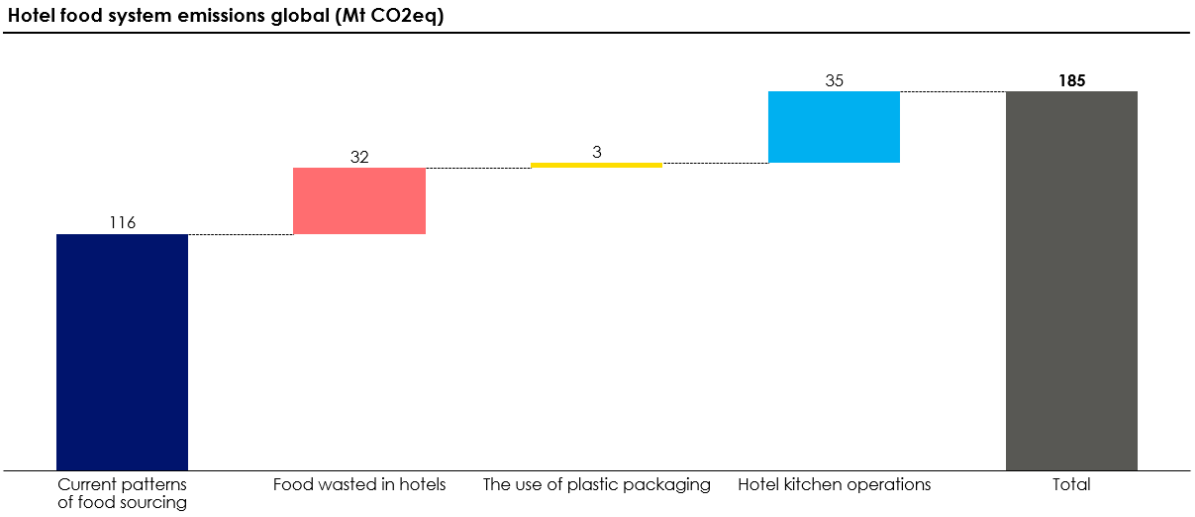
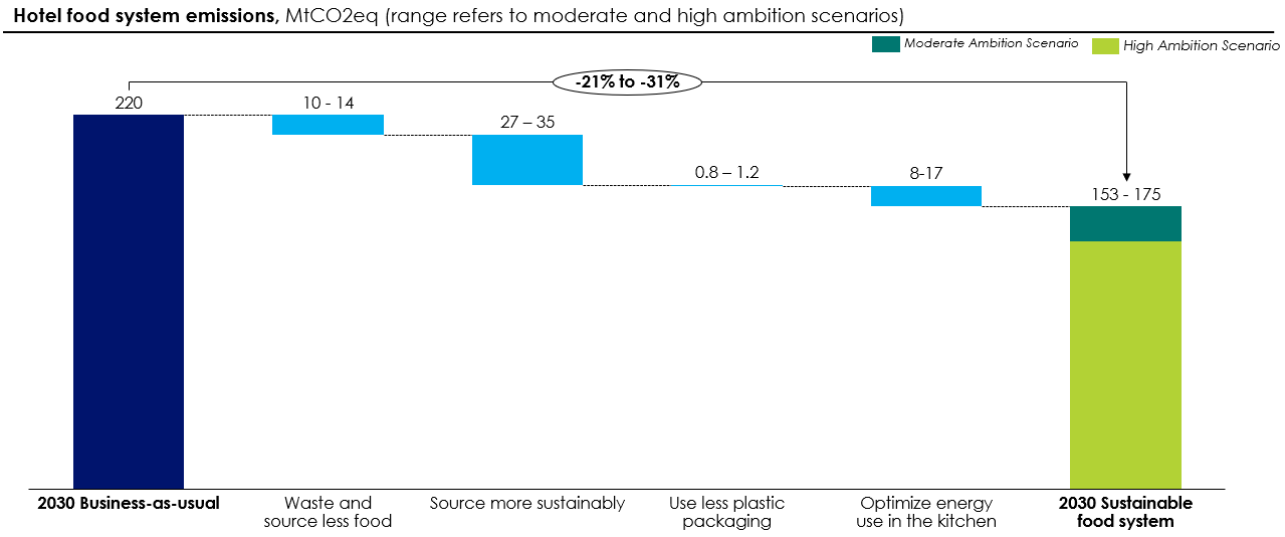
Technical Annex - SHA Hospitality Food Emissions

Overview Technical Annex

Technical Annex 1: Current Emissions



Technical Annex 2 & 3: 2030 Baseline Scenario Emissions & 2030 Better Scenario Emissions



Technical Annex 1: Current Emissions

Description:

- Table 1 outlines the estimated global current baseline Food emissions for Hotels calculated for SHA, accompanied by assumptions and sources. These cover Scope 1, 2, and 3 emissions. The assumptions have strived to focus on hotel emissions only. The four key categories are:
    - **Food Sourcing:** emissions comprise all the GHG emissions linked to the production of food for hotels. They include emissions from converting land to food production (largely through deforestation), fertilizer use, livestock management, soil management, food processing, food transportation, and emissions related to food lost along the way.
    - **Food Packaging:** is produced from fossil fuels, and extracting and creating these materials emits greenhouse gases. For hotel food systems, the problem lies in consumer facing plastic, such as water bottles, yoghurt pots, but also in the 'behind the scenes' plastic – the packaging used by suppliers and manufacturers to transport the food. This is often single use, non-recyclable flexible plastic.
    - **Kitchen Operations:** will generate more emissions because of the energy used to store and prepare food and to keep kitchens cool. The main sources of emissions from hotel kitchens are cold chambers (walk-in fridges) and ovens. Inefficient or outdated equipment are a significant contributor to kitchen emissions.
    - **Food Waste:** This waste is additional to food losses further upstream (i.e. from farm to the hotel), but includes a part of upstream food waste linked to over-ordering of hotels. Buying more food than is needed, food spoilage and guests leaving food on their plates are all forms of in hotel food waste. Emissions of the production of the wasted food is included in the totals.
- This work draws on various sources, for which the Systemiq work on Better Travel & Tourism, Better World (2022), Winnow data, and PlantWorks Model have been crucial. Moreover, population, tourism and hotel data from UNWTO, FAO, SHA, and case-studies have been fundamental to the work.

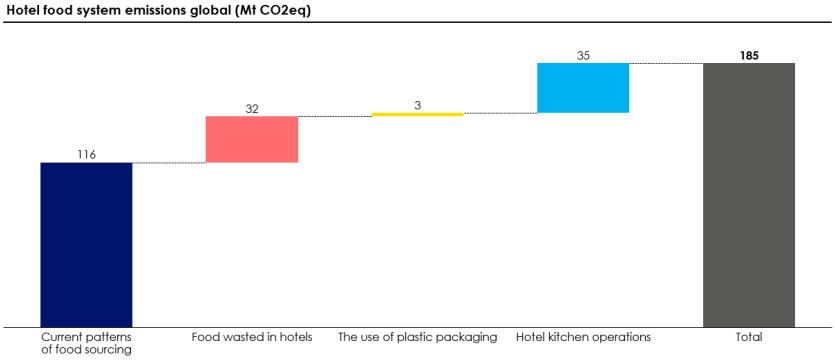


Table Annex 1: Current Emissions of the Hotel Food System

Category	Emissions (MtCO2eq)	Arithmetic & assumptions	Sources
TOTAL	**185**		
Food sourcing	**116**	– Regional diet emissions (per person per day) were based on Systemiq Analyses (PlantWorks model). The global figure was scaled to regions based on total tonnes of food consumed (from FAO). These were divided by population (WBG). Resulting in: ○ [kg CO2eq pppd] North America: 8.2; South America 5.4; Europe 6.8; Africa 4.7; Asia 6.0. – Average diet emissions were increased by 28% (USDA, Census) to represent tourists consuming more during holidays vs. at home	*Systemiq analyses (PlantWorks Model); FAO food consumption data; WBG population; UNWTO & Eurostat & Better Travel and Tourism Better World report for overnight hotel stays; SHA for*

		– These were multiplied by the low and high estimate of number of overnight hotel stays p.a.: ○ Low: [Overnight hotel stays p.a. in mlns persons] North America: 2940; South America 640; Europe 4650; Africa 1040; Asia 3500. Globally 12.78bn. (UNWTO, Eurostat) ○ High: Total yearly tourist nights is estimated at 28.5bn (BTTBW), assume 67% of these stay in hotels (based on different regional examples) resulting in 19bn overnight tourist hotel stays p.a. – Resulting in 108 – 162 MtCO2eq globally – Emissions from 'downstream packaging' (1.7 – 3.5 MtCO2eq, see 'Food Packaging' category) & 'downstream food waste' (8 – 17.9 MtCO2eq, global PlantWorks estimate scaled to hospitality), as well as share of 'upstream Food waste to allocate to hotels waste bucket' (2.7 – 4.8 MtCO2eq (see 'Food Waste' category) were excluded from the Systemiq Analyses / PlantWorks number – Resulting in total Food Sourcing emissions of hospitality to range from 96 - 136 MtCO2eq (Av. 116 MtCO2eq) – This was cross-referenced with top-down analyses of case study hotel stating Food Sourcing equals ~25% of hotel emissions. Global emissions 52.6 – 53.8 GtCO2eq, of which 1% hotels (SHA), 25% of this equals 131 – 135 MtCO2eq.	*share of hotels of global emissions;*
Food Packaging	**3**	**Low estimate:** – Case-study hotel provided data on average non-food waste pppd: EU 97g, USA 344g. Assumed RoW 344. – Assumed share not recycled to be 60% EU, 80% USA, Asia 70%, and RoW 90%. – Emissions of waste: 700gCO2eq/kg non-recycled waste (BTTBW report) – Resulting in gCO2eq/tourist day of 41 for EU, 192 USA, 168 Asia, 216 RoW – This was multiplied by totals of # tourists in hotels p.a. (see 'Food Sourcing' category). – Resulting in Low estimate of 1.7 MtCo2eq Food Packaging of hotels p.a. **High estimate:** – Average waste per tourist per day is 1.67kg (BTTBW report) – Share of non-food waste is 33% (BTTBW report) – Share not recycled globally estimated at 70% (BTTBW report & Breaking the Plastic Wave 2019) – Emissions of waste: 700gCO2eq/kg non-recycled waste (BTTBW report) – Resulting in 270 gCO2eq/tourist day which was multiplied by totals of # toruists in hotels p.a. (see 'food sourcing' category) – Resulting in high estimate of 3.45 MtCO2eq Food Packaging of hotels p.a. – Average of 1.7 & 3.45 at 2.6MtCO2eq	*Case-study for waste; Better Travel & Tourism Better World report 2022; Breaking the Plastic Wave 2019*
Kitchen operations	**35**	– Better Travel & Tourism Better World report estimated global emissions of Food & beverage operations in Facilities at 147 – 204 MtCO2eq – Hotels emissions share of total Travel & Tourism facilities is estimated at 17-22%, based on: ○ Global emissions are 52.6 – 53.8 GtCO2eq, of which 1% hotels (SHA), equaling hotels emissions at 526 – 538 MtCO2eq ○ Travel & Tourism global emissions of facilities (incl. food production, food loss waste, material waste, other) are 2400 – 3160 MtCO2eq (BTTBW report) ○ Hotel emissions are 17 – 22% of T&T facilities emissions – 17-22% was taken from the above mentioned 147 – 204 MtCO2eq, resulting in 25 – 45 MtCO2eq, av. Of 35 MtCO2eq – This was cross-referenced with top-down analyses of case study hotel stating Food Operations equals ~3-5% of hotel emissions. Global emissions 52.6 – 53.8 GtCO2eq, of which 1% hotels (SHA), 3-5% of this equals 16 - 30 MtCO2eq. This brand at higher end of sustainability efforts.	*Better Travel & Tourism Better World report 2022; Case-study hotel*

Food Waste	**32**	– Winnow provided per hotel guest per cover data on food waste for all global regions, based on data from ~600 hotels (all budget ranges & regions) post 2021 ○ This was multiplied by 1.5 assuming tourists eat 1.5 covers per day in hotels ○ [Food waste pre & post-consumer, in g/day/hotel guest]: North America 308g, South America 553g, Europe 253g, Africa 229g, Asia 251g. Global 269g. ○ Cross-referenced with data from Better Travel & Tourism Better World report, using a 783g per hotel guest per day of food waste. – An average of 7.96 kg CO_2eq/kg food waste was applied, based on average emissions of a tourist-diet assumed eating pattern with increased (~x3 versus regular average global diet) consumptions of carbon-intense products. – Average regional per hotel guest emissions were multiplied by average yearly hotel guests (as per other categories above) – For a low and high estimate, an error margin of 30% was applied based on advice from Winnow to tackle the underestimation. They stated that the data for pre-consumer waste was more extensive than for post-consumer as many times hotels don't always invest in additional systems to measure both waste streams. Moreover, they stated that due to implementation of their systems, chefs already take more care of food waste, causing an underestimate of regular numbers. – This resulted in on average 28 $MtCO_2$eq hotel consumer waste emissions (kitchen and plate), and with 30% error applied low of 19.8 $MtCO_2$eq and high 36.8 $MtCO_2$eq, or 2.5 – 4.6bn kg food waste / year – Additionally to the above hotel kitchen and plate waste emissions, a share of the Food Sourcing emissions linked to upstream food waste have been allocated to this category. This was based on the impact that over ordering (due to wastage) has on additional food production and the associated upstream losses. ○ Upstream food waste accounts for 15% of Food Sourcing emissions (excl. post-consumer food waste emissions), based on PlantWorks data ○ 18-23% of this was taken from the Hotel Food Sourcing bucket and added to the Hotel Food Waste bucket. 18-23% is the share of kg food wasted at hotels (2.5-4.6 bn kg) of total food sourced by hotels (13.6 – 20.3 bn kg). Or, 2.7 – 4.8 $MtCO_2$eq to be added to Food Waste bucket. – This leads to 23-42 $MtCO_2$eq, or 32 $MtCO_2$eq on average for Hotel Food Waste (incl. a share of upstream food waste)	*Winnow Case Studies; WWF;*

Technical Annex 2: 2030 Baseline Scenario Emissions

Description:

- Table 2 outlines the estimated global 2030 baseline (or BAU) Food emissions for Hotels calculated for SHA, accompanied by assumptions and sources. These cover Scope 1, 2, and 3 emissions. The assumptions have strived to focus on hotel emissions only.
- Key in scaling current emissions to 2030 baseline emissions were the expected regional growth (current – 2030) of number of overnight stays in hotels by tourists, drawn on estimations of UNWTO and Eurostat. These estimations show a global increase of 19% (2.5% CAGR) from current to 2030 in number of hotel stays. The annual growth of the overall Travel & Tourism industry is estimated at 4.4% [Better Travel & Tourism, Better World report, 2022].

Table Annex 2: 2030 Baseline Scenario Emissions of the Hotel Food System

Category	Emissions (MtCO2eq)	Arithmetic & assumptions	Sources
TOTAL	**220**		
Food sourcing	**138**	– Regional 2030 expected number of overnight stays in hotels were estimated, drawn on estimations of UNWTO and Eurostat: ○ [# overnight hotel stays p.a. in mln people] North America: 3495 (+19%); South America 799 (+23%); Europe 5341 (+15%); Africa 1369 (+32%); Asia 4160 (+19%). – Emissions per tourist night were estimated to be the same in 2030 as in current – Current values were increased by the expected increase of overnight stays – Resulting in 110 – 165 MtCO2eq, av. 138 MtCO2eq	*UNWTO & Eurostat; building on Systemiq analyses for 'current baseline'*
Food Packaging	**3**	– As per above – Resulting in 2 – 4.1 MtCO2eq, av. 3.1 MtCO2eq	*As per above*
Kitchen operations	**41**	– As per above – Resulting in 30 - 53 MtCO2eq, av. 41 MtCO2eq	*As per above*
Food Waste	**38**	– As per above – Resulting in272 – 49 MtCO2eq, av. 38 MtCO2eq	*As per above*

Technical Annex 3: 2030 Better Scenario Emissions

Description:

- Table 3 outlines the estimated global 2030 Better Scenario Food emissions for Hotels calculated for SHA, accompanied by assumptions and sources. These cover Scope 1, 2, and 3 emissions. The lower and higher estimations are the result of Moderate and High Ambition Scenarios. The assumptions have strived to focus on hotel emissions only.
- Key levers per emission category are building on Systemiq work, especially the work for PlantWorks Model and Better Travel & Tourism Better World report 2022.

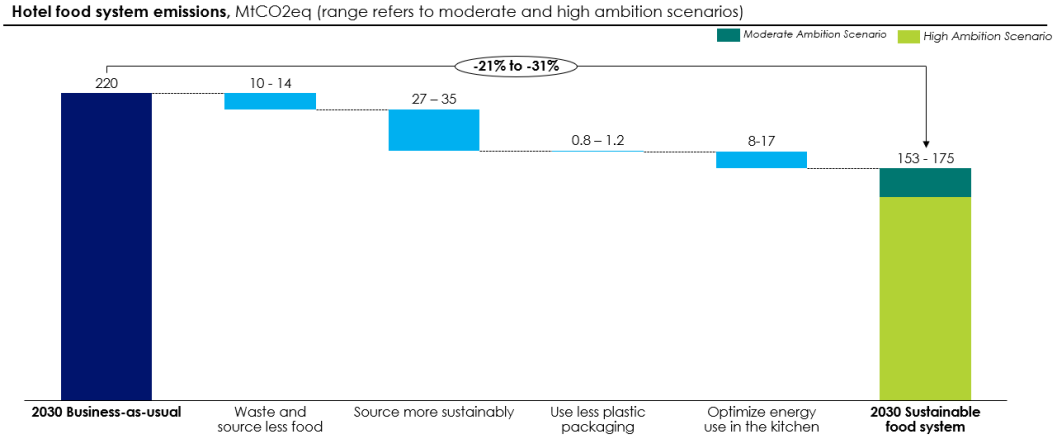


Table Annex 3: 2030 Better (Moderate & High Ambition) Scenario Emissions of the Hotel Food System

Category	Emissions (MtCO2eq, Moderate & High Ambition Scenario)	Arithmetic & assumptions	Sources
TOTAL	**153 - 175**		
Food sourcing	**103 - 111**	**Lever 1: Switch to EAT-Lancet diets** – A medium and High Adoption rate was assumed per global region. The Medium Adoption rate was the average of PlantWorks' Low and High adoption Scenario. The High Adoption Scenario was based on PlantWorks: ○ [Adoption rate of EAT-Lancet diet, Medium – High] North America: 25% - 30%; South America 15% - 30%; Europe 25% - 30%; Africa 15% - 30%; Asia 15% - 30%. – The effects of applying these were obtained via the PlantWorks model, using the 'Demand focused – Diet Only' scenario, resulting in 8% (Moderate Ambition) and 14% (High Ambition) reduction of Baseline Sourcing emissions **Lever 2: Switch to Sustainable Sourcing practices** – A high adoption rate from the PlantWorks Model was assumed for effects of switching to sustainable sourcing practices. These include: Enteric Fermentation (~5-10% global adoption), Manure Management (~10-33% global adoption), Improved Rice Cultivation (~5-33% global adoption), Nutrient Management (~5-33% global adoption). – The effects of applying these were obtained via the PlantWorks model, using the 'Supply focused' scenario, resulting in 12% reduction of Baseline Sourcing emissions **Both levers**: account for a 20% (Moderate Ambitious Scenario) and 26% (High Ambitious Scenario) reduction of Baseline Sourcing emissions.	*Systemiq Analyses (PlantWorks model);*
Food Packaging	**1.9 – 2.3**	– A reduction target of 50% by 2030 was assumed to reduce plastic carbon footprint for hotels, based on BTTBW Report	*Better Travel & Tourism Better World report*

		– Global adoption rates of the target for hotels were 50% in Moderate Ambition Scenario, and 75% in High Ambition Scenario o This was cross-referenced with case-studies stating a reduction of packaging waste ranging from 40-84% (Ceasars Hotels, EU Report) – Baseline 2030 Regional emissions were reduced by 50% applying a 50-75% adoption ration, resulting in 1.9 – 2.3 MtCO2eq	*2022; Case-studies (Ceasars Hotels, EU Report)*
Kitchen operations	**24 – 33**	– A reduction target of 51% by 2030 was assumed to reduce kitchen operations carbon footprint for hotels, based on BTTBW Report & IEA (stating an overall reduction of carbon footprint for building operations of 51% by 2030) – Global adoption rates of the target for hotels were 40% in Moderate Ambition Scenario, and 80% in High Ambition Scenario (assuming large hotel chains occupying ¼ of market reduce 60-90% and smaller players reduce 35-50%) – Baseline 2030 Regional emissions were reduced by 51% applying a 40-80% adoption ration, resulting in 24 - 33 MtCO2eq	*IEA NZE 2050; Better Travel & Tourism Better World report 2022;*
Food Waste	**24 - 29**	– A reduction target of 50% by 2030 was assumed to reduce hotel food waste carbon footprint for hotels, based on BTTBW Report but being more ambitious as hotels have concentrated power + possibilities to invest in reduction levers (e.g. technology, education) – Global adoption rates of the target for hotels were 50% in Moderate Ambition Scenario, and 75% in High Ambition Scenario (assuming large hotel chains occupying ¼ of market reduce 60-90% and smaller players reduce 35-70%) o Investing in Food Waste technologies is proven to be an effective investment with good returns, hence higher ambitions for smaller players as well – Baseline 2030 Regional emissions were reduced by 50% applying a 50-75% adoption ration, resulting in 24 - 29 MtCO2eq	*Better Travel & Tourism Better World report 2022;*