Sustainable Hospitality Alliance

Hotel Carbon Measurement Initiative (HCMI)

v 1.2, June 2020

In collaboration with:

WORLD TRAVEL & TOURISM COUNCIL

Hotel Carbon Measurement Initiative (HCMI) v1.2

Methodology

June 2020

Hotel Carbon Measurement Initiative (HCMI) is free resource, available to download from:

www.sustainablehospitalityalliance.org/hcmi

HCMI was first developed when Sustainable Hospitality Alliance was known as International Tourism Partnership (ITP).

Contents

1.0 Introduction

In June 2012, Sustainable Hospitality Alliance (the Alliance) and the World Travel & Tourism Council (WTTC), in collaboration with 23 leading global hospitality companies, launched the Hotel Carbon Measurement Initiative (HCMI) version 1.0. The methodology was developed by the hospitality industry to calculate and communicate the carbon footprint of hotel stays and meetings in a consistent and transparent way. Version 1.2 of the methodology, described in this document, clarifies the treatment of refrigerants, mobile fuels plants and provides additional guidance on how hotels should calculate their greenhouse gas (GHG) emissions.

HCMI is a ground-breaking initiative to unite hotel industry efforts to calculate and communicate carbon impacts by agreeing on a standardised methodology and metrics. A joint Carbon Measurement Working Group, consisting of representatives from Sustainable Hospitality Alliance and WTTC's hotel members, was established in May 2011. In partnership with advisor KPMG, the Working Group developed this methodology to measure GHG emissions from individual hotels on a meeting room and guest room basis.

The group saw an opportunity to improve how the hotel industry communicates its impacts. Previously, approaches to measuring and reporting on carbon emissions varied widely. This led to confusion amongst consumers, particularly corporate clients, looking to understand their own potential carbon footprint and meet their own goals/targets in this area. In addition, the number and range of methodologies and tools in use make transparency of reporting within the hotel industry a challenge.

The methodology was first developed in 2011, applying a number of aspects of the GHG Protocol Standards[1]. During 2012 its practical applicability was tested in hotels of different styles and size in different geographical locations. It was further refined following a subsequent stakeholder engagement programme, including a number of Hotel Associations and a review by the World Resources Institute (WRI), one of the GHG Protocol development partners. During 2013, the Working Group gathered further feedback from users of the methodology and stakeholders, reviewed research by Cornell University's Center for Hospitality Research, and updated the methodology accordingly.

The methodology attempts to strike a balance between ease of implementation and accuracy. We recognise that the methodology has certain limitations, but it is designed to be applicable to all types of hotels around the world even those with no previous experience in carbon reporting. The methodology is not an assessment of all environmental risks and opportunities that hotels face and is only a first step in the implementation of a thorough environmental programme. The methodology is a voluntary approach to measure GHG emissions. A number of other organisations provide guidance on activities such as carbon neutrality, product life cycle assessment, or energy management, which are not within the scope of this document.

A review process has been put in place to ensure the methodology may be further refined as user feedback and new research come to light. In particular areas where it is recognised that the accuracy of the proposed approach is less than could be achieved using a more complicated measurement and calculation process, the medium term aim is to identify practical ways of refining the methodology to enhance it accuracy without making it unduly cumbersome.

[1] The GHG Protocol is the most widely used international accounting tool for government and business leaders to understand, quantify, and manage greenhouse gas emissions. The GHG Protocol is a decade-long partnership between the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD).

The Hotel Carbon Measurement Initiative demonstrates how effective collaboration can provide solutions which benefit customers, individual companies, and wider industry. Through common measurement and language, stakeholders will now be able to greater understand their footprints and impacts.

> **"Calculating a carbon footprint helps hotels to understand the link between how they operate and what they consume in terms of energy and fuels and the impact on the environment through carbon emissions. Being able to not only have a total carbon footprint and a footprint per occupied room, but also see this split down into the different sources enables a hotel to prioritise their actions and think about the types of energy they use in the hotel. This is particularly important for hotels in regions that already have or are looking to implement carbon taxes and legislation such as the CRC Energy Efficiency Scheme in the UK, as carbon taxes will add further costs onto a hotel's bottom line."**
>
> Robert McCann, Environment Manager - Corporate Responsibility, InterContinental Hotels Group

1.2 The Working Group

The Working Group comprises representatives of leading international hotel companies such as

Accor, Beijing Tourism Group, Carlson Rezidor Hotel Group, Diamond Resorts International, Fairmont Hotels and Resorts, Hilton Worldwide, Hong Kong & Shanghai Hotels, Hyatt Corporation, InterContinental Hotels Group, Jumeirah Group, Mandarin Oriental Hotel Group, Marriott International Inc, Meliá Hotels International, MGM Resorts International, NH Hoteles, Orient-Express Hotels Ltd, Pan Pacific Hotel Group, Premier Inn - Whitbread Group, Starwood Hotels & Resorts Worldwide, Inc., Shangri-La Hotels and Resorts, The Red Carnation Hotel Collection, TUI AG, Wyndham Worldwide.

> **"Implementing the HCMI tool across our hotel portfolio has supported and enabled our managers to share best practice and to understand their sites carbon footprint per guest and meeting room sold. Our managers now look for innovative ways to cut costs on utilities as well as practical approaches to educate and create awareness for our 40,000 team members who work with us and the 20 million customers who visit us every month."**
>
> Chris George, Head of Energy & Environment, Whitbread Hotels & Restaurants Group PLC

The Sustainable Hospitality Alliance brings together engaged hospitality companies and uses the collective power of the industry to deliver impact globally and at a local scale. We tackle the major challenges affecting our planet and its people, bringing together our members and other partners, to achieve a more sustainable and inclusive world for all. Sustainable Hospitality Alliance has unparalleled access to the hospitality industry and facilitates a non-competitive platform around which different hotel companies, funders, partners and key stakeholders collaborate to make a positive difference to our communities and destinations. Our membership of hotel companies represents almost 25% of the global hotel industry by volume. Our Board of Trustees and Senior

Advisory Council members comprise of senior C-suite level executives in support of our strategic direction.

Sustainable Hospitality Alliance was founded in 1992 as the International Hotels Environment Initiative (IHEI) by a consortium of chief executives from ten global hotel companies as a result of the United Nations Conference on Environment and Development. From launch, we were part of the Prince's Charities group, with HRH The Prince of Wales as president – first as a programme of International Business Leaders Forum (IBLF) and then in 2013 relocating to Business in the Community (BITC), The Prince's Responsible Business Network, where we were known as the International Tourism Partnership (ITP).

The World Travel & Tourism Council (WTTC) is the global authority on the economic and social contribution of Travel & Tourism. It promotes sustainable growth for the industry, working with governments and international institutions to create jobs, to drive exports and to generate prosperity. Travel & Tourism accounts for 255 million jobs globally. At US$6 trillion (9% of GDP) the sector is a key driver for investment and economic growth. For more than 20 years, the World Travel & Tourism Council has been the voice of this industry globally. Members are the Chairs, Presidents and Chief Executives of the world's leading, private sector Travel & Tourism businesses. These Members bring specialist knowledge to guide government policy and decision-making, raising awareness of the importance of the industry as an economic generator of prosperity.

KPMG in the UK operates from 22 offices across the United Kingdom with over 11,000 partners and staff. KPMG is a global network of professional firms providing Audit, Tax, and Advisory services, operating in 152 countries with 145,000 professionals working in member firms around the world. KPMG's global sustainability practice is over 20 years old, having scoped the first ever greenhouse gas emissions assurance of BP plc in 1992. It has 700 practitioners around the world.

> **"HCMI will help us to move forward the sustainability agenda. Calculating our carbon footprint helps our decision making on energy efficiency and to communicate NH Hoteles' environmental commitment to our responsible clients."**
>
> Mónica Chao Janeiro, Corporate Environment Manager,
> NH Hoteles

2.0 Brief overview of the methodology

The methodology provides hotels with a carbon footprint:

- per occupied room on a daily basis, and;
- per area of meeting space on an hourly basis.

This information can then be used to calculate the carbon footprint of a specific client's use of the hotel (i.e. number of room nights and usage of meeting rooms). These are the measures which feedback has suggested the industry will find most useful, particularly for hotels completing ***Request For Proposals (RFPs***) from potential clients.

The methodology includes all energy used 'on site' and, if applicable, includes carbon emissions from outsourced laundry operations (a significant source of emissions and a key area of many hotels' environmental programmes). The methodology recognises that some hotels operate a number of different facilities and so to improve comparability excludes any emissions from private areas, i.e. ***private space*** which is not accessible by guests.

The Working Group has incorporated ongoing research from the Cornell University's Center for Hospitality Research to determine the materiality of certain mobile emissions (e.g. hotel cars, shuttle buses, lawn mowers, etc.) and fugitive emissions (e.g. refrigerants). GHG emissions for the whole of a hotel are then allocated proportionally to guest rooms and meeting space on a consistent basis.

Carbon dioxide (CO2) is the most prevalent GHG, but methane (CH4) and nitrous oxide (N2O) are also harmful to the climate. As such GHG emissions are often reported as CO2-equivalents (CO2e). These emissions are calculated based on the sources of energy consumption using conversion factors advised in the Green House Gas (GHG) Protocol. The methodology's practicality was tested with over 50 hotels of different type, class, geography and ownership and via targeted stakeholder engagement to incorporate feedback from the travel and tourism industry.

2.1 Who should use this methodology?

The methodology is designed to be applied by any hotel around the world. The methodology has been designed in partnership with major hotel groups; however, it applies to individual hotels, large and small, regardless of the type of amenities offered.

Separately but complementary to HCMI, we have explained in Appendix 7 of this document how to calculate energy consumption per area, which is a metric that is often requested by hotel corporate clients and stakeholders. The calculations follow the same principles as the HCMI methodology.

> **"Tourism is a business which is sensitive to the environment in which it takes place as strong climate and weather events have an effect on tourism destinations. As part of the tourism value chain, the hotels industry will now be able, thanks to the HCMI, to assess their impact as a whole, but more importantly, in a homogenous standardised way for all companies. Our aim is not only to calculate the business units' footprint, but also to be able to sensitise and involve our guests in being part of the solution to reduce the impact on climate change of the hospitality business, by making them aware of the individual footprint of their stay."**
>
> Gabriel Escarrer Jaume, CEO and Vice Chairman of Meliá Hotels

2.2 Relationship with other GHG reporting standards

GHG Protocol: The HCMI methodology follows the GHG Protocol principles of relevance, completeness, consistency, transparency, and accuracy. The HCMI methodology defines:

- the reporting boundaries: entire hotel (minus any private space, plus outsourced laundry) using the operational control approach;
- ***scope of emissions***: scope 1 & 2 are included as recommended. In addition, emissions from outsourced laundry are also included because they are significant, contribute to the hotel's GHG risk exposure, are deemed critical to stakeholders, and potential emissions reductions can be influenced by the hotel;
- exclusions (private space, on-site staff accommodation, space leased to 3rd party not related to the hotel), and treatment of offsets and on-site generation; and
- reporting period.

The GHG protocol has four reporting standards[2], none of which individually fit with the purposes of HCMI. The HCMI methodology is aligned to the GHG Protocol's *Corporate Standard* but it calculates emissions at the individual hotel level, not at the corporate level. The HCMI methodology is aligned to the GHG Protocol's *Product Life Cycle Standard* in so far as it calculates GHG emissions resulting from the running of a hotel, but it does not calculate the emissions of the full life cycle of the hotel such as its construction materials, fittings and amenities including raw materials, manufacturing, transportation, storage, use and disposal. The HCMI methodology uses insights from the GHG Protocol Scope 2 guidance[3] to enable hotels to report on their use of renewable energy and electricity (market-based and location-based methods) but does not use this guidance to calculate the overall carbon footprint of the hotel. HCMI only offers a simplified method for hotels to aggregate and communicate on their use of renewable energy and electricity, based on market-based reporting only (not location-based).

ISO14064: HCMI also follows the principles of ISO14064-1[4] and includes requirements for determining boundaries, quantifying emissions and removals, and reporting data at the individual hotel level. HCMI however does not require hotels to disclose specific activities aimed at improving GHG management or provide guidance on quality management of the GHG inventory. Currently, HCMI only recommends an internal review process and does not mandate external verification.

Further information: Further background information on climate change and GHG emissions can be found on the GHG Protocol website (www.ghgprotocol.org).

For more information or to give your feedback on the methodology please contact info@sustainablehospitalityalliance.org.

*Please note that all words in **bold and italics** are defined in Appendix 1.*

[2] The four separate but linked standards are:
- the *Corporate Accounting and Reporting Standards ('Corporate Standard')*: designed for organizations to inventory and report all of the GHG emissions they produce,
- the *Product Life Cycle Accounting and Reporting Standard*: calculates the full life cycle emissions of a product,
- the *Project Accounting Protocol and Guidelines*: calculates reductions in GHG emissions from specific projects, and
- the *Corporate Value Chain (Scope 3) Accounting and Reporting Standard*: calculates GHG emissions from an organisation's entire value chain emissions impact.

[3] See example p50 of: https://ghgprotocol.org/sites/default/files/standards/Scope%202%20Guidance_Final_Sept26.pdf

[4] ISO 14064 is an international standard against which GHG emissions reports are voluntarily verified. Part 1 (ISO 14064-1:2006) specifies principles and requirements at the organization level for quantification and reporting of greenhouse gas (GHG) emissions and removals. It includes requirements for the design, development, management, reporting and verification of an organization's GHG inventory.

3.0 Boundaries

Reporting boundaries define what should be included in the hotel's carbon footprint. The methodology requires hotels to report on all GHG emissions resulting from activities within their premises (known as scope 1 and 2 emissions) and, if applicable, from outsourced laundry operations (scope 3 emissions). This includes restaurants, meeting spaces, shops, casinos, golf courses, spas, garden space, fitness centres, '***back of house'***, and any other amenities that are located within the hotel's premises. ***Private space*** is the one exception to this rule.

The methodology does not include the activities of suppliers outside of your premises (except laundry facilities), the guests' travel to your hotel, or employees' business travel in non-company cars.

Private space: GHG emissions from areas which are not accessible to hotel guests or conference attendees (e.g. private apartments) or not related to the hotel (e.g. the hotel leases a floor to a third party, such as restaurants, shops, hairdressers, etc.) should be excluded from the calculations. On-site staff accommodation is also considered private space.

The energy consumption of these private areas may be included in the hotel's energy bills (and measured through the hotel's meters). However, they operate separately from the hotel and their energy consumption should be subtracted from the hotel's total. This is calculated by either:

- Subtracting the ***sub-metered*** energy consumption of the private space (if all energy sources used in the private areas are sub-metered); or
- Subtracting a percentage of energy consumption based on area apportionment of private ***conditioned space*** compared to total conditioned space.

Note: if the private areas are metered and billed separately, then the hotel does not need to undertake any calculations, as the private areas' energy consumption would already be excluded from the hotel's own energy consumption.

Outsourced laundry: Laundry associated emissions can make up a significant portion of a hotel's overall emissions. Laundry has been a very high profile item in hotels' environmental activities for years and most hotels encourage their guests to re-use towels during their stay. However, many hotels outsource some or all of their laundry activity. GHG emissions from outsourced laundry operations should be included in a hotel's overall footprint in order to assist with the comparability of different hotels' overall footprints.

Other emissions: Other '***scope 3*** emissions' (referred to in the GHG Protocol) coming from activities such as travel (guests' travel to and from the hotel and employees' business travel), production of purchased materials and consumables in the hotel, waste disposal, product use, and other outsourced activities (except laundry) are excluded from the calculations.

Organisations wishing to calculate such emissions should refer to guidance from the WRI or the Climate Registry. However, in order to maintain consistency of reporting, these emissions should not be included in the HCMI calculations. Non-facility, offsite emissions from corporate offices and water consumption are also excluded.

The Working Group recognises that water, waste, biodiversity, and GHG emissions lifecycle analysis are important aspects of a hotel's overall environmental impact, however as these require complex calculations and estimation techniques, they have not been incorporated into HCMI. Hotels wishing to measure and report their water use in line can use Sustainable Hospitality Alliance's Hotel Water Measurement Initiative, created in 2016.

Renewable energy and electricity: Hotels can use energy and electricity generated from renewable sources in several ways:

Type of renewable energy use	How it is factored in HCMI
Through the electricity and energy they purchase from a local utility, which might include renewable generation in its energy mix (e.g. "20% of our electricity is generated from renewable sources").	A cleaner energy mix results in a lower emission factor, therefore a lower hotel carbon footprint.
Through an active approach, procuring a set amount of renewable energy through renewable energy certificates (e.g. certificates of origin).	A cleaner energy mix results in a lower emission factor, therefore a lower hotel carbon footprint. Hotels wanting to report specifically on the amount (or %) of renewable energy/electricity can do so through HCMI, but this will not affect the carbon footprint calculation.
By producing renewable energy or electricity on the hotel premises (e.g. wind turbine, solar panels).	HCMI considers that energy produced on site will be used by the hotel and therefore reduces the need for external energy/electricity supply, thus reducing the overall consumption and carbon footprint. Hotels wanting to report specifically on the amount (or %) of renewable energy/electricity they use can do so through HCMI, but this will not affect the carbon footprint calculation.

The HCMI spreadsheet allows hotels to aggregate and report on their use of these renewable electricity and energy sources, expressing the results in the following format:

- TOTAL renewable energy and electricity used by the hotel (kWh)
- TOTAL renewable electricity used by the hotel (% of total electricity use)
- TOTAL renewable energy and electricity used by the hotel (% of total energy consumption

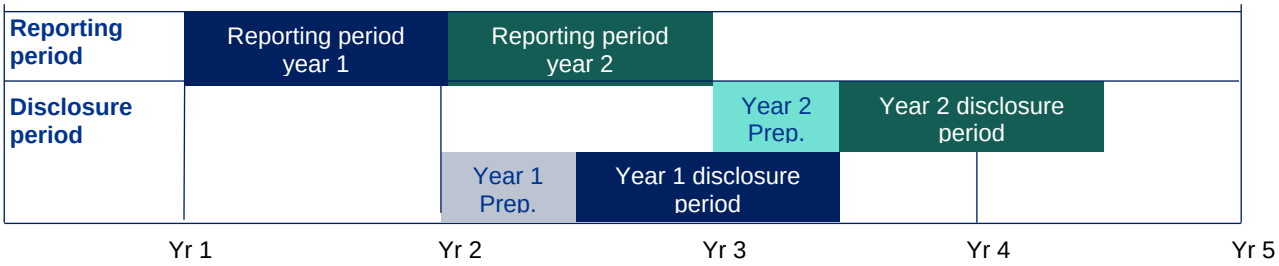
4.0 Reporting Period

4.1 Baseline year

The calculations are required to be performed once a year. The methodology includes an element of standing data, which is unlikely to change year on year, and information that should be updated annually (e.g. energy consumption and number of occupied rooms). Total GHG emissions should be calculated using a 12-month data set but the 12-month data period can be defined by each hotel or company internally e.g. calendar year, financial year.

4.2 Reporting and disclosure periods

- Data is collected and reported for a twelve month period (the reporting period). From the end of the reporting period, hotels have a maximum of six months to gather data and carry out the footprint calculations. After the calculations have been completed, the carbon footprint data is valid for 12 months (the disclosure period). Therefore, the footprint data is never more than 18 months old.
- Please note that preparing the data in 60 days instead of 6 months is considered 'best practice'.
- The diagram below shows how the reporting and disclosure period interact:



4.3 Refurbishments

The methodology calculates GHG emissions during "normal operations". Conducting extensive refurbishments during the reporting year may distort results which aim to show a normal operating position.

Hotels undertaking refurbishments should disclose this information where possible. If the refurbishment is major and alters the energy consumption by +/- 20% compared to the previous reporting period then hotels must use the previous period's data (and disclose this fact). Although the data will be older, it is more likely to be a truer reflection of the hotel energy consumption during normal operations.

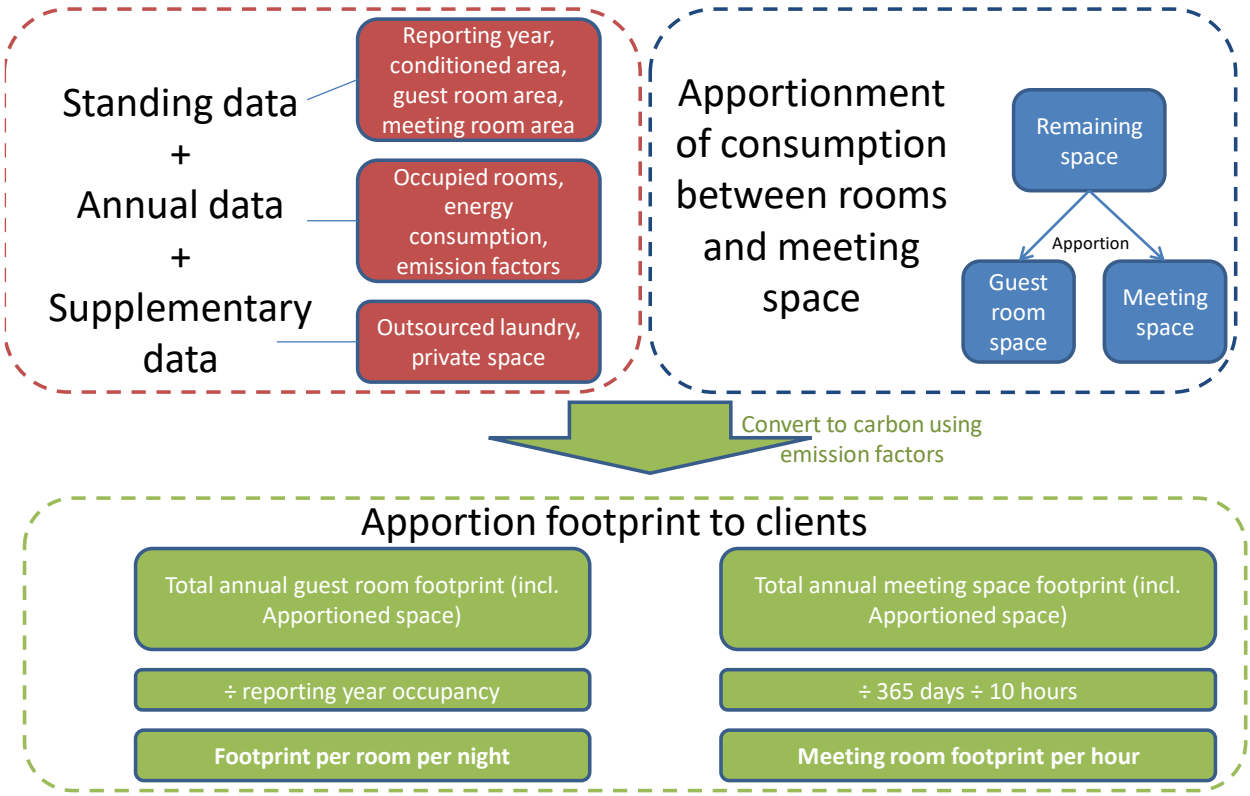
Routine refurbishments do not have to be disclosed or accounted for.

4.4 Seasonality

We recognise that hotels energy consumption vary by seasons. However, in line with the GHG Protocol, variations in energy consumption and therefore GHG emissions during the year are not taken into consideration. Hotels are asked to provide only one GHG emissions figure per year and thus emissions are averaged out over the 12-month period.

5.0 Data Requirements

5.1 Summary of data flow



The main pieces of data necessary for a hotel to calculate the carbon footprint for a guest room and meeting space are as follows:

5.2 Standing data

This data is unlikely to change from one year to the next and should be readily available to hotel managers.

Data requirements	Rationale	Likely source
Reporting year (start and end date)	Necessary to provide the disclosure period 12 months period should be used	Determined by the hotel's management team
Total area of guest rooms and corridors (sqft or sqm)	Necessary for footprint apportionment	Architectural plan, property/facility management
Total area of meeting facility space (sqft or sqm)	Necessary for footprint apportionment	Architectural plan, property/facility management
Total area of conditioned space (sqft or sqm)	Necessary for footprint apportionment	Architectural plan, property/facility management
Total number of rooms	Necessary for footprint apportionment	Architectural plan, property/facility management

If the hotel has any ***private space***:

Private space (sqft or sqm)	Necessary for footprint apportionment	Architectural plans, property/facility management

Please note that conditioned space is only used to calculate the percentage of GHG emissions from private space. It is only necessary to measure it if the hotel has private space with energy which is not sub-metered.

Conditioned space is often calculated in slightly different ways by different hotels (e.g. including or excluding walls). Given its limited impact on the overall calculations and in the interest of simplicity, hotels should continue using their current measurement methods.

The area of guest rooms and meeting space is required to allocate GHG emissions between them. This is explained in more details in the 'Calculating Emissions' section.

5.3 Data for the reporting year

Total number of ***occupied rooms*** for reporting year	Necessary for footprint apportionment (and for outsourced laundry estimations, if needed)	Sales data or management accounts data
Total energy consumption for the reporting year from fuel and electricity etc.	Necessary for total footprint calculation	Energy bills and/or meter readings
Emission factors	These should be country or state specific to allow for greater accuracy. Each type of energy consumption (e.g. gas, oil, electricity, should have its own emission factor).	Emission factors are obtained from national or international Datasets (e.g. IEA, see appendix 2)
Renewable energy	Energy and heat purchased from a supplier using renewable sources (e.g. geothermal district heating), or generated on-site using renewable sources (such as biomass, biofuel, hydropower, geothermal energy, solar)	Energy bills, or energy generator meter readings
Renewable electricity	Electricity purchased from a supplier generating electricity from renewable sources. The amount of renewable electricity supplied should be verifiable through mechanisms such as Power-Purchase Agreements, and Renewable Energy Certificates. Renewable electricity can also be produced on-site by the hotel using solar panels or wind turbines, or any renewable electricity generation system.	Renewable energy certificates Power Purchase agreements Energy bills Electricity generator meter readings NB: Certificates of origin are recommended as the most robust source of data. In case certificates are not available, please refer to the energy mix or share of renewables disclosed on energy bills.

Occupied rooms: Occupied rooms are the total rooms that were occupied by guests over the 12 month reporting period. The methodology assumes each occupied room shares its proportion of the total footprint equally.

No-shows are not included in occupied room count, but complimentary rooms that were occupied but not paid for are included.

In summary: Occupied room = total number of rooms sold less no shows plus complimentary rooms that were occupied and not paid for throughout the reporting year.

Since Occupied Rooms are used, out-of-order rooms not within the hotel's inventory do not affect the rooms calculation. Because the methodology uses occupied rooms instead of available rooms, all GHG emissions apportioned to guest rooms are allocated to hotel guests, leaving no emissions unassigned.

Emissions are calculated on a per occupied room basis. If relevant to your business (e.g. some resorts or camps), you may also calculate your footprint per bed sold, using the same methodology. However, you need to make this distinction clear in your reporting.

Energy Consumption: Energy consumption may come from the following sources:

- Fuels consumed on-site such as natural gas (stationary combustion), oil and other fuels
- Purchased electricity
- Mobile fuels burned (from vehicles and landscaping equipment)
- District heating, district cooling or energy purchased from a Combined Heat & Power (CHP) plant not operated by the hotel

Energy consumption data should be obtained from your energy invoices or from taking meter readings at the beginning and end of the reporting period.

Note: Consumption data based on actual meter readings is preferable as energy bills can be inaccurate or based on estimated readings. It is good practice to take your own meter readings to measure your energy consumption and verify the accuracy of your energy bills. Meter readings should be scheduled to coincide with carbon monitoring and reporting periods. Meter readings should be taken at regular intervals and a process should be in place to record the readings.

Smart meters that record consumption on a half-hourly basis are effective tools to measure and manage your energy consumption.

Estimating data: If you do not have data for the entire year, you may estimate your consumption based on the following estimation techniques[5].

- Pro rata:
    - calculating the daily energy consumption using the available data, and
    - multiplying the daily energy consumption by the number of missing days
- Direct comparison: using consumption data for a similar period in the previous year. The advantage of this is that it accommodates variability in energy demand (e.g. gas consumption in winter and summer months).
- Price settlement: calculating energy consumption by dividing your energy costs by your energy rate.

Renewable energy: HCMI is designed to take the use of renewable energy into account when calculating the overall carbon footprint of a hotel:

- Purchased energy from renewable sources has a lower emission factor, therefore a lower carbon footprint

[5] UK Government: https://www.gov.uk/government/collections/energy-and-emissions-projections

- Onsite renewable energy (e.g. from solar or wind) reduce the amount of energy that a hotel needs to purchase and therefore reduces its energy consumption.

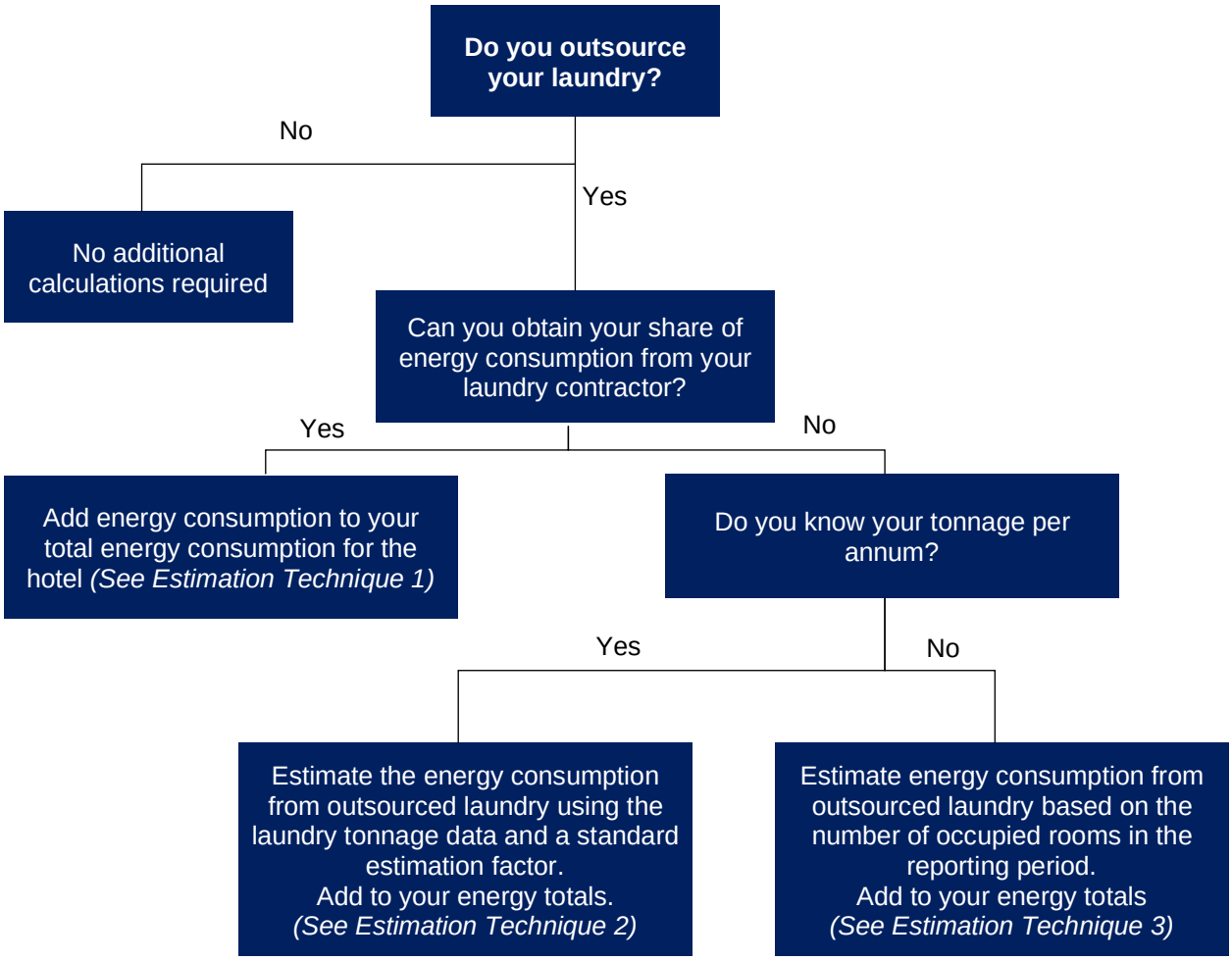
However, hotels and businesses are increasingly switching their energy supply towards more renewable sources, and may want to communicate their efforts in that direction to their customers and stakeholders.

The version 1.2 of the HCMI calculation spreadsheet (2020) is designed to help hotels communicate on their use of renewable energy more transparently. However, this addition does not change the overall carbon footprint calculation for the hotel, it only breaks down energy sources further to enable transparency on the use of renewables. We therefore recommend businesses wanting to communicate on renewables to break down the information in the following order:

- Total energy and heat purchased from supplier using renewable sources (e.g. geothermal district heating, through green electricity supplier, Power-Purchase Agreement, Renewable Energy Certificates), in kWh
- Total energy and heat generated on-site using renewable sources (using biomass, biofuel, hydropower, geothermal energy, solar, wind), in kWh

NB: Any renewable energy generated on site and sold back to the grid should not be counted in HCMI.

Outsourced laundry: The impact of in-house laundry operations is already captured in the core methodology. GHG emissions from outsourced laundry operations should be included in a hotel's footprint based on the decision tree below.



The energy consumption from outsourced laundry operations should be added to the hotel overall energy consumption using one of the estimation techniques below (in order of preference):

Estimation technique 1: data from contractor

Hotels should try to obtain energy consumption data from their laundry suppliers. The supplier should supply energy data for the same reporting year as the hotel's GHG emissions reporting year, or estimate based on a 12 month period that is similar to the reporting year.

The laundry supplier probably washes and dries laundry for several clients. Therefore its total energy consumption should be apportioned to a specific hotel based on the percentage of volume that each hotel is responsible for. If this is not available, a percentage of revenue may be an appropriate application. The supplier does not have to supply its total revenue or volume data, as this may be commercially sensitive information. However, they should be able to provide your hotel's portion of the energy use.

For example, if your supplier's total electricity consumption for the year is 100,000 kWh and you represent 10% of their business (by volume or revenue), your share of electricity consumption is: 10,000 kWh. The same calculations should be carried out for gas, oil, and any other sources of energy used by the laundry supplier.

Note: if one central laundry facility services multiple hotels within the same hotel group, the same principle applies. The laundry operator should calculate their energy consumption for the year and a percentage of that consumption should be apportioned to each hotel based on the percentage of volume of laundry.

Estimation technique 2: using laundry tonnage

If your laundry supplier is not able to provide your share of the energy consumption, the next best alternative is to estimate the energy consumption required to wash and dry all of your laundry in a 12 months period using the amount of laundry.

The tonnage of laundry information may be available from your invoices. Alternatively, a reasonable estimate can be obtained by weighing the average amount of laundry used in a room and multiplying by the number of occupied rooms for the reporting period. Please note that the weight of laundry taken from a room may vary and we recommend that a sample should be taken regularly to provide an average for the reporting period. Please note the laundry must be dry when weighed. Best practice would be 5% of rooms each month.

As with technique 2, the limitations of estimation technique 3 are recognised: all guest rooms may not be cleaned every day and the amount of linen varies by hotel class. In addition, as with technique 2, the mix of electricity, gas, oil, or other sources will vary by country and by laundry contractor. If better information becomes available, it will be reviewed and considered for inclusion in the methodology.

Once you have your laundry tonnage information, you should calculate your energy consumption from outsourced laundry using the following estimates:

- Electricity: 180 kWh per metric tonne of laundry, plus
- Gas: 1,560 kWh per metric tonne of laundry, plus
- Oil: 111 litres per metric tonne of laundry

These estimates are based on the Carbon Trust- Guide to the laundries sector (CTG064) publication, which conducted a survey on the energy consumption of commercial laundries in the UK.

Please note that these figures include a 10% uplift on the Carbon Trust data to take into account the uncertainty of the estimated data and to encourage hotel managers to obtain data directly from their suppliers.

The limitations of the estimation technique is recognised, as the mix of electricity, gas, oil, or other sources will vary by country and by laundry contractor. If better information becomes available, it will be reviewed and considered for inclusion in the methodology.

This uplift of 10% on estimated data is customary and follows other carbon reporting methodologies. For example, the IPCC Aviation recommends a 9 to 10% uplift to emissions from aviation to take into account non-direct routes and delays/circling and the UK's Carbon Reduction Commitment also applies a 10% uplift for estimated data.

Estimation technique 3: using occupancy

If the two options above are not available to you, you should estimate your laundry tonnage by using an average per occupied room. This is equivalent to: 5.12 kg per occupied room (source: Laundry Today). You should then follow technique 2 to estimate the energy consumption.

Note: Hotels where guest rooms are not fully serviced on a daily basis (e.g. timeshares) are encouraged to use techniques 1 or 2.

Fugitive emissions: Fugitive emissions are usually emissions arising from unintentional releases of gas from certain hotel cooling systems. Certain gases (refrigerants) found within air-conditioning units, fridges, and freezers when released have a similar impact on the atmosphere as CO2. When any of this equipment is installed, operated, serviced or retired there may be leaks of these refrigerant gases, which are known as fugitive emissions. Version 1.1 of HCMI clarifies the treatment of fugitive emissions following the release of Cornell University Center for Hospitality Research's report Determining Materiality in Carbon Footprinting[6].

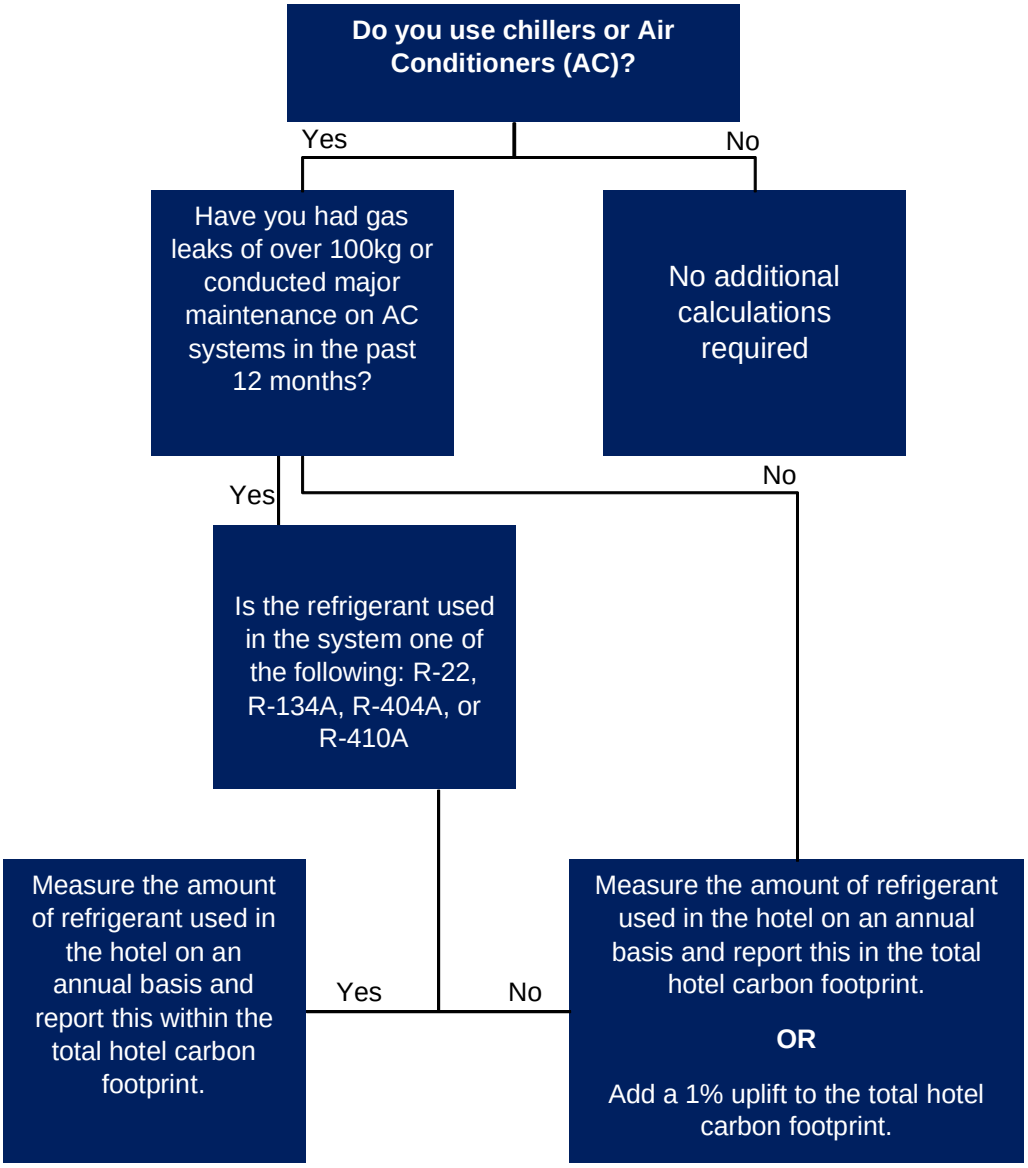
The amount of refrigerant leaked is usually small. However, their impact can be significant. This is because they are much more damaging to the atmosphere than CO2[7].

For many hotels, fugitive emissions will be insignificant compared with their total GHG emissions. However, for some hotels with significant air-conditioning or refrigeration systems, refrigerant replacement may be a significant source of emissions, due to leaks or major maintenance programme during the reporting year, and should be measured.

Fugitive emissions should be included in a hotel's footprint based on the decision tree below:

[6] Cornell Hospitality Report Vol. 12, No 12, September 2012, Eric Ricaurte

[7] the ***Global Warming Potential*** (GWP) of different refrigerants varies greatly. Some commonly used refrigerants (R-22, R-134A, R404, and R410-A) are particularly harmful. For example, the R-22 gas traps 1,810 times more heat in the atmosphere than CO2.



How to measure fugitive emissions: The amount of refrigerants used is quantified by measuring the amount of refrigerant gas being replaced in each cooling unit. This information should be available from your Maintenance team or from contractors hired to service your equipment. The data may be obtained from service logs and purchase or usage records.

Once you have determined the total amount of each refrigerant used during the reporting year, you can calculate your fugitive emissions by using the conversion table in Appendix 3. Fugitive emissions are calculated in tonnes of CO2 equivalent (tCO2e).

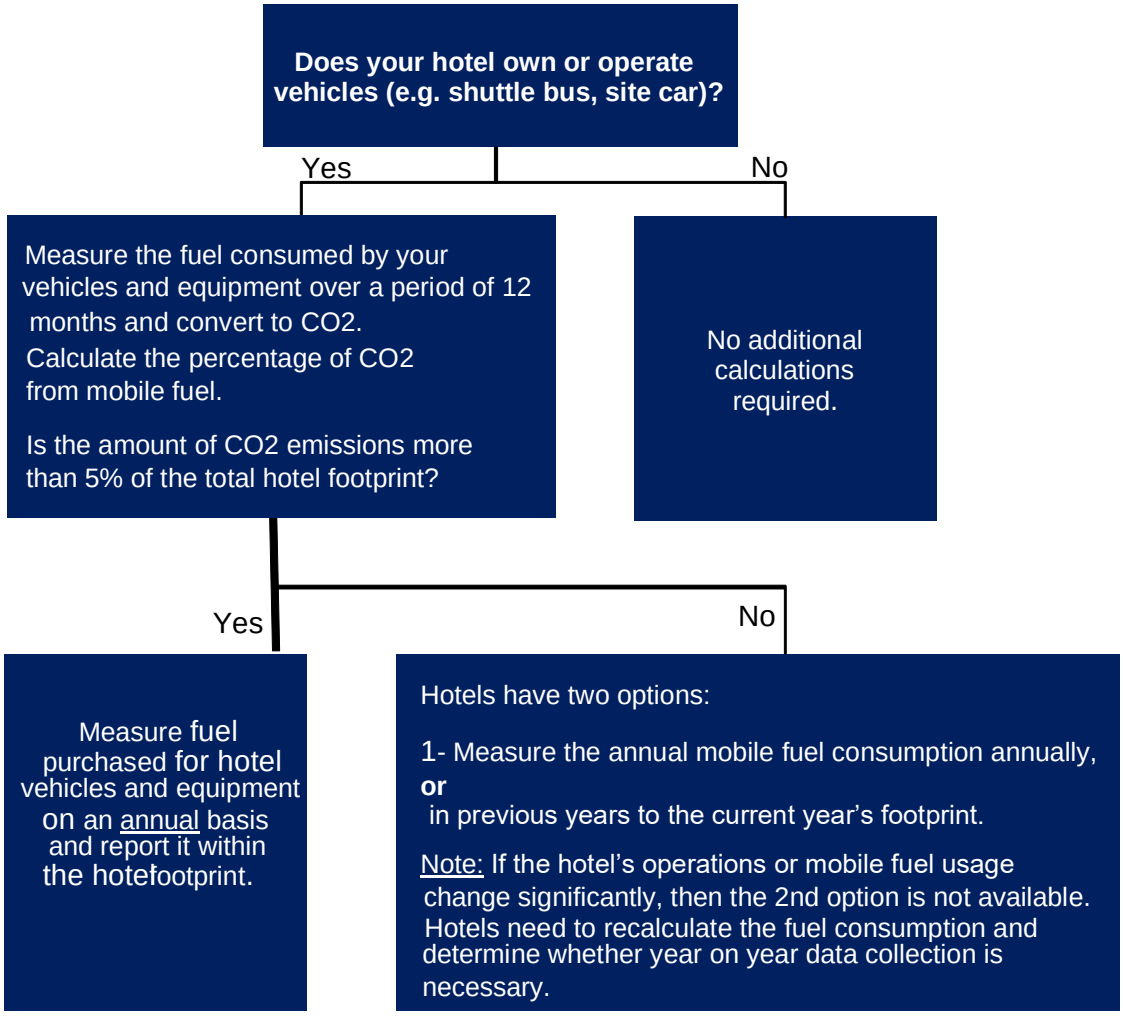
Hotels may also use the Screening method or Material Balance Method of calculating fugitive emissions described in the GHG Protocol's Scope 1&2 GHG Inventory Guidance, page 19 (https://ghgprotocol.org/sites/default/files/Guidance_Handbook_2019_FINAL.pdf). The Screening method is the simpler of the two methods; however it requires hotels to carry out an inventory of equipment, including the type of refrigerants used, the equipment charge capacity, and approximate amount of time the equipment is used during the reporting year.

Mobile fuels: Mobile fuels, such as diesel or gas oil, are used by hotels for hotel shuttles, company cars, landscaping equipment, jet skis, etc. The amount of GHG emissions from the consumption of mobile fuels is unlikely to be more than 10% of a hotel's total emissions and, in many cases, will be insignificant. As with fugitive emissions, Version 1.1 of HCMI clarifies the

treatment of mobile fuel emissions following the release of Cornell University Center for Hospitality Research's report Determining Materiality in Carbon Footprinting. The report concludes that:

- if a hotel does not have transportation vehicles, mobile fuel emissions from other sources (e.g. landscaping) are most likely insignificant;
- if a hotel operates vehicles, it can perform a twelve-month performance period test to determine the percentage that mobile fuel emissions represent toward total emissions.

Fugitive emissions should therefore be included in a hotel's footprint based on the decision tree below:



How to measure mobile fuel emissions: A hotel should measure the fuel consumption of all vehicles and other equipment (such as landscaping equipment) that it owns or has operational control over. For example, the fuel consumption of owned or leased company cars, shuttles, jet skis, lawn mowers should be included. However, vehicles operated by third parties such as limousines, delivery trucks, taxis, etc. should be excluded.

The appropriate emission factor for each fuel should be applied to calculate the total amount of GHG emissions from mobile fuels. Please refer to Appendix 2 for guidance on emission factors.

Emission factors: Emission factors convert activity data (e.g. energy consumption) to GHG emissions. Hotels may choose the emission factor (EF) sources for stationary combustion, provided that they are from a reputable, third-party source such as:

- national agencies (preferred option); e.g. the US Environment Protection Agency (EPA: http://www.epa.gov/climatechange/emissions/index.html) or the UK Department of Business, Energy and Industrial Strategy ((https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019)
- GHG Protocol (www.ghgprotocol.org /calculation-tools/all-tools),
- the International Energy Agency (http://www.iea.org/statistics/topics/co2emissions/), or
- the Climate Registry (http://www.theclimateregistry.org/).

CO2 Equivalents: EFs should include emissions of carbon dioxide, methane and nitrous oxide from all the agreed sources (i.e. hotels should use CO2-equivalent EF that incorporate the ***Global Warming Potentials*** of CH4 and N2O, instead of CO2 EF). EFs are to be quantified using High Heating Values[8].

Transmission & distribution losses: Site energy is used when quantifying purchased electricity energy (not source energy). Therefore under the guidance of the GHG Protocol, unless a company that purchases electricity, heat, and/or steam owns or controls the transmission and distribution (T&D) network, T&D loses should not be included in the company's GHG inventory.

Emissions from District Heating, District Cooling, or energy from a CHP: The emission factors for energy purchased from district heating, district cooling, or CHP plants operated by third parties depend on the efficiency and input fuel of these plants. Appendix 4 provides some guidance on how to calculate GHG emissions for these energy sources, where a hotel is able to obtain this information from its service provider.

[8] Heating Value refers to the amount of energy released when a fuel is burned completely.

6.0 Calculating Emissions

6.1 Total hotel GHG emissions

This is the total energy usage (electricity, gas, gas oil plus any additional energy sources) plus energy usage from outsourced laundry (if applicable) less energy consumed in private space (if applicable), converted into tonnes of CO2e using the most relevant emission factor for the country/state.

Please be careful of common errors:

- Choice of emission factors: make sure to multiply your energy consumption data from one energy source (e.g. natural gas) with the EF for the same energy source and for your country or region. Electricity EFs vary greatly by region depending on the energy mix used to generate electricity (e.g. coal, nuclear, renewables, etc.).
- Unit conversion factors: energy consumption is reported in your invoices or is measured through your meters using various units (e.g. kWh, GJ, m3, ft3, litres, etc.) these vary from country to country. It is important that your energy consumption data and EFs are in the same units. Standard unit conversions are listed in Appendix 5. There are also several online tools that can help you with conversions.

6.2 Offsets

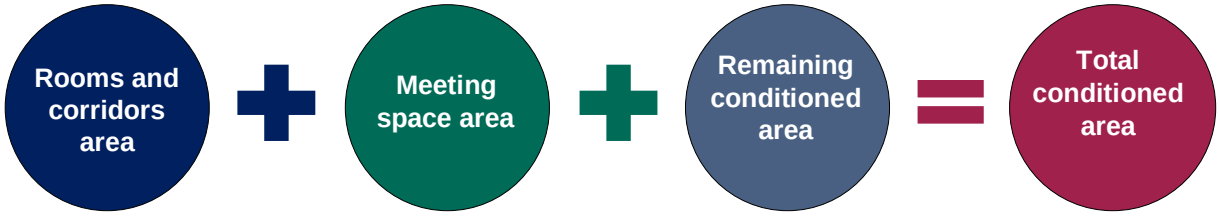
The methodology measures the GHG efficiency at which a hotel provides guest rooms and meeting space to its customers. If the hotel purchases carbon offsets, it can disclose this information, but it cannot deduct the amount of emissions that is offset from its total GHG emissions. This is consistent with GHG Protocol Corporate Standard Revised version 2004 (chapter 11 page 82); "companies should always report their own internal emissions in separate accounts from offsets used to meet the target, rather than providing a net figure."

6.3 Apportionment

For carbon reporting purposes, the hotel is divided into its two main services, guestrooms and meeting space, to avoid overlapping of footprints for guests that both attend meetings and stay at the hotel. ***Back of house*** areas and other services and facilities are interpreted as being part of the service offering.

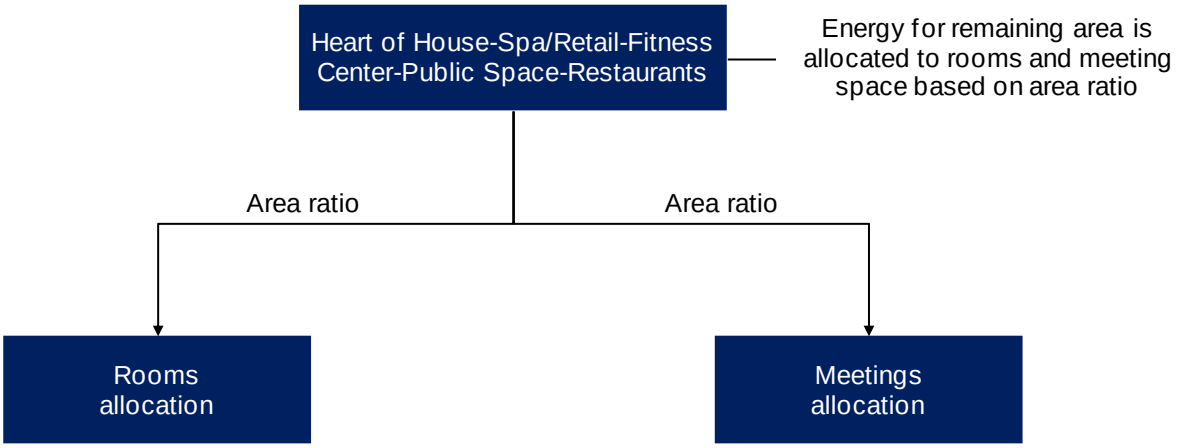
GHG emissions are allocated to guest rooms and meeting space based on the ratio of space occupied by guest rooms and meeting space within the hotel.

The two services are apportioned as follows:



- Total area is defined as total conditioned space
- Rooms and corridors adjacent to rooms are defined as a percentage of total area
- Meeting space is defined as a percentage of total area
- Remaining areas of heart of house, spa, retail, fitness, public space, restaurants, etc. make up the remaining percentage of total area

- The percentage of Remaining Areas is allocated proportionately to Rooms and Meeting Space
- Remaining energy is allocated to the categories of “Rooms” and “Meeting Space” proportionate to their area ratio



Carbon footprints for all rooms and all meetings are calculated as follow:

Rooms Allocation x (Total Energy x Emission Factors) = Carbon footprint for all rooms

Meetings Allocation x (Total Energy x Emission Factors) = Carbon footprint for all meetings

Note: If a hotel has no meeting space, then all GHG emissions are allocated to guest rooms.

6.4 Carbon Intensity

The methodology assumes equal intensity for all areas of the hotel. This was deemed necessary to keep the methodology simple enough that hotel managers can use it on their own, without the need of extensive sub-metering, data analysis, or external assistance.

This estimation does not impact the overall carbon footprint of the hotel but may affect the apportionment between guest rooms and meeting space. For clients who book both (e.g. a combination of meeting space and hotel rooms), the methodology does not think this will have a material impact. The methodology can be refined in the future to take into account new research in this field.

7.0 Outputs

7.1 Carbon footprint per occupied room on a daily basis

The room footprint is intended to communicate the footprint of one night's stay in a hotel room. This footprint can then be multiplied by the number of room nights occupied by a client. Occupied rooms are the total rooms that were occupied by guests in a given period, and according to this methodology each occupied room shares the proportion of the total footprint equally.

Carbon Footprint for all rooms ÷ Occupied Rooms = Carbon Footprint per Occupied Room

Carbon Footprint per Occupied Room x Number of Client Rooms = Client Rooms Carbon Footprint

7.2 Carbon footprint per area of meeting space on an hourly basis

Meetings footprints are derived using the average daily consumption of meetings energy. The Meetings Carbon Footprint per Day is broken down based on meeting-hours and proportion of meeting space utilized.

Meetings Carbon Footprint ÷ 365 = Meetings Carbon Footprint per Day

To arrive at the Meetings Carbon Footprint per Hour per area of meeting space (sqm/sqft), the Meetings Carbon Footprint per Day is divided by the average number of operation hours of meetings in one day and by the total area of meeting facility space. The average number of operation hours of meetings in one day is set and standardized at 10 hours.

The Meetings Carbon Footprint per hour per sqm/sqft is then multiplied by the amount of meeting space utilized for the meeting and the duration of the meeting in hours.

Example

A client has booked a meeting room for a three day conference. Two days before the conference, the hotel sets up the room. The day before the conference, the client sets up the conference between 10:00 and 20:00. The conference then runs for 3 days for 8 hours each day. On the last day, the client needs 4 hours to break down their set up. The hotel then cleans the meeting room and set it up for another event. The number of hours used by the client is therefore: 10 + (3*8) + 4 = 38 hours

(Meetings Carbon Footprint per Day per sqm/sqft) ÷ (10) x (amount of meeting space utilized) = Client meeting footprint per hour

A client's footprint will be calculated by multiplying this figure by the number of hours that the client has utilized the meeting space, including the client set-up and breakdown time, but excluding the hotel set-up and breakdown time.

Please note that the energy consumed during the hotel set up and breakdown of the meeting space is still captured in the overall footprint calculations, but the allocation of the GHG emissions is based on the client's utilization of the meeting space.

Hotels which were closed for part of the reporting period should use the number of days they were open for, instead of the standard 365 days.

Comments

We recognise that the methodology assumes that meeting rooms are being used for on average 10 hours per day 365 days of the year. Feedback suggests that this is a realistic estimate of average usage (excluding set up time) of meeting space across the year, although it is recognised that this varies considerably from hotel to hotel. This assumption may be reviewed in the future if more information becomes available. However, in order to keep the methodology simple, we opted for a standard meeting space utilisation rate.

We recognise that room occupancy levels and utilisation of meeting space has an impact on the final outputs. However, the methodology does not attempt to measure the incremental GHG emissions from a guest room or meeting room but the average over a 12 months period.

Please note that the methodology for guest rooms uses a spatial measure (m2 or sq ft) only to allocate GHG emissions between guest rooms and meeting space. The output of this methodology focuses on the client as the generator of emissions. GHG emissions are therefore reported per occupied room. As a result the methodology for guest rooms (unlike meeting rooms) does not account for different room sizes (e.g. standard room v. suite). This may be reviewed in the future.

7.3 Amount of renewable energy used by the hotel

The total renewable energy use of the hotel (expressed in kWh) is calculated by adding the amounts used from four potential sources:

Total renewable energy use = energy and heat purchased from supplier using renewable sources + energy and heat generated on-site using renewable sources.

7.4 Share of renewable energy used by the hotel (% of total energy use)

This figure takes into account energy use from renewable sources, expressed in one single unit (we recommend using kWh).

Share of renewable energy used by the hotel = Total renewable energy use ÷ total energy use.

7.5 Internal review

In line with GHG Protocol guidance, we recommend the following activities are implemented in order to reduce the risk of errors:

- Conduct an independent review: at the minimum, ask someone who has not been involved with the calculations to check the data; an external review is likely to add to the credibility of the data
- Check for mistakes in converting measurement units, entering data, using formulas, etc.
- Check for large variances in energy consumption between periods: can these be explained or could there be an error between invoices or meter readings and your calculations spreadsheet?
- Where appropriate compare results of different hotels within a group and investigate unexplained differences in the results to enable different applications of the methodology to be identified and addressed

7.6 Improving performance

This methodology is designed to measure GHG emissions. Each hotel and hotel group is responsible for improving their own performance and reducing their GHG emissions (and energy costs). Guidance on improving performance is available from a number of sources.

Appendix 1: Definitions

Term	Definition
Back of house	• All non-client facing areas. This includes kitchen, offices, employees locker rooms, storage rooms, in-house laundry facilities, etc.
Carbon footprint	• The total amount of carbon produced directly and indirectly to support guests' activities; expressed in this methodology as tonnes of carbon dioxide
Carbon footprint per occupied room on a daily basis	• The carbon footprint that is allocated to each occupied room on a daily basis
Carbon footprint per area of meeting space on an hourly basis	• The carbon footprint that is allocated to one hour of utilization of a meeting space and based on the percentage of meeting space area used.
Conditioned space	• The area of a hotel that is conditioned by any heating, ventilations, air conditioning (HVAC) equipment.
Emission factor	• The conversion figure used to convert energy consumption into a unit of carbon
Energy consumption	• This is your total energy consumption for all your premises, including any outdoors facilities or private apartments. You should obtain this data from your energy invoices or from taking meter readings at the beginning and end of the reporting period. • Consumption data based on actual meter readings is preferable as energy bills can be inaccurate or based on estimated readings. It is good practice to take your own meter readings to measure your energy consumption and verify the accuracy of your energy bills. Meter readings should be scheduled to coincide with carbon monitoring and reporting periods. Meter readings should be taken at regular intervals and a process should be in place to record the readings. • Estimating consumption: if you do not have data for the entire year, you may estimate your consumption based on the following estimations techniques (source UK Environment Agency): – Pro rata estimation technique involves quantifying the missing data for a data gap using a proportional method based on actual consumption from another similar period – Direct comparison method uses data that corresponds with a similar period of supply. The advantage of this is that it accommodates variability in energy demand. – Price settlement: using the unit price shown on an earlier bill for this billing period or an average price per unit to convert energy costs into consumption data.
Fugitive emissions	• Emissions that are not physically controlled but result from the intentional or unintentional releases of GHGs. A common example is emissions from refrigerants, air conditioning and refrigeration units.
Global Warming Potential (GWP)	• A factor describing the radiative forcing impact (degree of harm to the atmosphere) of one unit of a given GHG relative to one unit of CO2 (GHG protocol definition)
Mobile fuels	• Energy consumption from transport, machinery and equipment.
Occupied rooms	• Sum of all rooms sold plus complimentary rooms less no-shows for the reporting period

Appendix 2: Emission Factors

Emission factors for electricity production and common fuels are available in datasets updated annually by the International Energy Agency (IEA). You may also find relevant emissions for your country of from your national government agencies, such as US EPA, UK BEIS, Australia's Department of Climate Change and Energy Efficiency, or Environment Canada, who provide accurate and up to date emission factors. Hotels should select the most current and relevant emission factors available. Electricity emission factors are updated annually to account for the change in how electricity is generated within a country or intra-national regions.

National government agencies often publish national datasets on a freely accessible platform online. IEA data needs to be purchased. Below are the links where you will find IEA datasets.

Common fuels (excluding electricity):
https://www.iea.org/statistics/relateddatabases/co2emissionsfromfuelcombustion/

Electricity: http://data.iea.org/payment/products/115-co2-emissions-from-fuel-combustion-2016-edition.aspx

Appendix 3: Global Warming Potential (GWP) of Refrigerants

Refrigerant used	Global Warming Potential (GWP) of refrigerant (kg CO2e)
HCFC-22/R22 = chlorodifluoromethane	1,810
HFC-134a	1,430
R-404A	3,922
R-410A	2,088
HFC-23	14,800
HFC-32	675
HFC-41	92
HFC-125	3,500
HFC-134	1,100
HFC-143	353
HFC-143a	4,470
HFC-152a	124
HFC-227ea	3,220
HFC-236fa	9,810
HFC-245fa	1,030
HFC-43-l0mee	1,640
Perfluoromethane (PFC-14)	7,390
Perfluoroethane (PFC-116)	12,200
Perfluoropropane (PFC-218)	8,830
Perfluorocyclobutane (PFC-318)	10,300
Perfluorobutane (PFC-3-1-10)	8,860
Perfluoropentane (PFC-4-1-12)	9,160
Perfluorohexane (PFC-5-1-14)	9,300
Sulphur hexafluoride (SF6)	22,800

The GWP of refrigerants listed in this table indicate the relative amount of heat trapped by refrigerants compared to CO2. Fugitive emissions are calculated in tonnes of CO2 equivalent using these GWP factors.

For example, 1 kg of R-22 released in the atmosphere equals 1,810 kg of CO2-equivalent (or 1.81 tonnes).

To measure your total fugitive emissions, you need to follow these steps:

1) Determine the amount of each refrigerant used in the reporting year (in kg);
2) For each refrigerant, multiply the amount used by its GWP;
3) Sum up the figures to obtain a total in kg of CO2-equivalent; and
4) Divide by 1,000 to obtain a total amount of fugitive emissions in tonnes of CO2-equivalent. This number will be added to your total GHG emissions.

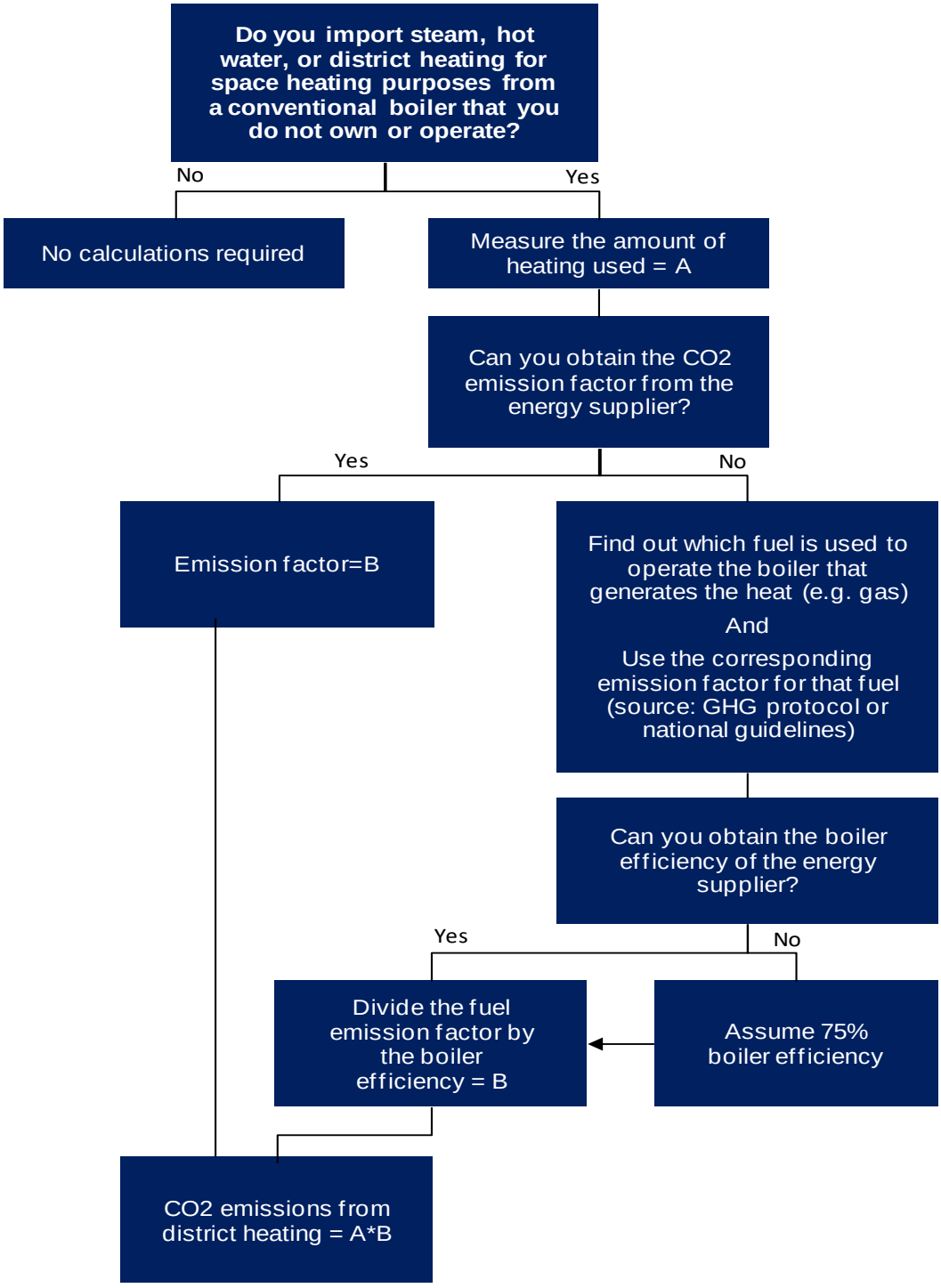
Source: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019

Further guidance on how to calculate refrigerant leakage is provided in the UK government 'Environmental reporting guidelines'.

Appendix 4: District Heating, Cooling, and Combined Heat & Power

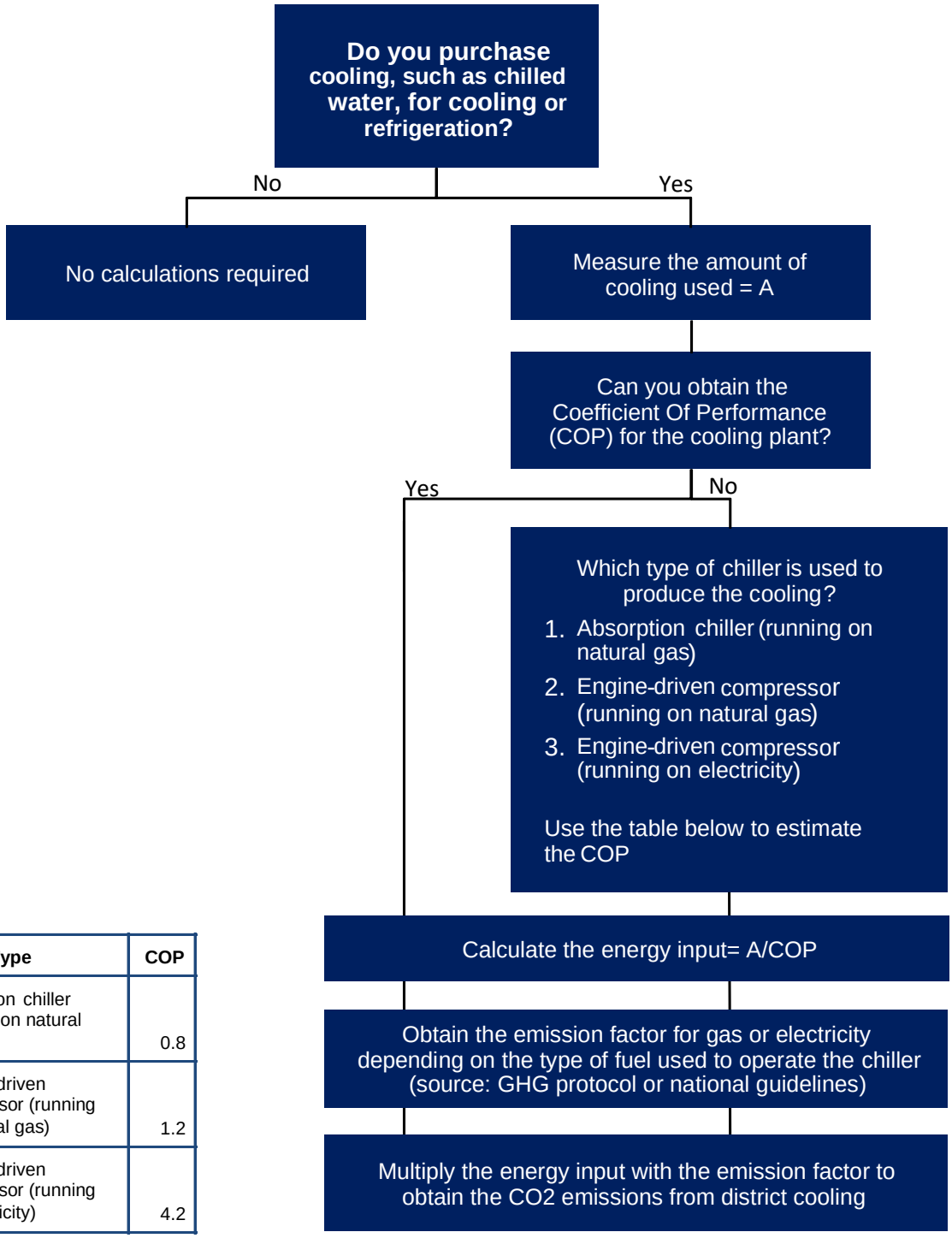
Some hotels purchase electricity, steam, or heat from a Combined Heat & Power (CHP) plant that they do not own or operate. HCMI version 1.1 provides in the following decision trees some information on how to calculate GHG emission from these energy sources, using guidance from the Climate Registry. For hotels using the HCMI spreadsheet tool, this information can be used to fill cells B8 to B11 in Tab 2.

District heating



Note: The quantity of steam or heat used (A) can be obtained from invoices or metered records.

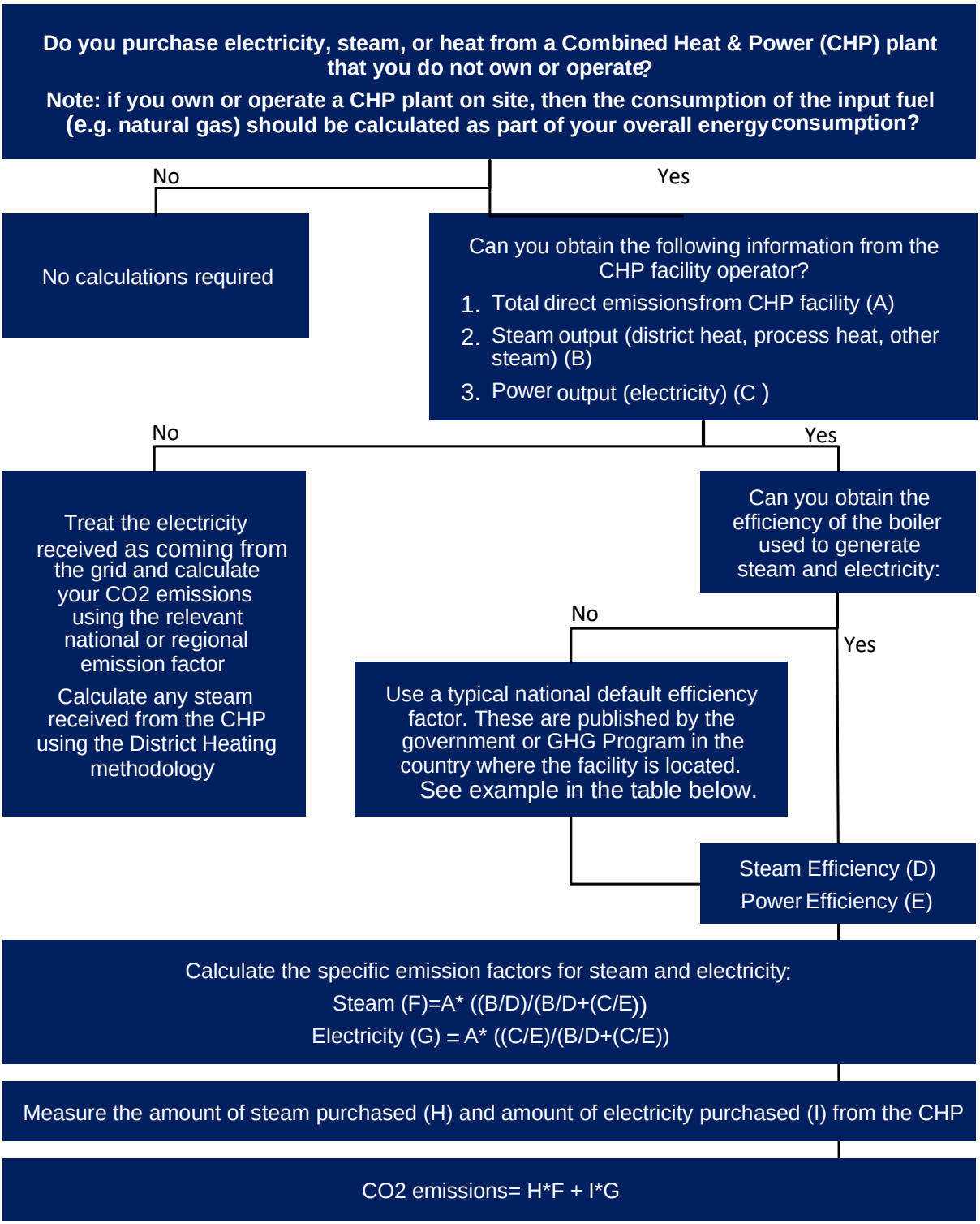
District Cooling



Chiller Type	COP
Absorption chiller (running on natural gas)	0.8
Engine -driven compressor (running on natural gas)	1.2
Engine -driven compressor (running on electricity)	4.2

Note: The quantity of cooling used (A) can be obtained from invoices or metered records.

Energy from Combined Heat & Power Plants



For example, the US EPA Climate Leaders and UK DEFRA have published the following efficiency factors:

GHG Program / Country	Assumed efficiency of typical power production	Assumed efficiency of typical steam production
US Climate Leaders, EPA	0.35	0.8
UK Emissions Trading Scheme, DEFRA	0.33	0.66

Note: The quantity of heating, steam (B) or electricity (C) used can be obtained from invoices or metered records.

Appendix 5: Unit conversions

If this annex does not have the conversion factor you are looking for, a more complete list of conversions is available at http://www.onlineconversion.com

Common unit abbreviations:

- kilo (k) = 1,000
- mega (M) = 1,000,000
- giga (G) = 1,000,000,000

Energy

From/To - multiply by	GJ	kWh	therm	toe	kcal
Gigajoule, GJ	1	277.78	9.47817	0.02388	238,903
Kilowatthour, kWh	0.0036	1	0.03412	0.00009	860.05
Therm	0.10551	29.307	1	0.00252	25,206
Tonne oil equivalent, toe	41.868	11,630	396.83	1	10,002,389
Kilocalorie, kcal	0.000004186	0.0011627	0.000039674	0.000000100	1

Volume

From/To - multiply by	L	m3	cu ft	Imp. gallon	US gallon	Bbl (US,P)
Litres, L	1	0.001	0.03531	0.21997	0.26417	0.0062898
Cubic metres, m3	1000	1	35.315	219.97	264.17	6.2898
Cubic feet, cu ft	28.317	0.02832	1	6.2288	7.48052	0.17811
Imperial gallon	4.5461	0.00455	0.16054	1	1.20095	0.028594
US gallon	3.7854	0.0037854	0.13368	0.83267	1	0.023810
Barrel (US, petroleum), bbl	158.99	0.15899	5.6146	34.972	42	1

Weight/Mass

From/To - multiply by	kg	tonne	ton (UK)	ton (US)	lb
Kilogram, kg	1	0.001	0.00098	0.00110	2.20462
tonne, t (metric ton)	1000	1	0.98421	1.10231	2204.62368
ton (UK, long ton)	1016.04642	1.01605	1	1.12000	2240
ton (US, short ton)	907.18	0.90718	0.89286	1	2000
Pound, lb	0.45359	0.00045359	0.00044643	0.00050	1

Appendix 6: Worked example

Profile

Hotel H is an independent, full service hotel in California with 180 guest rooms.

Hotel H would like to calculate its footprint for calendar year 2012. Management has until 30th June 2013 to gather the required information and complete the calculations.

Hotel characteristics

Conditioned area (i.e. area that is heated or cooled):

- A basement where the back of house functions is located (360 sqm).
- A lobby, restaurant and bar on the Ground floor (1,000 sqm).
- Meeting space only on the 2nd floor (1,360 sqm).
- 8 floors with guest rooms and corridors only (510 sqm each; 4,080 sqm total).
- Private apartments occupy the top two floors (600 sqm each, 1,200 sqm total).

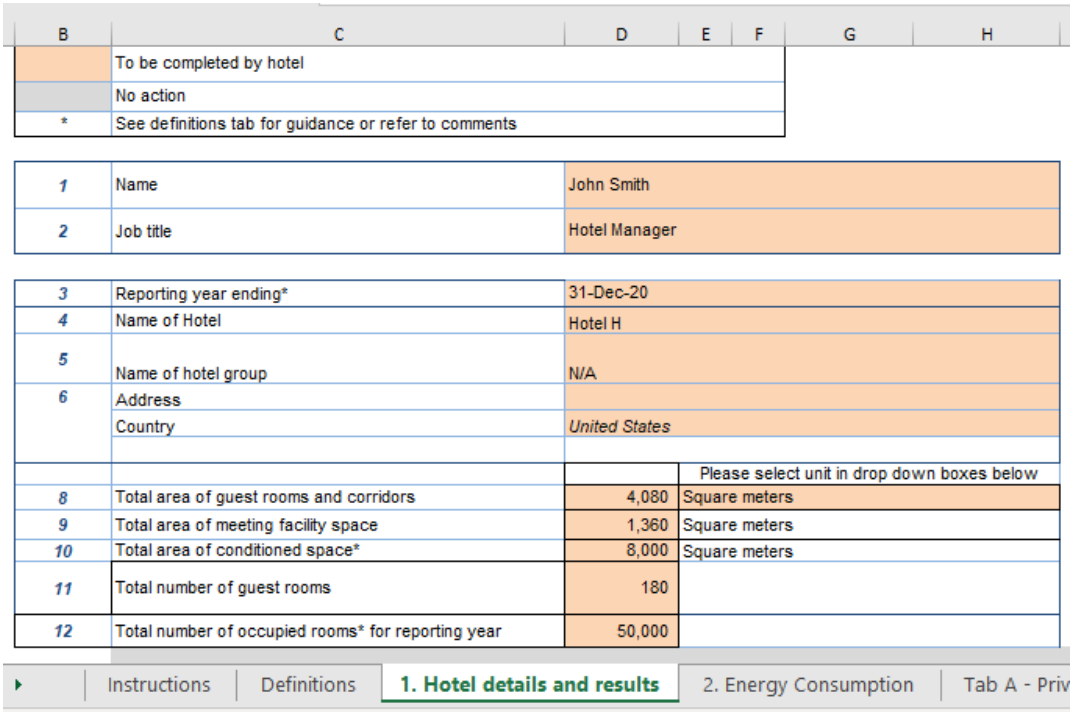
The total conditioned area of the hotel is: 8,000 sqm, and the total area of the private space is 1,200 sqm (15% of total building area).

Unconditioned area:

- An outdoor swimming pool and outdoor area (500 sqm).

Occupancy:

Sales records indicate that during 2012, 50,300 room nights were sold. 500 rooms were no-shows and 200 rooms were complimentary. The total number occupied rooms were: 50,000.



B	C	D	E	F	G	H
	To be completed by hotel					
	No action					
*	See definitions tab for guidance or refer to comments					

1	Name	John Smith
2	Job title	Hotel Manager

3	Reporting year ending*	31-Dec-20	
4	Name of Hotel	Hotel H	
5	Name of hotel group	N/A	
6	Address		
	Country	*United States*	
			Please select unit in drop down boxes below
8	Total area of guest rooms and corridors	4,080	Square meters
9	Total area of meeting facility space	1,360	Square meters
10	Total area of conditioned space*	8,000	Square meters
11	Total number of guest rooms	180	
12	Total number of occupied rooms* for reporting year	50,000	

Instructions | Definitions | **1. Hotel details and results** | 2. Energy Consumption | Tab A - Priv

Building energy consumption:

Energy invoices for 2012 for the building reveal that consumption was as follow:

- Electricity: 2,540,802 kWh
- Gas: 4,207,102 kWh (data converted from Btu to kWh using an online conversion tool)
- Oil: 657 litres

Small refurbishments have taken place throughout the year. Management does not believe this had a significant impact on energy consumption.

Outsourced operations:

Hotel H outsources its laundry to a local supplier. Management has asked the supplier to provide the hotel's share of energy consumption at the supplier's facilities (i.e. total amount of energy consumed during the year by the supplier multiplied by the amount of the hotel's linen as a percentage of the total amount of linen washed by the supplier). The supplier knows that Hotel H represents 20% of its business however it does not have its total energy consumption data available for 2012.

However, based on the supplier's invoices, Hotel H knows that 347 metric tonnes of linen were washed last year. Total emissions from laundry are calculated by the team using the default emission factors provide by the Carbon Trust:

347t x 180kWh = 62,460 kWh electricity consumption

347t x 1560kWh = 541,320 kWh gas consumption

347t x 111litres = 38,517 litres oil consumption

Section B Please complete this section if you outsource your laundry.

B.1	Can you get your share of the energy consumption* from your laundry contractor for the reporting year?	No	Go to question B.2	Electricity	[redacted] kWh
				Gas	[redacted] kWh
B.2	Do you know your laundry tonnage?	Yes		Oil	[redacted] Litres
				Click here to convert your existing data to kWh or litres	

	Metric tonne	US ton
Enter your laundry tonnage in either metric tonnes or US tons	347	
	347	
	[redacted]	

Estimated electricity consumption	62,460	kWh
Estimated gas consumption	541,320	kWh
Estimated oil consumption	38,517	Litres

Source: Carbon Trust- Guide to the laundries sector (CTG064)

Source: Laundry Today

Private Space:

Private apartments occupy 15% of the building's area. These apartments have sub-meters that only measure small power consumption (i.e. lighting and equipment). Therefore heating and cooling cannot be separately measured. Hotel management then needs to ignore the sub-metering and simply subtract 15% of the electricity, gas, and oil consumption of the building.

Section A Please complete this tab if you have private areas not available to guests and meeting attendees

Private areas:

A.1	Is the space sub-metered*	No	Go to question A.2	Total electricity consumption from private space	
				Total gas consumption from private space	
				Total oil consumption from private space	
				Other fuel sources (listed in tab 1. Basic hotel details):	
				0	
				0	
				0	
				0	
				Click here to convert your existing data to a different unit	
A.2	Total area of the private space	1,200	Square meters		
	Total area of conditioned space*	8,000	Square meters		
	Percentage of private space	15%			

Total energy consumption:

Energy Consumption

	Total Consumption	Private space consumption (Tab A- if	Outsourced Laundry (Tab B- if applicable)	Total
Total Electricity consumption for reporting period* (in kWh)	2,540,802	381,120	62,460	2,222,142
Total Gas consumption for reporting period* (in kWh)	4,207,102	631,065	541,320	4,117,357
Total Oil consumption for reporting period* (in litres)	657	99	38,517	39,075

Emission factors:

Hotel H looks up the Emission Factors (EF) for California.

	Unit	CO2e emission factor (source: http://www.ghgprotocol.org/calculation-tools/all-tools)
Total Electricity consumption for reporting period* (in kWh)	kWh	0.2988
Total Gas consumption for reporting period* (in kWh)	kWh	0.1822
Total Oil consumption for reporting period* (in litres)	litres	2.6765

Total carbon footprint from energy consumption:

Hotel H has now gathered the required information to calculate its total footprint for 2012.

Energy source	Total consumption	Emission factor	Carbon emissions
Electricity	2,222,142 kWh	0.2988	663,954 kgCO2e
Gas	4,117,357 kWh	0.1822	750,141 kgCO2e
Oil	39,075 litres	2.6765	104,585 kgCO2e

Total GHG emissions from energy consumption are	1,519 tCO2e (metric tonne of CO2 equivalent)

Refrigerants:

Hotel H runs a decentralised air-conditioning system and is aware of leaks last year. However, Hotel H does not use one of the refrigerants with the highest Global Warming Potential. Hotel H does not need to measure its refrigerants usage but its overall footprint will be uplifted by 1%.

Section C	Please complete this tab if your Air Conditioning or refrigeration units have had a refrigerant gas leak of over 100 kg or if you have conducted major maintenance on your AC systems during the reporting period?

C.1	Is the refrigerant gas used in your systems one of the following: R-22, R-134A, R-404A, or R-410A?	No	Your total carbon footprint will be uplifted by 1%. No further calculations are required
	Estimated emissions from refrigerants	**15.19**	

C.2	Amount of each refrigerant used in the reporting year (in kg)	Refrigerant used	Global Warming Potential (GWP) of refrigerant (kg CO2e)	CO2-equivalent emissions (tonne)
	Common refrigerants with high GWP			
		HCFC-22/R22 = chlorodifluoromethane	1,810	0.00
		HFC-134a	1,430	0.00
		R-404A	3,922	0.00
		R-410A	2,088	0.00
	Other refrigerants			
		Methane	25	0.00
		Nitrous oxide	298	0.00
		HFC-23	14,800	0.00
		HFC-32	675	0.00
		HFC-41	92	0.00

... | Definitions | 1. Hotel details and results | 2. Energy Consumption | Tab A - Private Areas | Tab B - Ou

Mobile Fuels:

Hotel H runs hotel vans that transport guests to local attractions and the airport. This is the first time that Hotel H is measuring its GHG emissions using the HCMI methodology. Hotel H calculates its petrol and diesel consumption based on invoices covering the reporting year.

Hotel H calculates that its mobile emissions contribute more than 5% to its overall footprint, therefore management will need to measure transport fuel consumption again next year when updating the footprint calculations.

Section D Please complete this tab if your hotel owns or operates vehicles (e.g. shuttle bus, hotel car)

D.1	Have you in previous years calculated your mobile fuel emissions using the HCMI methodology?	No	Go to section D.5
D.2	Were these mobile fuel emissions **less than 5%** of your hotel's total emissions?		
D.3	Have your hotel operations or mobile fuel usage changed significantly since the previous reporting period?		
D.4	Enter your emissions from mobile fuels calculated in previous reporting period.		tCO2e

D.5	Calculate your mobile fuel emissions using the table below

Mobile Fuels	Country or Region	Consumption	Energy unit	Emission factor	Total emissions (tCO2e)
Most common fuels					
Gasoline/Petrol	USA	1,000	litre	2.327356	2.33
Gasoline/Petrol	UK		litre	2.3018	0.00
Gasoline/Petrol	Other		litre	2.271545	0.00
On-Road Diesel Fuel	USA	30,000	litre	2.681346	80.44
On-Road Diesel Fuel	UK		litre	2.6413	0.00
On-Road Diesel Fuel	Other		litre	2.676327	0.00
LPG	USA		litre	1.529556	0.00
LPG	UK		litre	1.4902	0.00
LPG	Other		litre	1.61145	0.00
Other fuel (please specify)					0.00
Other fuel (please specify)					0.00
				Total	**82.77** **tCO2e**

Percentage of total emissions from mobile fuel	5.1%

Note regarding future reporting:
Your emissions from mobile fuels are significant and should be measured annually.

Total emissions are the sum of emissions from energy, refrigerants, and mobile fuel **= 1, 616.64 tCO2e**

Carbon footprint allocation:
The CO2e footprint needs to be allocated to the rooms and meeting space based on the respective area ratio:

- Rooms to meeting space ratio: 4,080/(4,080+1,360) = 75%
- Meeting Space to rooms ratio: 1,360/(4,080+1,360) = 25%

Therefore:

- Rooms Carbon Footprint Allocation = 75%
- Meetings Carbon Footprint Allocation = 25%

Therefore:

- Rooms Carbon Footprint = 1,617 x 75% = 1,212 tCO2e
- Meetings Carbon Footprint = 1,617 x 25% = 404 tCO2e

Carbon Footprint per occupied room on a daily basis and carbon footprint per area of meeting space on an hourly basis:
Footprint per Occupied Room is calculated as follow:

- Carbon Footprint for all rooms ÷ Occupied Rooms = Carbon Footprint per Occupied Room
- Rooms Carbon Footprint = 1,212 tCO2e/year
- 50, 000 rooms were occupied in 2012. Therefore:

(1,212 x 1000) ÷ 50,000 = 24.2 kgCO2e per occupied room on a daily basis

Footprint per area of meeting space on an hourly basis is calculated as follow:

- Meetings Carbon Footprint 404 tCO2e/year
- Industry average meetings value = 10 hours
- Total area of meeting facility space = 1,360 square meters

(404 x 1000) ÷ (365 x 10) ÷ 1,360 = 0.1 kgCO2e per area of meeting space (1 sqm/sqft) on an hourly basis

Carbon footprint for a specific client:

Client C has occupied 25 rooms for 3 nights.

Carbon Footprint per Occupied Room x Number of Client Rooms = Client Rooms Carbon Footprint

Their rooms' footprint is:
24.2 x 75 = 1,819 kgCO2e

This client has also used one hotel meeting room (100 sqm of meetings space) for a total of 10 hours. The meeting room footprint is therefore:

0.1 x 100 x 10 = 81 kgCO2e.

Total carbon footprint of the client's stay is:
1,819 + 81 = 1,900 kgCO2e

Results			
Total CO2e for reporting period			
1,616.64	**tCO2e**		
Total Guestrooms Carbon Footprint		**1,212**	**tCO2e**
Total Meetings Carbon Footprint		**404**	**tCO2e**
Carbon footprint per occupied room on a daily basis		**24.2**	**kgCO2e**
Carbon footprint per area of meeting space (1 sqm/sqft) on an hourly basis		**0.1**	**kgCO2e**

CO2 emissions for a specific client:			
Number of room nights for client		75	
Amount of meeting space occupied by client		100	Square meters
Duration of client's meetings		10	Hours
Client's rooms carbon footprint		1,819	kgCO2e
Client's conference carbon footprint		81	kgCO2e
Total client's carbon footprint		**1,900**	**kgCO2e**

Appendix 7: Supplement to HCMI – Energy Use per Area

Introduction

Some stakeholders require hotels to disclose various energy-per-area metrics. This Supplement to the Hotel Carbon Measurement Initiative describes how to calculate such metrics using the same data and methodology as HCMI. We still apportion energy consumption between guest rooms and meeting rooms in the same way that carbon emissions are apportioned in the HCMI methodology.

There is no need to gather additional data if you have already calculated your hotel's carbon emissions following the HCMI methodology.

As with HCMI, the calculations are required to be performed once every reporting year. Some of the standing data (e.g. rooms and meeting space areas, number of hotel rooms, etc.) is unlikely to change year on year.

Calculations

When applying the HCMI methodology, you will have calculated your hotel's annual energy consumption for each fuel type (e.g. electricity, natural gas, gas oil, etc.). However, the consumption data for the different fuel types may not all be measured in the same units (e.g. kWh, Joules, m3, ft3, therm, mmBtu, etc.). You will therefore need to convert any fuel consumption that is not measured in kilowatt-hour (kWh) into kWh using unit conversion factors provided by your energy suppliers or using the factors in the Appendix 5 of this document. You will then be able to calculate a total energy consumption in kWh.

As with the HCMI methodology, the total energy consumption is apportioned to guest rooms and meeting rooms based on the following formulas:

Energy consumption for all guest rooms = Rooms Allocation x Total Energy

Energy consumption for all meeting rooms = Meetings Allocation x Total Energy

where the *Rooms Allocation* and *Meetings Allocation* percentages are based on the ratio of space occupied by guest rooms and meeting space within the hotel.

Note: If a hotel has no meeting space, then all energy consumption is allocated to guest rooms.

Energy per guest rooms metrics

Annual guest rooms energy consumption per m2 or sqft = Energy consumption for all guest rooms ÷ Rooms Area

Annual energy consumption per available guest room = Energy consumption for all guest rooms ÷ Number of hotel rooms

Energy consumption per occupied room = Energy consumption for all guest rooms ÷ Number of occupied hotel rooms

Energy per meeting space area or usage metrics

Annual meeting rooms energy consumption per m2 or sqft = Energy consumption for all meeting rooms ÷ Meeting Space Area

Meeting rooms energy consumption per meeting hour = Energy consumption for all meeting rooms ÷ (365 x 10)

Note: Hotels which were closed for part of the reporting period should use the number of days they were open for, instead of the standard 365 days. Meeting rooms are assumed to be utilised for 10 hours per day.

Meeting rooms energy consumption per area of meeting space per hour = Meeting rooms energy consumption per meeting hour per sqft/sqm x surface of meeting space utilized

The energy consumption used by a client for a meeting is calculated by multiplying the *Meeting rooms energy consumption per area of meeting space on an hourly basis* by the number of hours that the client has utilized the meeting space, including the client set-up and breakdown time, but excluding the hotel set-up and breakdown time.

For example, a client has booked a meeting room for a three day conference. Two days before the conference, the hotel sets up the room. The day before the conference, the client sets up the conference between 10:00 and 20:00. The conference then runs for 3 days for 8 hours each day. On the last day, the client needs 4 hours to break down their set up. The hotel then cleans the meeting room and sets it up for another event. The number of hours used by the client is therefore: 10 + (3*8) + 4 = 38 hours.

Please note that the energy consumed during the hotel set up and breakdown of the meeting space is still captured in the overall calculations, but the allocation of the energy consumption is based on the client's utilization of the meeting space.

Appendix 8: HCMI 2020 update – key changes

In 2020 the HCMI methodology was revised based on Members' recommendations regarding challenges in using HCMI. A brief summary of the changes is captured in the table below.

What	Revised
Clarified definition of private space in relation to outsourced businesses (e.g. restaurants, hairdressers etc)	Areas which are not accessible to hotel guests or conference attendees (e.g. private apartments) or not related to the hotel (e.g. the hotel leases a floor to a third party) should be excluded from the calculations. On-site staff accommodation is also considered private space. Back of house areas or public spaces are not considered private space.
Update information regarding Gas Refrigerants	See appendix 3 in HCMI spreadsheet, all values have been updated
Simplify input of hotel total surface area	• Total area is defined as total conditioned space.
Clarify carbon footprint per area of meeting space (1sqm/sqft) on an hourly basis	Meetings footprints are derived using the average daily consumption of meetings energy. The Meetings Carbon Footprint per Day is broken down based on meeting-hours and surface of meeting space utilized.
Advise on how to input electricity use from renewables	The version 1.2 of the HCMI calculation spreadsheet (2020) is designed to help hotels communicate on their use of renewable energy more transparently. However this addition does not change the overall carbon footprint calculation for the hotel, it only breaks down energy sources further to enable transparency on the use of renewables. We therefore recommend businesses wanting to communicate on renewables to break down the information in the following order: • Total energy and heat purchased from supplier using renewable sources (e.g. geothermal district heating, through green electricity supplier, Power-Purchase Agreement, Renewable Energy Certificates), in kWh • Total energy and heat generated on-site using renewable sources (using biomass, biofuel, hydropower, geothermal energy, solar, wind), in kWh NB: Any renewable energy generated on site and sold back to the grid should not be counted in HCMI.

Appendix 9: Acknowledgements & Sources

The Working Group

Accor, Beijing Tourism Group, Carlson Rezidor Hotel Group, Diamond Resorts International, Fairmont Hotels and Resorts, Hilton Worldwide, Hong Kong & Shanghai Hotels, Hyatt Corporation, InterContinental Hotels Group, Jumeirah Group, Mandarin Oriental Hotel Group, Marriott International Inc, Meliá Hotels International, MGM Resorts International, NH Hoteles, Orient-Express Hotels Ltd, Pan Pacific Hotel Group, Premier Inn - Whitbread Group, Starwood Hotels & Resorts Worldwide, Inc., Shangri-La Hotels and Resorts, The Red Carnation Hotel Collection, TUI AG, Wyndham Worldwide.

World Travel & Tourism Council (WTTC).

Sustainable Hospitality Alliance (the Alliance).

Advisors

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Sources

- WRI (www.ghgprotocol.org /calculation-tools/all-tools)
- Cornell University School of Hotel Administration Center for Hospitality Research
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- Climate Registry (http://www.theclimateregistry.org/),
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