SustainGenix GmbH
Regenerative Tourism in Practice

Great Himalaya Trail

GHG Emissions Calculations: METHODOLOGY DISCLOSURE

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GHGe Calculation Methodology

1. Introduction

This Greenhouse Gas Emissions Calculation Methodology Disclosure (GHGe CMD) provides the rules, requirements and guidelines for calculating the carbon footprint for tourism services, particularly trekking, offered by tour operators, associations, and local and international entities providing tourism services.

The GHGe CMD aims to promote and support responsible tourism services in alignment with international standards and best practice.

2. Scope

The GHGe CMD scope includes all types of tourism service programs, such as ecotourism, natural and adventure tourism, education tourism, historical tourism, leisure and cultural tourism. Tour operators will be able to use the GHGe calculation tool to provide their customers with information and concrete details regarding the carbon footprint of their specific programs and packages. This GHGe CMD is based on international data sets and EU-compliant methodologies as well as aligning with similar methodologies in Thailand and Bhutan.

Tourism services have many micro-suppliers. Therefore, to simplify practical data collection and GHGe quantification methodology, this GHGe CMD determines **5 significant components** that contribute to emissions: transportation (air and land), accommodation, activities, food and beverages, and waste management.

This tool is designed to focus attention on operations within the control of the tour operator, which typically does not include international air transportation, but may include domestic flights. This GHGe CMD therefore, takes a simplified approach to calculating air transport emissions and international flight sectors are not included.

3. Service descriptions & process

Tourism services utilising this tool shall specify detailed information regarding their tourism products and programs, such as the information of agency/service provider, type of tourism,

the title of the tourism program/package and duration (e.g. the Green Travel Tour Ltd., Ecotourism package A for 3 days 2 nights etc.).

4. Definitions of Tourism Package

- A tourism program specifies activities, venues, dates and times either as various options for tourists to select, or as a Package Tour.
- GHG emissions (GHGe) footprint and carbon dioxide equivalent (CO_2e) are considered to be the same measurement type.
- This GHGe CMD defines the Functional Unit as of 'greenhouse gas emissions per person per day' as the most meaningful comparable functional unit of measurement.

Data collection period

- Collecting or storing data to cover services for at least 12 months of each type of tourism service program or the amount of data that represents a suitable representation by specifying the reasons along with the scope, methodology and conditions for collecting data clearly.

5. System Boundary

The GHGe CMD system boundary specifies relevant raw materials, energy and natural resources used in the tourism service delivery process in order to fulfil customer expectations. This includes services relating to 5 main activities as follows:

1. Transportation by air and land;
2. Accommodation type and duration of stay;
3. Activities by type;
4. Food and beverage services;
5. Waste management;

And, does not include optional and/or discretionary tourism service activities, for example:

- Optional food and beverage services at extra charge;
- Optional travelling and transportation services at extra charge; and,
- International air transportation.

Wherever there is no secondary data already assigned, the scope of data should be selected to analyse the number of GHGe from raw material acquisition, energy or other resources from a reliable, high representation and accurate or academically acceptable database in a prioritised order as follows:

1) Peer-reviewed information (theses and related international research) that have already been accepted.
2) Publicly available databases such as LCA Software, industry specific databases, country specific databases.
3) Information published by international organisations such as IPCC, UN, etc

6. Data Disclosure

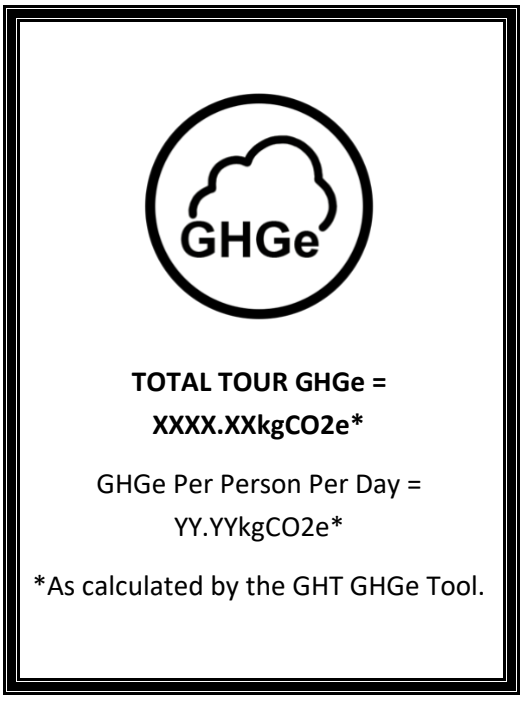
The GHGe calculation disclosure is specified by the following guideline:

Label format, position and size

The format of the GHGe label must comply with this guideline for each unique tourism service or product.

The GHGe label can be displayed on tourism guides, booklets or websites, or displayed on other documents used to publicise the services of the organisation in various forms.

The GHGe label will be represented as a number (maximum 2 decimal points) and accompanied by the GHGe icon as shown and state methodology used, including a link to this document or published on the company website.



7. GHG Calculation Components

7.1 Transportation by Air or Land

List of data to be collected

- In case of aviation traveling, the great circle arc (DME arc) air distance correction factor may be applied (for example, www.greatcirclemapper.net and recheck with www.airmilescalculator.com) but as the GHGe Tool only considers domestic flights, it is unlikely that significant distance corrections need to be applied. The distance must be specified as per the actual flight route and per leg including stops in a hub or stopover location
- GHG Emission Factor for aviation is taken from the UK Government DEFRA database, which also stipulates a Radiative Forcing Index (RFI) value of 1.9:

Table 1: Emission Factors	Unit	Emission Factor kgCO2e
Domestic air transport flights	pkm	0.1143

Source: Defra, 2010 (RFI 1.9)

- The following multipliers of each flight class can be applied with the default emission factor for international flights:

Table 2: Flight class emission multipliers	Multiplier factor
Economy	1.0
Premium Economy	1.5
Business Class	2.0
First Class	2.5
Unknown	1.0

- The amount of each type of fuel consumption and/or distance travelled (in kilometres or miles, see Tables 3 and 4) from travelling by different types of vehicles throughout the trip. In case there is no fuel quantity data, estimate the amount of fuel from the distance data of each type of vehicle throughout the trip. Divided by fuel consumption (km/l) by collecting the following information.
    - Distance used by each type of vehicle throughout the trip.
    - Fuel consumption rate of each type of vehicle used with a reference source.

Example Calculation: Let's say you drive a gasoline car that gets 10.25km/L and you drive 100km.

Fuel Consumption: 100km / 25km/L = 9.756L of gasoline consumed.

*CO2equivalent Emissions: 9.756Lt * 2.2394 = 21.848kg of CO2.*

- In the case of public transport vehicles, collect information on the distance travelled by each type of public transport throughout the trip.
- In the case of travelling by a vehicle that does not use fuel for propulsion such as canoes, kayaks, bicycles, and rafts, GHG emissions are set to zero.

Table 3: Land Transport Emission Factors

Land Transport - rural uninterrupted driving	Fuel consumption km per litre	Source	Emission factor kgCO2e/vkm	Source
Small car (eg city taxi) 1500cc - Petrol	6.42	Australian Transport, www.atap.gov.au, 2025	2.2394	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Mid-sized SUV - Petrol	7.77	Australian Transport, www.atap.gov.au, 2025	2.2394	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Full size SUV - Petrol	9.83	Australian Transport, www.atap.gov.au, 2025	2.2394	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
4WD and Dual Cab Utility - Petrol	10.25	Australian Transport, www.atap.gov.au, 2025	2.2394	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
4WD and Dual Cab Utility - Diesel	10.25	Australian Transport, www.atap.gov.au, 2025	2.741	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
1Ton Pickup (Bolero) - Diesel	11.11	American Petroleum Institute, 2004	2.741	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Average Heavy Bus/Coach - Diesel	23.33	Australian Transport, www.atap.gov.au, 2025	2.741	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Coaster bus 4Lt (20 seats) – Diesel	7.5	Transport company survey, SUSTOUR, 2025	2.741	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Coaster bus 6Lt (30 seats) – Diesel	6.5	Transport company survey, SUSTOUR, 2025	2.741	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
HiAce Bus (10 seats) Latest Model	12.5	Transport company survey, SUSTOUR, 2025	2.741	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Motorcycle up to 125cc (two stroke)	38.70	Pollution Control Department, Thailand, 2008	2.3549	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Motorcycle up to 350cc (eg Royal Enfield)	38.50	Royal Enfield owner forum www.royalenfieldowners.com/	2.3116	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Motorcycle up to 450cc (eg Royal Enfield)	36.00	Royal Enfield owner forum www.royalenfieldowners.com/	2.3116	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Motorcycle up to 500cc (eg Royal Enfield)	28.00	Royal Enfield owner forum www.royalenfieldowners.com/	2.3116	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE

Table 4: Transportation Fuel Use Emission Factors	Units	EMISSION FACTORS [kg CO2eq/unit]	reference data
Mobile Combustion (On road)			
Motor Gasoline - uncontrolled	litre	**2.2394**	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Motor Gasoline - oxydation catalyst	litre	**2.2719**	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Motor Gasoline - low mileage light duty vehicle vintage 1995 or later	litre	**2.2327**	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Gas/ Diesel Oil	litre	**2.7406**	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Compressed Natural Gas	kg	**2.2609**	IPCC Vol.2 table 3.2.1, 3.2.2, PTT
Liquified Petroleum Gas	litre	**1.7306**	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Liquified Petroleum Gas (1L = 0.54kg)	kg	**3.2049**	IPCC Vol.2 table 3.2.1, 3.2.2, DEDE
Mobile Combustion (Off road)			
Diesel & Kerosene			
- Agriculture	litre	**2.9793**	IPCC Vol.2 table 3.3.1, DEDE
- Camping	litre	**2.9793**	IPCC Vol.2 table 3.3.1, DEDE
- Industry	litre	**2.9793**	IPCC Vol.2 table 3.3.1, DEDE
- Household	litre	**2.9793**	IPCC Vol.2 table 3.3.1, DEDE
Motor Gasoline - 4 stroke			
- Agriculture	litre	**2.2738**	IPCC Vol.2 table 3.3.1, DEDE
- Camping	litre	**2.1816**	IPCC Vol.2 table 3.3.1, DEDE
- Industry	litre	**2.2455**	IPCC Vol.2 table 3.3.1, DEDE
- Household	litre	**2.3116**	IPCC Vol.2 table 3.3.1, DEDE
Motor Gasoline - 2 stroke			
- Agriculture	litre	**2.3171**	IPCC Vol.2 table 3.3.1, DEDE
- Camping	litre	**2.3454**	IPCC Vol.2 table 3.3.1, DEDE
- Industry	litre	**2.3077**	IPCC Vol.2 table 3.3.1, DEDE
- Household	litre	**2.3549**	IPCC Vol.2 table 3.3.1, DEDE

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7.2 Accommodation

List of data to be collected

- Room nights for each type of accommodation throughout the trip (Note: Room nights are the unit for counting the number of night stays in the hotel, calculated from the number of nights multiplied by the number of rooms, demonstrate the total of all room usage. regardless of the number of guests per room).
- If GHGe cannot be assessed from room night data, estimate GHGe from occupancy per person per night (guest night), expressed as GHGe/Guest night.
- Information on GHGe of each type of accommodation should first be obtained from the accommodation (with evidence and sources of data). Without access to data on GHGe from different accommodation types, use the GHGe data in Table 5 before considering selecting other values.

Table 5: Accommodation Emission Factors	unit	EF (kgCO2e)
Camping	Per night	0
1 and 2-star hotels	Room-night	12.17
	Guest night	6.08
3-star hotel	Room-night	16.21
	Guest night	8.10
4-star hotel	Room-night	18.27
	Guest night	9.14
5-star hotel	Room-night	28.42
	Guest night	14.21
The homestay without air conditioning.	Room-night	0.56
	Guest night	0.28
The homestay with air conditioning.	Room-night	6.26
	Guest night	3.13

Source: Thailand Greenhouse Gas Management Association, tver.tgo.or.th

7.3 Activities

List of data to be collected

- Total number of activities through the entire trip duration.
- Data on the Emissions Factor value of each activity.
- Consider the total number of activities taken by tourists. This does not include personnel and team members of the tour operator.
- Activity Emission Factor values in Table 6 are required to be used, considering these data before other values. If the specified value is not used, the source of the data and the reasons shall be justified.

Table 6: Activities Emission Factors	Emission Factor	Unit	Source
Standard per day non-defined	1.50	kg/day	SUSTOUR Bhutan
Balloon flight	31.50	kg/activity	Victoria Government, Australia, www.litter.vic.gov.au/
Event or Conference including local buffet lunch	7.40	kg/day	Business meeting estimate, www.cesaer.org/
Golf (1 round)	11.00	kg/activity	Saito (2010) and GCSAA (2012), see golf report.
Scenic flight helicopter	83.10	kg/activity	Mobitool: www.mobitool.ch/

7.4 Food and Beverage Services

List of data to be collected

- Total number and types of meals served to tourists with a non-alcoholic beverage.
- Data on the GHGe Factor value of food and beverage per meal.
- Consider the total number of meals served to tourists. This does not include personnel and team members of the tour operator.
- Food and beverage: GHGe factor values attached in Table 7 are required to be used, considering these data before other values. If the specified value is not used, the source of the data and the reasons shall be justified.

Table 7: Food and Beverage Emission Factors	kgCO2e/average serving	Source
Continental Breakfast	1.4	www.hhc.earth/knowledge-base/lca- example-english-vs-continental-breakfast
Simple Prepared Meal: snack, a boxed meal like picnic box with water	1.65	Thailand Greenhouse Gas Management Association, tver.tgo.or.th
Typical Local Buffet: 5-6 typical local-recipe dishes with water, tea and coffee	2.27	Thailand Greenhouse Gas Management Association, tver.tgo.or.th
International Buffet: more than 8 kinds of food, including international recipes, served with water, tea and coffee	3.93	Thailand Greenhouse Gas Management Association, tver.tgo.or.th
Vegetarian Buffet: 5+ dishes consisting of whole grains, legumes, fruits and vegetables with water, tea and coffee	1.12	Thailand Greenhouse Gas Management Association, tver.tgo.or.th
Local meal (homestay): locally grown and prepared meals served with water, tea or coffee	1.41	Thailand Greenhouse Gas Management Association, tver.tgo.or.th
Sandwich or Wrap	1.34	pure.manchester.ac.uk/ws/portalfiles/portal/63517838/Carbon_footprint_of_sandwiches.pdf

7.5 Waste Management

Data collection boundary

- Assessment of GHGe from waste management from tourism services stipulates that the amount of waste from tourism is 2.5 kilograms per person per day. Such waste is disposed of by landfill waste management method, which has a GHG emission of 2.32 kgCO_2e/kg. (*Source: Thailand Greenhouse Gas Management Association, tver.tgo.or.th*)
- Camping trip travel days have a waste amount of 7.6kg per person per day, with a GHG emission of 2.32 kgCO_2e/kg. (*Source: Byers, A. C., Gustafsson, T., Shrestha, M., & Chhetri, N. (2021). A sustainable solid waste management plan for Sagarmatha (Mt Everest) National Park and Buffer Zone, Nepal. Mountain Research and Development, 40(3). https://doi.org/10.1659/MRD- JOURNAL- D- 20- 00018.1*)
- Waste amount can be reduced for amounts that are proven to be recycled, repurposed, or reused.
- International inbound and outbound travel days, where there is only one flight travel activity on that day, are not counted in the number of days for waste calculations.

Condition for the secondary data preparation

- If the stipulated GHGe is not used, the amount of waste generated and the GHGe from such waste management must be shown, together with the data collection principles and calculation methods or use of data from other reference sources, proof of credibility and suitability.