF – 18900 kg * 0.856 $kgCO_2e/kg$ = 16,178.4 $kgCO_2e$

– Timber-plywood – 14500 kg * 0.681 $kgCO_2e/kg$ = 9,874.5 $kgCO_2e$

– Flat glass – 9360 kg * 1.09 $kgCO_2e/kg$ = 10,202.4 $kgCO_2e$

– Carpet – 2000 m^2 * 12.7 $kgCO_2e/m^2$ = 25,400 $kgCO_2e$

Total emissions = 61,655.30 $kgCO_2e$

2. Freight and Logistics

The event's logistics involved three shipments: one by air, which delivered the freight ordered internationally to Berlin, and two by road, which delivered the freight from local warehouses to the event venue. The event organizer was able to obtain data on the distance travelled and weight of each shipment.

Primary data collected:

– Type of transportation – Freighter aircraft, freight truck

– Total distance travelled – 1,400 km by air, 40 km and 60 km respectively by truck

– Weight of shipment – 13.4 t by air, 24.8 t and 17.1 t respectively by truck

– Fuel consumption – Aviation fuel by aircraft, gasoline by truck

Emission factors and databases used:

– Freighter aircraft (WTW): 1,509 g CO_2e/t-km (GLEC Framework v3.0)

– Freight truck (WTW, full truck load): 66 g CO_2e/t-km (GLEC Framework v3.0)

Emissions calculation:

– Freighter aircraft: 13.4 tonnes * 1400 km * 1509 g CO_2e/t-km = 28,308.84 $kgCO_2e$

– Freight truck: [(24.8 tonnes * 40 km) + (17.1 tonnes * 60 km)] * 66 g CO_2e/t-km = 133.188 $kgCO_2e$

Total emissions = 28,442.03 $kgCO_2e$

3. Food and Beverage

The event organizer catered set box meals for all 1000 attendees for lunch. To accommodate dietary preferences, one-third of the meals were vegetarian, and two-thirds were chicken-based. It is assumed that all 800 visitors attended only one day of the event, while the 40 organizers and 160 exhibitors attended both days.

Primary data collected:

Ingredients for one vegetarian meal

- Rice: 60 g
- Egg: 60 g
- Broccoli: 80 g
- Apple: 80 g
- Beans: 50 g
- Bell peppers: 80 g

Ingredients for one chicken-based meal

- Rice: 60 g
- Egg: 60 g
- Broccoli: 80 g
- Apple: 80 g
- Chicken: 100 g
- Cheese: 30 g

Emission factors and databases used:

- Rice: 3.1 $kgCO_2e/kg$ (IFEU 2023)
- Egg: 3.0 $kgCO_2e/kg$ (IFEU 2023)
- Broccoli (fresh): 0.3 $kgCO_2e/kg$ (IFEU 2023)
- Apple (regional in April): 0.4 $kgCO_2e/kg$ (IFEU 2023)
- Beans (fresh): 0.4 $kgCO_2e/kg$ (IFEU 2023)
- Bell peppers: 0.6 $kgCO_2e/kg$ (IFEU 2023)
- Chicken: 5.5 $kgCO_2e/kg$ (IFEU 2023)
- Cheese (hard cheese, like parmesan): 6.3 $kgCO_2e/kg$ (IFEU 2023)

Emissions calculation:

- One vegetarian meal: (0.06 kg * 3.1 $kgCO_2e/kg$) + (0.06 kg * 3.0 $kgCO_2e/kg$) + (0.08 kg * 0.3 $kgCO_2e/kg$) + (0.08 kg * 0.4 $kgCO_2e/kg$) + (0.05 kg * 0.4 $kgCO_2e/kg$) + (0.08 kg * 0.6 $kgCO_2e/kg$) = 0.490 $kgCO_2e$
- One chicken meal: (0.06 kg * 3.1 $kgCO_2e/kg$) + (0.06 kg * 3.0 $kgCO_2e/kg$) + (0.08 kg * 0.3 $kgCO_2e/kg$) + (0.08 kg * 0.4 $kgCO_2e/kg$) + (0.10 kg * 5.5 $kgCO_2e/kg$) + (0.03 kg * 6.3 $kgCO_2e/kg$) = 1.161 $kgCO_2e$
- Number of vegetarian meals served = 400
- Number of chicken meals served = 800

Total emissions = 1,124.80 $kgCO_2e$

4. Travel To and From Destination

Based on data collected from registration forms, the event organizer obtained travel data from 600 visitors and all 40 organizers and 160 exhibitors. The 100 local organizers and exhibitors made the round trip between their homes and the venue twice, as they attended both days of the event. The data collected is summarized below. WTT emissions have not been included for this emission source category.

Attendee Type	Origin	Mode of Transport
Visitors	60% local	For local visitors:
(800 in total, 600 with known data)		– 50% local train/metro
		– 10% bus
		– 40% taxi/car
	40% non-local	For non-local visitors:
		– 50% train
		– 50% plane
Exhibitors (160 in total)	50% local,	For local exhibitors:
		– 40% local train/metro
		– 60% taxi/car
	50% non-local	Nicht ortsansässige Aussteller:
		– 60 % Zug
		– 40 % Flugzeug
Organizers (40 in total)	50% local,	For non-local exhibitors:
		– 30% local train/metro
		– 70% taxi/car
	50% non-local	For non-local organizers:
		– 100% train (all non-local organizers reside within Germany)

Primary data collected (from registration forms):

– Mode of transport: bus, train, plane
– Average two-way distance travelled by bus: 30 km
– Average two-way distance travelled by local train or metro: 50 km
– Average two-way distance travelled by taxi or car: 80 km
– Average two-way distance travelled by train (long-distance): 400 km
– Average two-way distance travelled by plane: 1,400 km
– Travel class for attendees travelling by plane: 70% economy class, 30% business class

Emission factors and databases used:

- Bus: 0.0555 $kgCO_2e$/passenger.km (Probas 2024)
- Car (petrol, middle class): 0.207 $kgCO_2e$/passenger.km (Probas 2024)
- Local train (electric traction): 0.0548 $kgCO_2e$/passenger.km (Probas 2024)
- Train (long-distance): 0.00954 $kgCO_2e$/passenger.km (Probas 2024)
- Flight (international, economy class, with radiative forcing): 0.13464 $kgCO_2e$/passenger.km (DESNZ 2023)
- Flight (international, business class, with radiative forcing): 0.39044 $kgCO_2e$/passenger.km (DESNZ 2023)

Assumptions/proxies used:

- All 800 visitors attended one day of the event. The 160 exhibitors travelled to the venue for 4 days (i.e. the entire length of event, plus 2 days), while the 40 organizers travelled to the venue for 6 days (i.e. the entire length of the venue tenancy period).
- For local attendees who indicated they took a taxi or used a car, a 1.5 carpooling factor was applied.
- For the remaining 200 visitors, 25% "local" (so 50), 75% "non-local" (so 150) were assumed.
- An extrapolation was done for the remaining 200 visitors, based on the emissions of the 600 visitors with known data.

Emissions calculation:

For 600 visitors with known data

- Bus: 36 attendees * 30 km * 0.0555 $kgCO_2e$/passenger.km = 59.94 $kgCO_2e$
- Local train/metro: 180 attendees * 50 km * 0.0548 $kgCO_2e$/passenger.km = 493.2 $kgCO_2e$
- Taxi/car: 144 attendees ÷ 1.5 (carpooling factor) * 80 km * 0.207 $kgCO_2e$/passenger.km = 1,589.76 $kgCO_2e$
- Train (long-distance): 120 attendees * 400 km * 0.00954 kg CO_2e/passenger.km = 457.92 $kgCO_2e$
- Flight (economy class): 84 attendees * 1,400 km * 0.13464 $kgCO_2e$/passenger.km = 15,833.664 $kgCO_2e$
- Flight (business class): 36 attendees * 1,400 km * 0.39044 $kgCO_2e$/passenger.km = 19,678.176 $kgCO_2e$

For 200 visitors without known data

- Average emissions per "local" attendee: (59.94 $kgCO_2e$ + 493.2 $kgCO_2e$ + 1589.76 $kgCO_2e$) ÷ 360 attendees = 5.9525 $kgCO_2e$
- Estimated emissions for 50 "local" attendees: 5.1185 $kgCO_2e$ * 50 attendees = 297.625 $kgCO_2e$
- Average emissions per "non-local" attendee: (457.92 $kgCO_2e$ + 15,833.664 $kgCO_2e$ + 19,678.176 $kgCO_2e$) ÷ 240 = 149.874 $kgCO_2e$
- Estimated emissions for 150 "non-local" attendees: 149.874 $kgCO_2e$ * 300 = 22,481.1 $kgCO_2e$

For 160 exhibitors with known data

- Local train/metro: 32 attendees * 50 km * 4 days * 0.0548 $kgCO_2e$/passenger.km = 350.72 $kgCO_2e$
- Taxi/car: 48 attendees ÷ 1.5 (carpooling factor) * 80 km * 4 days * 0.207 $kgCO_2e$/passenger.km = 2,119.68 $kgCO_2e$
- Train (long distance): 48 attendees * 400 km * 0.00954 kg CO_2e/passenger.km = 183.17 $kgCO_2e$
- Flight (economy class): 22 attendees * 1400 km * 0.13464 $kgCO_2e$/passenger.km = 4,222.31 $kgCO_2e$
- Flight (business class): 10 attendees * 1400 km * 0.39044 $kgCO_2e$/passenger.km = 5,247.51 $kgCO_2e$

For 40 organizers with known data

- Local train/metro: 8 attendees * 50 km * 6 days * 0.0548 $kgCO_2e$/passenger.km = 131.52 $kgCO_2e$
- Taxi/car: 12 attendees ÷ 1.5 (carpooling factor) * 80 km * 6 days * 0.207 $kgCO_2e$/passenger.km = 794.88 $kgCO_2e$
- Train (long distance): 20 attendees * 400 km * 0.00954 kg CO_2e/passenger.km = 76.32 $kgCO_2e$

Total emissions = 74,017.50 $kgCO_2e$

5. Local Transportation

The event organizers did not collect hotel information using the registration forms, and thus used assumptions to estimate emissions from local transportation. Based on the calculations from *Travel To and From Destination*, there are 490 "non-local" attendees in total.

Assumptions/proxies used:

- All "local" attendees did not stay in hotels and thus did not have any local transportation activities.[38]
- All 800 visitors attended one day of the event. The 160 exhibitors travelled to the venue for 4 days (i.e., the entire length of event, plus 2 days), while the 40 organizers travelled to the venue for 6 days (i.e., the entire length of the venue tenancy period).
- Each "non-local" attendee's two-way travel distance between the hotel and the airport or railway station is 40 km.
- Each "non-local" attendee's two-way travel distance between the hotel and the venue is 20km.
- For travel between hotel and airport or railway station, 50% of "non-local" attendees took the local train or metro, 10% took the bus, and 40% took a taxi.
- Assume a car-pooling factor of 1.5 for attendees travelling by taxi.

Emission factors and database used:

- Bus: 0.0555 $kgCO_2e$/passenger.km (Probas 2024)
- Train (local, electric traction): 0.0548 $kgCO_2e$/passenger.km (Probas 2024)
- Taxi (petrol passenger car, middle class): 0.207 $kgCO_2e$/passenger.km (Probas 2024)

[38] If a "local" attendee is travelling from home, the journey is recorded under "Travel To and From Destination" instead of "Local Transportation".

Emissions calculation:

For two-way travel between hotel and airport or railway station

- Bus: 49 attendees * 40 km * 0.0555 $kgCO_2e$/passenger.km = 108.78 $kgCO_2e$
- Train (local, electric traction): 245 attendees * 40 km * 0.0548 $kgCO_2e$/passenger.km = 537.04 $kgCO_2e$
- Taxi (petrol passenger car, middle class): 196 attendees ÷ 1.5 (carpooling factor) * 40 km * 0.207 $kgCO_2e$/passenger.km = 1,081.92 $kgCO_2e$

For visitors' two-way travel between hotel and event venue

- Bus: 39 attendees * 20 km * 0.0555 $kgCO_2e$/passenger.km = 43.29 $kgCO_2e$
- Train (local, electric traction): 195 attendees * 20 km * 0.0548 $kgCO_2e$/passenger.km = 213.72 $kgCO_2e$
- Taxi (petrol passenger car, middle class): 156 attendees ÷ 1.5 (carpooling factor) * 20 km * 0.207 $kgCO_2e$/passenger.km = 430.56 $kgCO_2e$

For exhibitors' two-way travel between hotel and event venue

- Bus: 5 attendees * 20 km * 4 days * 0.0555 $kgCO_2e$/passenger.km = 22.2 $kgCO_2e$
- Train (local, electric traction): 25 attendees * 20 km * 4 days * 0.0548 $kgCO_2e$/passenger.km = 109.6 $kgCO_2e$
- Taxi (petrol passenger car, middle class): 20 attendees ÷ 1.5 (carpooling factor) * 20 km * 4 days * 0.207 $kgCO_2e$/passenger.km = 220.8 $kgCO_2e$

For organizers' two-way travel between hotel and event venue

- Bus: 5 attendees * 20 km * 6 days * 0.0555 $kgCO_2e$/passenger.km = 33.3 $kgCO_2e$
- Train (local, electric traction): 25 attendees * 20 km * 6 days * 0.0548 $kgCO_2e$/passenger.km = 164.4 $kgCO_2e$
- Taxi (petrol passenger car, middle class): 20 attendees ÷ 1.5 (carpooling factor) * 20 km * 6 days * 0.207 $kgCO_2e$/passenger.km = 331.2 $kgCO_2e$

Total emissions = 3,296.81 $kgCO_2e$

6. Accommodation

The event organizers did not collect hotel information using the registration forms, and thus used assumptions for accommodation emissions. All non-local exhibitors and organizers were sponsored to stay in a 3-star hotel for the entire duration of their time in Berlin, for 4 and 6 nights each respectively.

- Assumptions/proxies used:
- All "local" attendees did not stay in hotels.
- All "non-local" visitors only stayed in their hotels for one night each.

Emission factors and database used:

– One room-night in Berlin (All Hotels): 0.0126 $MTCO_2e$/room-night (Hotel Footprinting Tool)

– One room-night in Berlin (3 Stars): 0.0086 $MTCO_2e$/room-night (Hotel Footprinting Tool)

Emissions calculation:

– All accommodations for visitors: 390 * 12.6 $kgCO_2e$/room-night = 4,914 $kgCO_2e$

– 3 Stars hotels for exhibitors: 50 * 4 nights * 8.6 $kgCO_2e$/room-night = 1,720 $kgCO_2e$

– 3 Stars hotels for organizers: 50 * 6 nights * 8.6 $kgCO_2e$/room-night = 2,580 $kgCO_2e$

Total emissions = 9,214 $kgCO_2e$

7. Energy

The event organizer obtained purchased electricity data from the venue provider. However, a total was provided for the venue's two main halls with no submetering in place. The event organizer thus used apportionment to estimate the energy used for its event.

As the event was held in summer, no heating was used. The energy used to cool the venue is already included in the venue provider's purchased electricity data.

Portable gasoline generators were also used during the event. However, the amount of gasoline used was not recorded, and thus the event organizer used a similar event in another German city as a proxy.

Primary data collected:

– Total electricity used at venue during event period: 60,000 kWh

Emission factors and database used:

– Gasoline (regular grade): 3.169 tCO_2e/t (Umweltbundesamt 2022)

– Electricity (including well-to-tank emissions): 498 gCO_2e/kWh (Umweltbundesamt 2022)

Assumptions/proxies used:

– Since the primary data for total amount of gasoline used is not available, the event organizer used proxy data, which was around 40 liters (approximately 30 kg) in total.

Emissions calculation:

For apportionment of electricity:

	Event A	Event B
Duration of event	2 days	3 days
Floor area used	8,000 m^2	10,000 m^2
Duration of event * Area used	16,000	30,000
Apportionment ratio	34.78%	65.22%
Apportioned kWh	17,391.3 kWh	32,608.7 kWh

– Apportioned electricity: 17,391.3 kWh * 0.498 $kgCO_2e$/kWh = 8,660.87 $kgCO_2e$

– Gasoline: 30 kg * 3.169 $kgCO_2e$/kg = 95.07 $kgCO_2e$

Total emissions = 8,755.94 $kgCO_2e$

8. Water

The event organizer was able to obtain purchased water data from the venue provider. However, it was provided as a total for the venue's two main halls with no submetering in place. The event organizer thus used apportionment to estimate the water used for the event.

Primary data collected:

– Total purchased water used at venue during event period: 90,000 liters

– Area of main hall used by event: 8,000 m^2

– Total area of two main halls: 18,000 m^2

Emission factors and database used:

– Tap water: 0.000242 $kgCO_2e$/liter (Probas 2024)

Emissions calculation:

– Tap water: 90,000 liters * 0.000242 $kgCO_2e$/liter * (8,000 m^2 ÷ 18,000 m^2) = 9.68 $kgCO_2e$

Total emissions = 9.68 $kgCO_2e$

9. Waste

The event organizer provided recycling bins to collect recyclable waste, such as plastics, metals, paper and cardboard, and glass separately. They engaged waste and recycling service providers to weigh general and recyclable waste by type. Food waste was not collected as the amount of food waste generated from the lunch box meals was predicted to be negligible.

The amount of wastewater produced was assumed to be 90% of the amount of purchased water for the event.

Primary data collected:

- General waste: 1,200 kg
- Plastic waste: 270 kg
- Metal waste: 54 kg
- Paper and cardboard waste: 630 kg
- Glass waste: 126 kg
- Wastewater: 81,000 liters (assuming 1 liter = 1 kg)

Emission factors and databases used:

- Commercial and industrial waste – 21.281 $kgCO_2e$/tonnes (DESNZ 2023)
- Plastics (open-loop recycling) – 21.281 $kgCO_2e$/tonnes (DESNZ 2023)
- Metals (mixed cans, open-loop recycling) – 21.281 $kgCO_2e$/tonnes (DESNZ 2023)
- Paper and board (mixed, open-loop recycling) – 21.281 $kgCO_2e$/tonnes (DESNZ 2023)
- Glass (closed-loop source) – 21.281 $kgCO_2e$/tonnes (DESNZ 2023)
- Wastewater – 0.201 $kgCO_2e$/m3 (DESNZ 2023)

Emissions calculation:

- General waste – 1,200 kg * 0.021281 $kgCO_2e$/kg = 25.5372 $kgCO_2e$
- Plastic waste – 270 kg * 0.021281 $kgCO_2e$/kg = 5.74587 $kgCO_2e$
- Metal waste – 54 kg * 0.021281 $kgCO_2e$/kg = 1.14917 $kgCO_2e$
- Paper and cardboard waste – 630 kg * 0.021281 $kgCO_2e$/kg = 13.40703 $kgCO_2e$
- Glass waste – 126 kg * 0.021281 $kgCO_2e$/kg = 2.68145 $kgCO_2e$
- Wastewater – 81 m3 * 0.201 $kgCO_2e$/m3 = 16.281 $kgCO_2e$

Total emissions = 64.80 $kgCO_2e$

10. Digital Content and Communication

The event was in-person with no video conferences held. However, the event organizer tracked the number of visits to its website and used Website Carbon to estimate the emissions per website visit.

The event organizer did not collect information to estimate the number of emails sent and received. As the event organizer was not able to obtain a proxy, they chose to exclude this from the emissions boundary considering it is an insignificant component of the event's overall emissions.

Primary data collected:

– Website visits – 12,200

Emission factor and database used:

Website visits – 0.38 gCO_2e/visit (Website Carbon)

Emissions calculation:

– Website visits - 12,200 visits * 0.00038 $kgCO_2e$/visit = 4.636 $kgCO_2e$

Total emissions = 4.64 $kgCO_2e$

Total Event Emissions

Category	Emissions ($kgCO_2e$)	% of Total
Production and Materials	61,655.30	33.04%
Freight and Logistics	28,442.03	15.24%
Food and Beverage	1,124.80	0.60%
Travel To and From the Destination	74,017.50	39.67%
Local Transportation	3,296.81	1.77%
Accommodation	9,214.00	4.94%
Energy	8,755.94	4.69%
Water	9.68	0.01%
Waste	64.80	0.03%
Digital Content and Communication	4.64	0.00%
Total	**186.585,50**	

B Emission Factors Library

The guideline recognizes the availability of several different EF databases for the same emission sources. Please refer to section 3.2 for more context on the selection of EFs and the respective emission source category sections (for more context on the hierarchy recommended for categories with multiple databases). The following table lists all EF databases mentioned throughout this document, with current links (as of November 2024). Databases are often updated on an annual (or other regular) basis, and links may change as a result. If available, updated databases should be used.

Emission Source Category	Specific Emission Source (if applicable)	Database	Latest Published Dataset	Relevant Location in Dataset	Accessibility
Production and Materials		Umweltbundesamt – Germany, Probas	2024	Sections: Herstellung von Rohmaterialien, Herstellung von verarbeiteten Produkten	Free
		Department for Energy Security and Net Zero (DESNZ) – UK, Greenhouse Gas Reporting: Conversion Factors	2023	Tab: Material use	Free
		Agence de la transition écologique (ADEME) – Frankreich, Base Carbone	2024	Section: Achats de matière et de biens	Free
		Circular Ecology und University of Bath, Inventory of Carbon and Energy (ICE) Database	2019	Full dataset	Free
		NZCE initiative, Materials Library	NZCE initiative, Materials Library		
Freight and Logistics		Global Logistics Emissions Council, GLEC Framework, as found in Umweltbundesamt & DSLV (2024), Treibhausgasemissionen im Transportsektor Leitfaden zur ISO 14083	2023	Module 1 – Emission factors	Free
Food and Beverage		Reinhardt, G., Gärtner, S., Wagner, T., Ökologische Fußabdrücke von Lebensmitteln und Gerichten in Deutschland.	2020	Section: 4.1 Ergebnisse: CO_2-Fußabdrücke	Free

Emission Source Category	Specific Emission Source (if applicable)	Database	Latest Published Dataset	Relevant Location in Dataset	Accessibility
Travel To and From Destination	Flights	Department for Energy Security and Net Zero (DESNZ) - UK, Greenhouse Gas Reporting: Conversion Factors	2023	Tabs: Business travel – air, WTT – business travel - air	Free
	Non-flights	Umweltbundesamt – Germany, Probas	2024	Section: Transportprozesse	Free
	WTT emissions for all modes	Department for Energy Security and Net Zero (DESNZ) - UK, Greenhouse Gas Reporting: Conversion Factors	2023	Tabs: Business travel – air, WTT – business travel - air	Free
Local Transportation	Mobile combustion	Umweltbundesamt – Germany, Probas	2024	Section: Transportprozesse	Free
	WTT emissions	Department for Energy Security and Net Zero (DESNZ) - UK, Greenhouse Gas Reporting: Conversion Factors	2023	Tabs: WTT- pass vehs & travel- land; WTT- fuels	Free
Accommodation		Greenview, Hotel Footprinting Tool (HFT)	2024	Full dataset	Free
Energy	Fuels	Umweltbundesamt – Germany, CO_2 Emission Factors for Fossil Fuels	2022	Table 23: CO_2 emission factors – fuel-related emission factors (excerpt; last revision: 15 February 2022)	Free
	Purchased electricity, heating and cooling (location-based)	Umweltbundesamt - Germany, Entwicklung der spezifischen Treibhausgas-Emissionen des deutschen Strommix	2023	Table 1: Gerundete Ausgangsgrößen und Berechnungsergebnis: Emissionen der Stromerzeugung, Stromverbrauch und Emissionsfaktor des Stroms	Free
	Purchased electricity (market-based)	Association of Issuing Bodies, European Residual Mixes	2023	Table 2: Residual Mixes 2022 (in the PDF Report)	Free
	Refrigerants	Department for Energy Security and Net Zero (DESNZ) – UK, Greenhouse gas reporting: conversion factors	2023	Tab: Refrigerant & other	Free

Emission Source Category	Specific Emission Source (if applicable)	Database	Latest Published Dataset	Relevant Location in Dataset	Accessibility
Water		Umweltbundesamt – Germany, Probas	2024	Section: Trinkwasser	Free
Waste		Department for Energy Security and Net Zero (DESNZ) – UK, Greenhouse gas reporting: conversion factors	2023	Tabs: Waste Disposal, Water treatment	Free
Digital Content and Communication	Video Conferences	Grant Faber: A framework to estimate emissions from virtual conferences, International Journal of Environmental Studies	2021	Full document	Paid
	Video Streaming	International Energy Agency (IEA): The carbon footprint of streaming video: fact-checking the headlines	2020	Full article	Free
	Website Visits	Website Carbon Calculator	2024	Full page	Free
	Emails	The Carbon Cost of an Email: Update!	2022	Full article	Free

C List of Materials

This list offers a high-level overview of materials commonly used in exhibitions and other events. As with other emission sources, organizations should assess the materiality of the different materials and consequently disclose their methodology when communicating their emissions accounting boundaries. For a more detailed overview of the materials listed below, please refer to the current draft and future versions of the NZCE Materials Library.

Flooring

- Sub Floor Platform: chipboard, recycled plastic high reuse raised exhibition floor (tile), elevated floor steel bar stands
- Underlay: carpet padding, polythene underlay
- Covering: carpet, vinyl flooring, wood

Construction elements

- Structure: metal (aluminum, steel), wood (MDF, fiber board), other (plasterboard, glass, polycarbonate panels), prefabricated stands (shell scheme, timber closed panel timber frame system)
- Paints / wall covering: paint (waterborne, solventborne), wallpaper
- Signage & finishing: plastic, paper & board, wood, plastic, natural & synthetic fiber, metal

Electrical

- Wiring: wiring / cabling (3 core)
- Lighting: adjustable LED spotlight, theater light, LED lamps
- Appliances: LED screen, refrigerator

Marketing materials

- Exhibitor / attendee ID: lanyards, badge holders, labels
- Printed materials: catalogues, pocket guides, flyers
- Promotional items: tote bags, water bottles, mugs

Furniture

- Tables & Chairs: stools, desks, sofas
- Appliances: refrigerators, coffee machines, water coolers

AV & IT equipment

- AV: screens, monitors, speakers, lighting
- IT: ticketing machines, desktop computers, scanners

Catering-related items

- Tableware: cutlery, plates, glasses, mugs
- Serving containers: trays, platters, bowls, chafing dishes & warmers, baskets

D Excluded Emission Sources and Pending Issues in this Guideline Version

This appendix lists emission sources excluded from this guideline based on lack of materiality or event-level control as determined by stakeholder input. It also highlights pending issues to be addressed in future versions of this document given current limitations in data availability.

Production and materials – standing investments

Rationale: not material

This emission source category is excluded from the scope of this guideline's first version since in comparison to other emission sources covered, standing investments (meaning owned and reused furniture or equipment) typically have a high reuse rate, resulting in assumed immaterial emissions when apportioned to each event.

Production and materials – apportionment on materials such as carpets, furniture, rental equipment, and shell scheme, etc.

Rationale: insufficient primary or secondary data

Current industry practices for apportioning the above items do not provide specific guidance on this topic yet. The industry will be further consulted on this (including through the NZCE initiative), and guidance will be added once industry consensus is achieved.

Freight and logistics, travel to and from the destination, local transportation – embodied carbon of vehicles

Rationale: not material

The embodied carbon of vehicles (meaning, emissions resulting from vehicle production) are excluded as vehicles are reused extensively, making their embodied emissions immaterial when apportioned to each event.

Travel to and from the destination and local transportation – stopovers and detours for local transportation

Rationale: outside of event-level control

The guideline assumes that attendees only travel between the hotel and venue. Any interim stopovers or detours are outside the scope and control of the event's value chain and thus are excluded from measurement.

Accommodation – Scope 3 Emissions of Hotels

Rationale: alignment with industry methodologies

Emissions from participants' hotel stays are included in section 4.6 as per the HCMI methodology. However, the hotel's Scope 3 emissions (such as from purchased goods and service, business travel, staff commuting) are excluded from the HCMI and thus from this methodology. The only Scope 3 emission of hotels currently included in HCMI is outsourced laundry. Other Scope 3 emissions of hotels stays are being addressed in a separate initiative called HCMI 3.0 led by the World Sustainable Hospitality Alliance.

Energy – energy baseload

Rationale: insufficient primary or secondary data

The working group discussed whether to include or exclude the venue's energy baseload in the overall event energy usage. Due to insufficient data and unclear impacts on different stakeholder groups, this guideline version was not able to determine a definitive approach, and the issue will be taken up in subsequent versions.

Digital content and communication – emails sent

Rationale: not material

This guideline does not recommend the exclusion of all emails sent for an event. However, like the exclusion of Scope 1 and 2 emissions of the event organizer's workplace/office (see below), general emails sent throughout the event life cycle are difficult to track and are assumed to be immaterial to the overall event emissions. Accordingly, this guideline recommends only the inclusion of mass emails (such as registration emails, and marketing emails) in the carbon footprint of the event.

Embodied carbon of the venue or building

Rationale: outside of event-level control

This emission source category is excluded from the scope of the first version of this guideline since compared to other emission sources covered, influence of most stakeholder groups is limited.

Land use change emissions of new buildings or infrastructure created

Rationale: insufficient primary or secondary data

This applies to very large events, such as sports tournaments, where land clearing is required for new stadium construction. Measuring emissions from land use change emissions is excluded from this guideline due to low prevalence of such practice and insufficient technical knowledge and data availability in the industry.

Scope 1 and 2 emissions of event organizer's workplace and office

Rationale: not material

The Scope 1 and 2 emissions of the event organizer's workplaces and offices are excluded from this guideline as they are deemed insignificant to the event's total footprint. Also, their scope 1 and 2 data are typically already reported on as part of their organizational footprints.

Timeline associated with the three tiers

Rationale: lack of agreed-upon method

The timeline associated with the three tiers will be taken up in future guideline versions based on NZCE's continued industry consultations, which have so far led to inconclusive results.

Coefficients and proxy data

Rationale: insufficient primary or secondary data

AUMA also aligns with the NZCE initiative on this point. The NZCE measurement team has started collecting data from supporters of the initiative. At time of this guideline's release, the data provided does not yet allow the creation of conclusive industry coefficients. The initiative will continue data collection to develop these coefficients in future methodology versions and AUMA will add these to upcoming guideline versions. If your organization has data to share for any of the ten identified emission source categories, please reach out to info@netzerocarbonevents.org.

E Divergences from the NZCE measurement methodology

Materiality

This guideline provides some additional context for organizations to consider when deciding which emission sources to include in their event level report. Please refer to section 2.3 for more context.

Production and materials– basic tier

The NZCE measurement methodology identified stands, carpets, and signage as the highest impact material categories to be included in the primary data collection of the basic measurement tier. This guideline adds that other materials should also be included if material amounts are used.

Production and materials – standing investments

The NZCE measurement methodology does not exclude any materials. This first guideline version excludes standing investments (meaning owned and reused furniture or equipment) since these typically have high reuse rates and are therefore assumed to result in immaterial emissions when apportioned to each event.

Food and beverage – meal proxies

While the NZCE measurement methodology has postponed including meal proxies based on a lack of global applicability, this guideline includes German-specific meal proxies to facilitate easier F&B emission calculation.

Food and beverage – F&B purchased by attendees at venue cafés or food trucks

The NZCE measurement methodology considers this emission source outside the control of individual events. However, based on feedback from this guideline's consultation rounds, this emission source can often be directly influenced by event organizers in the German context. This emission source often represents a significant share of overall F&B served and organizers are often required to guarantee a minimum turnover for self-pay catering at venue cafes, kiosks, or food trucks, with the organizer covering any shortfall. Accordingly, this emission source should be included as part of the advanced tier.

Energy – apportionment to use

Based on feedback received, this guideline recommends a modified approach for the apportionment of energy to more accurately reflect industry practice by using both duration of and floor used at the event.

Water

The NZCE measurement methodology excludes water supply and distribution as an immaterial emission source. This guideline includes water due to easier data and EF access in Germany than at the global scale.

Digital content and communication – emission sources excluded

While the NZCE measurement methodology argues for the inclusion of all emails, this guideline version excludes all emails not sent at mass scale based on assumed immateriality and data collection challenges.

Additionally, the NZCE measurement methodology offered initial calculation approaches for search engine queries and cloud usage. However, due to the difficulty of apportioning these emissions to specific events, they are excluded from this guideline.

Emission factor databases

This guideline uses German databases wherever possible. German specific EF databases were available for the following emission source categories: Production and materials, Food and Beverage, Travel To and From Destination, Local Transportation, Energy, and Water. Where German databases were not available or did not provide EFs for all relevant emission sources, EF databases were chosen in line with NZCE recommendations.

Assumptions

Assumptions throughout the guideline have been tailored to the German context wherever possible, with updates based on input from the AUMA working group. Data collection for assumptions should be expanded in future guideline versions to ensure the most accurate representation and wherever more accurate, context-specific assumptions are available, users should prioritize those.

Measurement expectations for each tier

Measurement expectations for the different tiers of each emission source category have been tailored to the German context wherever possible, with updates based on input from the AUMA working group.

F List of Abbreviations and Acronyms

ADEME	French Agency for Ecological Transition
AUMA	Association of the German Trade Fair Industry
AV	Audiovisual Technology
CO_2e	Carbon Dioxide Equivalent
CCF	Corporate Carbon Footprint
CSRD	Corporate Sustainability Reporting Directive
DESNZ	Department for Energy Security and Net Zero
DSLV	The German Freight Forwarding and Logistics Association
EAC	Energy Attribute Certificate
EF	Emission Factor
F&B	Food & Beverage
GHG	Greenhouse Gas
GLEC	Global Logistics Emissions Council
GTPI	Global Tourism Plastics Initiative
HCMI	Hotel Carbon Measurement Initiative
HFT	Hotel Footprinting Tool
ICE	Inventory of Carbon and Energy
IEA	International Energy Agency
IT	Information Technology
NZCE	Net Zero Carbon Events
MDF	Medium-Density Fiberboard
REC	Renewable Energy Certificate
RF	Radiative Forcing
TTW	Tank-to-Wheel
T&D	Transmission & Distribution
WTT	Well-to-Tank
WTW	Well-to-Wheel

G Reference list

- Agence de la transition écologique (2024): Nouvelle version Base Carbone V23.4, https://base-empreinte.ademe.fr/
- Association of Issuing Bodies (2023): European Residual Mix, 2023, https://www.aib-net.org/facts/european-residual-mix/2023
- AUMA-Trends 2024/2025 (2024): Facts and Figures. Trade fair venue Germany: Number one worldwide, https://trends.auma.de/en/2425/facts-and-figures/
- Bayerisches Landesamt für Statistik (n.d.): Abfallarten gemäß dem Europäischen Abfallverzeichnis (AVV - Abfallverzeichnis-Verordnung), Umrechnungsfaktoren, https://www.statistik.bayern.de/service/erhebungen/bauen_wohnen/abfall/abfallarten/index.php
- Circular Ecology (2019): Inventory of Carbon and Energy, https://circularecology.com/embodied-carbon-footprint-database.html
- Department for Energy Security and Net Zero (2023): Greenhouse gas reporting: conversion factors 2023, https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2023
- Faber, G. (2021): A framework to estimate emissions from virtual conferences, International Journal of Environmental Studies, 78, 4, https://doi.org/10.1080/00207233.2020.1864190
- Greenview (2024): Hotel Footprinting Tool, https://www.hotelfootprints.org/
- Icha, P.; Lauf, T. (2023): Entwicklung der spezifischen Treibhausgas-Emissionen des deutschen Strommix in den Jahren 1990 - 2022, Umweltbundesamt, https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/2023_05_23_climate_change_20-2023_strommix_bf.pdf
- Net Zero Carbon Events (NZCE) (2023): NZCE measurement methodology, 1st Edition, December 2023, https://www.netzerocarbonevents.org/wp-content/uploads/NZCE_Measurement-Methodology_AW_13-Dec-23.pdf
- Net Zero Carbon Events (NZCE) (2023): NZCE Production & Waste – Product Library, https://www.netzerocarbonevents.org/wp-content/uploads/20231208_NZCE-Production-Materials-Reference-List-2023-Draft_Final.pdf
- Kamiya, G. (2020): The carbon footprint of streaming video: fact-checking the headlines, International Energy Agency, https://www.iea.org/commentaries/the-carbon-footprint-of-streaming-video-fact-checking-the-headlines
- One Planet Network (2022): GTPI plastic measurement methodology tool for Accommodation Providers, https://www.oneplanetnetwork.org/knowledge-centre/resources/gtpi-plastic-measurement-methodology-tools-accommodation-providers
- Reinhardt, G.; Gärtner, S.; Wagner, T. (2020): Ökologische Fußabdrücke von Lebensmitteln und Gerichten in Deutschland, Institut für Energie- und Umweltforschung Heidelberg (IFEU), https://www.ifeu.de/fileadmin/uploads/Reinhardt-Gaertner-Wagner-2020-Oekologische-Fu%C3%9Fabdruecke-von-Lebensmitteln-und-Gerichten-in-Deutschland-ifeu-2020.pdf

- Smart Freight Centre (2023): Global Logistics Emissions Council Framework for Logistics Emissions Accounting and Reporting, V3.0 Edition, Revised and Updated, https://smart-freight-centre-media.s3.amazonaws.com/documents/GLEC_FRAMEWORK_v3_UPDATED_02_04_24.pdf
- Umweltbundesamt (2022): CO_2 Emission Factors for Fossil Fuels, https://www.umweltbundesamt.de/en/publikationen/co2-emission-factors-for-fossil-fuels-0
- Umweltbundesamt (2024): Probas, https://probas.umweltbundesamt.de/einblick/#/
- Umweltbundesamt (2024): Treibhausgasemissionen im Transportsektor. Leitfaden zur ISO 14083. Anwendung und Beispiele, https://www.umweltbundesamt.de/sites/default/files/medien/479/publikationen/treibhausgasemissionen_im_transportsektor.pdf
- Walkley, S. (2022): The Carbon Cost of an Email: Update!, https://carbonliteracy.com/the-carbon-cost-of-an-email/
- Wholegrain Digital (2024): Website Carbon Calculator, https://www.websitecarbon.com/
- World Sustainable Hospitality Alliance (2022): Hotel Carbon Measurement Initiative, v2.0, https://sustainablehospitalityalliance.org/resource/hotel-carbon-measurement-initiative/

AUMA is the Association of the German Trade Fair Industry. Acting both internationally and nationally, it represents the interests of all large and medium-sized exhibition companies in Germany, international event organisers in Germany and the associations that represent exhibitors, service companies and trade fair visitors.

Trade fairs in Germany secure up to 230,000 jobs. With no fewer than 70 exhibition venues between the North Sea and Lake Constance, Germany is truly unique as a trade fair-hosting country. Two thirds of all leading global economy trade fairs take place right here in Germany. At peak times, international, national and regional trade fairs in Germany attract more than 235,000 exhibiting companies and 16 million visitors. On average, 60 per cent of exhibiting companies and 35 per cent of specialist visitors to all leading trade fairs travel from abroad.

Imprint

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