

KlimaLink Standard

Calculation of emissions from bus transport

Version 2.0

TABLE OF CONTENTS

Foreword..... 2

1. Description..... 3

2. KlimaLink vehicle categories 3

3. Fuel types..... 3

4. Emission factors 3

5. System boundaries..... 4

6. Calculation formula..... 4

Appendix 6

 Version changes..... 6

Berlin, July 2026

Foreword

KlimaLink has set itself the aim of providing the tourism industry with a platform that makes the CO₂e emissions of various travel components within the tourism sector available in one central location.

There has been a significant increase in demand within the industry for a standardised method of calculating greenhouse gas emissions, and both business travellers and holidaymakers are increasingly asking about the actual emissions generated by their trips.

Various methods for calculating greenhouse gas emissions in tourism already exist. However, these do not define CO₂e emissions in a standardised manner and determine emissions using different approaches and levels of accuracy. KlimaLink's aim is to make CO₂e emissions available to all users in the tourism sector in accordance with the following criteria, within a standard comprising various methods:

- CO₂e emissions are recorded systematically and with a high degree of accuracy.
- CO₂e emissions from different components of a journey (flights, hotel stays, rail journeys, etc.) can be compared and categorised.
- The calculations are accurate enough to show travellers options for reducing greenhouse gas emissions even before they book.
- The calculations are accurate enough to enable comparisons of various types of combined travel products based on their absolute CO₂e emissions.
- The various methods rely entirely on travel input data that is available as standard within the travel industry's systems at tour operators and travel agents.
- The standard provides a unique CO₂e value for every travel component entered worldwide (flights, train journeys, hire cars, hotel stays, etc.). To this end, the individual methods specify fallback hierarchies which, in descending tiers (method variants), require increasingly less specific input data in order to always deliver the best possible result under the given circumstances.

The various calculation methods are dynamic and are updated whenever new scientific findings or improved data availability require adjustments.

This standard for calculating bus journeys was drawn up in accordance with ISO 14083. This standard, which forms the basis of the 'Count Emissions' Directive coming into force in the EU, serves as a uniform standard for calculating greenhouse gas emissions in passenger and freight transport. It establishes EU-wide comparable guidelines to enable the objective assessment of the CO₂e footprint of transport operations.

The distinctive feature of the KlimaLink standard lies in the ex-ante calculation of emission values per person. Data from previous years enable a concrete estimate of future emission values. As a result, the emissions associated with journeys – known as 'travel carbon footprints' – are made visible even before booking, thereby serving as a potential advisory and decision-making aid for travel agents and customers within sales channels. Those in the tourism sector can access these emissions figures via the emissions data platform made freely available by KlimaLink for this purpose.

1. Description

Emissions from motor vehicles, such as minibuses and coaches, can be calculated relatively easily, provided that the distance travelled and the occupancy rate are known.

The simplest and, at the same time, most accurate way to determine emissions for bus journeys is to multiply the amount of fuel consumed by the relevant emission factor (kilograms of CO₂e per litre) (see Chapter 4). Once this information is available, precise calculations can be made.

Alternatively, emissions can be determined on the basis of the distance to be travelled. In this case, an emission factor (kilograms of CO₂e per kilometre) is applied and the total emissions are divided by the actual or assumed load factor. As the actual fuel consumption is not available in this case, average values for the bus type must be assumed.

2. KlimaLink vehicle categories

There are various categories of bus. From a climate perspective, these can be divided into the following categories:

- Minibus (up to 10 seats) for transfers and short day trips.
- Local service bus (low-floor, solo or articulated, 35–45 seats) for city tours, as well as inner-city scheduled services and transfers.
- Long-distance coach (standard or double-decker, 45–80 seats) for longer journeys between towns and hotels, excursions, day trips, multi-day coach tours and chartered coach services.

3. Fuel types

There are a wide variety of possible fuel types (including LPG, methanol, hydrogen and hybrid). In 2024, diesel-powered buses accounted for 68.5 per cent of the European market, followed by electric buses with approximately 15.5 per cent¹. No relevant consumption data is currently available for other propulsion types; therefore, for the time being, KlimaLink's emissions calculations only take into account diesel and electric fuel types.

4. Emission factors

The KlimaLink standard specifies the emission factors for diesel and electricity as follows:

- Diesel: 3.51 kg CO₂e per litre of diesel²
- Electricity: 210 g CO₂e per kWh (EU-27 average for the data year 2025)³

These emission factors form the basis for calculations in the KlimaLink emissions data portal; they were taken from the website of the German Federal Environment Agency (UBA) and cover the entire fuel production chain (well-to-wheel). The UBA lists electric power there only for buses in local transport, so a further data source is used for electric propulsion in long-distance transport.

In future, country-specific emission factors for electrical energy will be used for electricity consumption. One source offering good global coverage is Our World in Data, based on data from

¹ Source: <https://www.acea.auto/reliable-data-statistics/> and <https://www.omnibusrevue.de/nachrichten/management/acea-marktanteile-der-kraftstoffarten-bei-neu-zugelassenen-bussen-in-der-eu-3348243>

² Source: "Emission factors for greenhouse gas accounting by organisations" by the Federal Environment Agency (Version 2.1 dated 28 February 2026, <https://www.umweltbundesamt.de/themen/wirtschaft-konsum/wirtschaft-umwelt/umwelt-energiemanagement/emissionsfaktoren-zur-treibhausgasbilanzierung-von>

³ Source: https://ourworldindata.org/grapher/carbon-intensity-electricity?mapSelect=~OWID_EU27

Ember and the Energy Institute (<https://ourworldindata.org/grapher/carbon-intensity-electricity>). Until this feature is fully implemented, an EU average of 211 g CO₂e/kWh will be used.

5. System boundaries

ISO 14083, on which this standard is based, stipulates that empty journeys must be included in the calculation, such as when a bus travels from the depot to the departure point. However, there is no publicly available data on such standby journeys, so they are not taken into account in the standard.

6. Calculation formula

Depending on the input provided on the emissions data platform supplied by KlimaLink, KlimaLink presents emissions data at various levels of accuracy, Tiers 1–3.

- **Tier 1:** Ex-post calculation based on actual fuel consumption multiplied by the emission factor, including emissions from the upstream supply chain.
- **Tier 2:** Emission factor for the vehicle categories and fuel types listed above, multiplied by the estimated distance and the assumed load factor.
- **Tier 3:** Emission factor for the vehicle categories and fuel types listed above, multiplied by the estimated distance and average load factor.

In all tiers, the energy source must be included in the emission factor (diesel including upstream emissions, hybrid or renewable energy).

Tier 2 uses average emission factors, whilst Tier 3 also uses average load factors. According to the German Federal Environment Agency (UBA)⁴, CO₂e emissions from regular service buses stand at 90 g/km/person across all propulsion systems (occupancy rate 16% in local transport) and at 30 g/km/person (occupancy rate 52%) across all propulsion systems for long-distance regular service buses.

$$CO_2e = F * f_F / Pax$$

The calculation of the fuel quantity or electrical energy F depends on the tier used:

Category 1: Direct user input

Tier 2: $F = d * c_{cat}$

⁴ Source from 2024: https://www.umweltbundesamt.de/system/files/medien/366/bilder/dateien/vtv_2024_pv_tab_pdf.pdf

Variable	Description	Units	Source
CO ₂ e	Symbol for the specific CO ₂ e for a journey divided by the number of passengers	kg	-
F	Consumption	L or kWh	User
f _F	CO ₂ e emission factor in CO ₂ relative to the fuel consumed	kg CO ₂ e/L or kg CO ₂ e/kWh	DIN EN 16258
d	Distance (actual/planned)	km	
c _{cat}	Fuel consumption of the vehicle category	L/km or kWh/km	
Passengers	Number of passengers on board		

This document was produced as part of the ‘Climate-Conscious Travel’ project, in which all companies, associations and organisations in the tourism sector are invited to participate. The project is funded and run by KlimaLink e.V. The KlimaLink emissions data platform is available to all tourism businesses.

In preparation for the EU ‘Count Emissions’ Regulation, KlimaLink has successfully had the 2026 calculation standard for air, rail and car/bus transport verified by GUTCert⁵, an accredited certification body in Berlin, to ensure compliance with ISO 14083. The certificate is included in the appendix.

Contact Futouris e.V./KlimaLink e.V.
Swantje Lehnerts
Managing Director, Futouris
Chair of the Board, KlimaLink
Swantje.lehnerts@futouris.org

Saskia Sánchez
KlimaLink e.V.
Managing Director
Saskia.sanchez@klimalink.org
c/o DRV
Lietzenburger Str. 99
10707 Berlin

Project Manager: Climate-Conscious Travel – Standard Development
Prof. Dr Harald Zeiss
Institute for Sustainable Tourism GmbH
harald.zeiss@inatour.de

⁵ <https://www.gut-cert.de/en/home-en>

Appendix

Version changes

Date	Version	Chapter	Change [...]	Responsible
22 July 2026	2.0	Foreword	Added: Introductory text	SA/SL
22 July 2026	2.0	2	Amended: Reduction to three vehicle categories; midibuses, regional buses and luxury buses are omitted	SH
22 July 26	2.0	3	Added: Justification for excluding LPG, methanol, hydrogen and hybrid fuels/propulsion systems.	SH
22 July 2026	2.0	4	Amended: Diesel: 3.51 kg CO ₂ e per litre of diesel, citing the source	SH
22 July 2026	2.0	4	Amended: Electricity: 210g CO ₂ e/kWh, citing the source	SH
22 July 2026	2.0	4	Added: Reference to the KlimaLink emissions data portal	SA
22 July 2026	2.0	4	Added: Source for country-specific emission factors: Ember and the Energy Institute (https://ourworldindata.org/grapher/carbon-intensityelectricity)	SH
22 July 2026	2.0	5	Added: System boundary for empty runs – justification for non-compliance	SA/SH
18 September 2023	1.0	All	Initial version	HZ/SL

HZ Prof. Dr Harald Zeiss, Institute for Sustainable Tourism GmbH

SL Swantje Lehnert, Futouris e.V.

SH Dr Sebastian Hirsch, atmosfair gGmbH

SA Saskia Sánchez, KlimaLink e.V.

Resultat

In Rahmen eines vereinbarten Verfahrens wurden die folgenden Berechnungsstandards der Organisation

KlimaLink e.V.

am Standort Lietzenburger Straße 99, 10707 Berlin

geprüft:

- „KlimaLink Standard KFZ“
- „KlimaLink Standard Bus“
- „KlimaLink Standard Bahn“
- „KlimaLink Standard Flug“

Die Berechnungsstandards für Transport „KlimaLink Standard KFZ“, „KlimaLink Standard Bus“, „KlimaLink Standard Bahn“ und „KlimaLink Standard Flug“ erfüllen die Anforderungen der für den Berechnungszweck relevanten Normkapitel aus den Kapiteln 3, 5, 6, 7, 8, Anhang A, E, F der ISO 14083:2023.

Die Einzelheiten zum Umfang der Prüfung sind im Anhang dargelegt. Die Berechnungsstandards erfüllen alle relevanten Anforderungen gemäß den im Anhang aufgeführten Normkapiteln. Die für die Berechnung verwendeten Emissionsfaktoren basieren auf veröffentlichten Informationen oder anerkannten, glaubwürdigen Quellen. Die angewandte Berechnungsmethode wurde auf Eignung und Plausibilität überprüft.

Die für die Prüfung erforderlichen Informationen wurden in den Dokumenten „2027_07 KFZ KlimaLink Standard V2.0.pdf“, „2027_07 Bus KlimaLink Standard V2.0.pdf“, „2027_07 Bahn KlimaLink Standard V2.0.pdf“ und „2027_07 Flug KlimaLink Standard V1.1.pdf“ vom 22.07.2026 klar dargelegt.

Die Prüfung wurde gemäß eines geeigneten Verfahrens entsprechend den Vorgaben der ISO 14064-3:2020-05 Anhang C durchgeführt.

Basis des Ergebnisses ist der Prüfbericht mit der Nr. C-26-25274-Tool.

Berlin, 26.08.2026



Prof. Dr.-Ing. Jan Uwe Lieback
Geschäftsführer

Nr. C-26-25274-Tool

Annex zu C-26-25274-Tool

Details zu Prüfungsinhalten

ISO 14083:2023 mit folgenden Kapiteln:

3.1.1, 3.1.2, 3.1.3, 3.1.5, 3.1.6, 3.1.7, 3.1.8, 3.1.11, 3.1.12, 3.1.14, 3.1.16, 3.1.17, 3.1.18,
3.1.19, 3.1.20, 3.1.22, 3.1.23, 3.1.24, 3.1.25, 3.1.27, 3.1.30, 3.1.31, 3.2.1, 3.2.2, 3.2.3,
3.2.4, 3.2.5, 3.2.7, 3.2.9, 3.3.1, 3.3.2, 3.3.3.2, 3.3.3.3, 3.3.3.4, 3.3.4, 3.3.8, 5.3.2, 5.4.1,
5.4.2, 5.4.3, 5.4.4, 5.6.2, 5.6.4, 6.1, 6.3.2, 7.2, 7.3, 8.3.2, 8.3.3, 8.4.2, 8.4.3, 8.4.5.2, 8.4.7,
A, A 3.1, A 3.2, A 4.2, A 5, E, E 2, E 3.1, E 3.2, E 5, F, F 2, F 3.1, F 4.5.