Travelling Large in 2014 'Inbound tourism'

The carbon footprint of inbound tourism to the Netherlands in 2014

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A project of Breda University of Applied Sciences Centre for Sustainable Tourism and Transport in collaboration with NRIT Research, NBTC-NIPO Research and CBS

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The carbon footprint of inbound tourism to the Netherlands in 2014
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Table of Contents


IN DE WESTERKERK·
REMBRANDT
ZOON VAN HARMEN

1 Introduction

This report is the second edition within the series of Travelling Large reports on the carbon footprint (CF, the emissions of the greenhouse gas CO_2) of inbound tourism to the Netherlands, after Pels et al. (2014). Many more editions have been written on the carbon footprint of Dutch holidaymakers (for the latest, see Eijgelaar et al. 2020) A first carbon footprint report on business travel in the Travelling Large series is planned for late 2020. All reports have been written by the Centre for Sustainable Tourism & Transport of Breda University of Applied Sciences, in collaboration with NRIT Research, NBTC-NIPO research and CBS. The data have been gathered for 2014 and show the carbon footprint of all international tourists visiting the Netherlands.

At the Paris climate conference (COP21) in December 2015, 195 countries adopted a universal, global climate deal and set out a global path to avoid dangerous climate change and a temperature rise of 2° C (UNFCCC 2015). It put the emissions of industrial sectors – including tourism – high on the agenda again. They are discussed by tourism stakeholders, for example as part of evolving Corporate Social Responsibility (CSR) strategies, COP21 itself (e.g. WTTC 2015), the Sustainable Development Goals (e.g. UNWTO 2016) and/or newly introduced climate policies (e.g. for aviation in ICAO 2016). Several Dutch tour operators and the Dutch Association of Travel Agents and Tour Operators (ANVR), amongst others, have recognised their responsibility, and have started to engage in carbon management. For these tour operators, some of the most important factors for taking action are increasing energy costs, international aviation policy, pressure from society to become greener, increasing demand for green trips, and the wish to obtain a green image and become a frontrunner among consumers and colleagues in doing so.

In 2008, the World Tourism Organisation (UNWTO) reported on the effects of climate change on tourism as well as the effects of tourism on greenhouse gas emissions (UNWTO-UNEP-WMO 2008). The UNWTO report estimates the contribution of tourism to carbon dioxide emissions at approximately 5% in 2005 (UNWTO-UNEP-WMO 2008). Gössling et al. (2015) found the emission to double between 2010 and 2032. More recently, Peeters (2017) assessed the long term development of tourism's carbon footprint and found this to increase by a factor 4.6 between 2015 and 2100. Where currently 22% of tourism trips is based on air transport, the share of air CO_2 emissions is 55%. By 2100 this will have risen to 75%. The strong growth of emissions is in stark contrast with the Paris 2015 Climate Agreement, that seeks to reduce emissions to almost zero by 2100. According to Peeters (2017), near zero-emissions is only achievable for tourism when all mitigation opportunities are fully implemented. This also includes a physical barrier – cap on airport slots or global aircraft fleet - to unlimited growth of air transport. Information on the share of tourism of all environmental impacts and eco-efficiency (kg CO_2 per Euro spent by tourists) of the Netherlands is important for the sector's continued implementation of CSR.

The aim of this research consists of two parts. Firstly, it provides a complete overview of the emissions of inbound (international) tourists to the Netherlands and eco-efficiency in

2014. Secondly, it compares the results with the carbon footprint and eco-efficiency of outbound tourism. This understanding requires answers to the following questions:

- What is the total carbon footprint of inbound tourists?
- How does the inbound tourist carbon footprint relate to the total carbon footprint of the Netherlands and the footprint of Dutch holidaymakers?
- What factors determine the carbon footprint of inbound tourists?
- What length of stay (LOS) and tourist markets are the least/most damaging to the environment?
- What is the eco-efficiency of different tourist markets?

Chapter two of this report briefly describes the method used to calculate the carbon footprint and the eco-efficiency. Chapter 3 gives an overview of the general characteristics of tourist trips to the Netherlands. Chapter 4 describes the carbon footprint of inbound tourism in 2014. Section 4.1 starts with several reference values for the CF in the Netherlands. Section 4.2 provides an overview of the calculated CF for holidays, split for short-haul and long-haul holidays and short and long trips. The chapter continues with a detailed breakdown of the CF by duration (4.3), country of origin (4.4), accommodation type (4.5), and transport mode (4.6). Section 4.7 examines the distribution of emissions over the different components of holidays (accommodation, transport, and activities). Chapter 5 looks at the eco-efficiency and compares the results with the eco-efficiency of the Dutch economy. Finally, in chapter 6, the research questions are answered, the results are reflected upon and some conclusions are drawn.

2 Methodology

Data on the characteristics of incoming tourists from the research conducted by the Netherlands Board of Tourism and Conventions (NBTC) form the basis of this report. NBTC conducts this research, titled 'Focus on the incoming tourist: Inbound Tourism Research' (see NBTC Holland Marketing 2015), once every three years. Specifically, for this analysis, as an indicator for the environmental effect of tourism, the carbon footprint (CF, expressed in kg CO_2 emissions) was used and added to the ITR2014 data. The CF is a legitimate indicator for calculating the environmental impact of the tourism industry. Carbon dioxide (CO_2) currently receives much societal and political attention, and policy is already developed for it, internationally (UNFCCC 2015) and in the Netherlands (EZK 2019). CO_2 is also one of the biggest environmental problems for tourism (see e.g. Peeters et al. 2007a, UNWTO-UNEP-WMO 2008). The CF is calculated by multiplying emission factors for CO_2 (in kg CO_2 per night, per kilometre, etc.) by the number of nights, distance travelled, etcetera. These calculations are performed on data on the accommodation type, number of nights, transport mode, country of origin, and type of trip, per trip featured in the ITR2014 database.

2.1 Carbon footprint

The carbon footprint is a measure of the contribution of an activity, country, industry, person, et cetera, to climate change (global warming). The CF is caused by the combustion of fossil fuels for generating electricity, heat, transport, and so on. CO_2 emissions cause a rise in the concentration of CO_2 in the atmosphere. Since the industrial revolution the CO_2 concentration has increased from 280 ppm to 407 ppm in 2018 (parts per million; see Dlugokencky et al. 2020), which causes the atmosphere to retain more heat. The atmosphere's ability to retain heat is called "radiative forcing", expressed in W/m^2. However, besides CO_2 emissions, other emissions also play a role in global warming. These include gases like nitrogen oxides, CFCs and methane. A common way to add the effects of these other greenhouse gases (GHG) to CO_2 is by converting them into carbon dioxide equivalents (CO_2-eq). To do this, "global warming potential" (GWP) is used as a conversion factor. These factors vary significantly per type of gas. For instance, the GWP of methane is 25 (see IPCC 2007: 33). This means that in one hundred years the emission of 1 kg methane has the same effect on the temperature as the emission of 25 kg of CO_2 over the same period. A conversion factor can also be determined for an industry or sector, which obviously depends on the exact mix of emissions. For nearly all tourism components this factor is relatively small (1.05, see Peeters et al. 2007a). However, for air travel this is not the case. Airplanes cause additional impacts on climate, as they not only produce additional GHGs like nitrogen oxides, but also because these substances appear in the upper atmosphere, where they cause chemical reactions, and in some cases contrails (condensation trails) and sometimes even high altitude 'contrail-induced' cirrus clouds. This produces a significant net contribution to "radiative forcing". In 2005, the total contribution of aviation to radiative forcing accumulated since 1940 was 2.0 (excluding cirrus clouds) to 2.8 times (including cirrus) as large as the effect of all airplane CO_2 emissions (best estimates from Lee et al. 2009). However, the uncertainty is large: the total contribution of

aviation to climate change lies somewhere between 1% and 14%. Unfortunately, as a result of various practical and theoretical objections, these percentages cannot be used as GWP (see Forster et al. 2006, Forster et al. 2007, Graßl et al. 2007, Peeters et al. 2007b). Thus, it is not possible to provide a CO_2-equivalent for air travel. In this report, we therefore limit ourselves to the CF of CO_2 emissions only (see also Wiedmann et al. 2007).
The CF consists of two parts: the direct and indirect CF. The direct CF consists of CO_2 emissions caused by the operation of cars, airplanes, hotels, etc. The indirect CF measures the CO_2 emissions caused by the production of cars, airplanes, kerosene, et cetera, and thus considers the entire lifecycle, in addition to the user phase (see Wiedmann et al. 2007). This report addresses all primary CO_2 emissions, plus the emissions caused by the production of fuel and/or electricity, but ignores all other indirect emissions.

2.2 Calculation model

The NBTC ITR2014 data have been processed with IBM SPSS Statistics 26.0, for which a syntax (a series of SPSS commands) has been developed to calculate the CF. For each single trip in the NBTC ITR2014 data, a CF has been calculated. Firstly, the NBTC ITR data was supplemented with the great circle distance, i.e. the shortest distance between origin and destination. Secondly, a diversion factor was added for each transport mode, which was used to multiply transport emissions with in the end. Thirdly, a CF per day for each tourist trip component (accommodation, transport, activities) was calculated, by using an emission factor for transport modes, accommodation types, and specific activities. By multiplying these factors with distance covered and the duration of the trip, the CF for each complete trip was found. Then, by increasing the individual carbon footprints with a weight factor and summation, the total carbon footprint of all trips was calculated. The dataset provided by NBTC includes weight factors based on the quarter, type of accommodation, tourist area, and mode of transport, so that they match the official data of Statistics Netherlands (CBS 2015). For a detailed description of the calculation method and the emission factors, generally the method used for the Dutch holidaymaker CF has been applied (Peeters 2015). Some additional calculations and assumptions are discussed in the following sections.

2.2.1 Data corrections

There was a discrepancy between two variables that describe the country of origin but are coded in the same fashion (V2a and Herkomstland). In 101 instances, the country of origin was coded differently in these two variables. Upon checking we found that 'Herkomstland' provides the most accurate description of the country of origin and we used this variable for our analyses. Since the weight factors are based on variable 'V2A', this means that the distribution of trips per country of origin differs slightly between the two variables. Since the distance associated with the country of origin plays a big role in the emissions of that trip, we decided to prioritise emission calculations over providing a distribution of trips that is the same as that of CBS (2015).

2.2.2 Compound markets

Some countries with a low number of respondents were combined into compound markets as follows:

- Iceland and Slovakia, added to 'Rest of Europe'
- South Korea, Qatar, Saudi Arabia, and Thailand, added to 'Rest of Asia'
- Dutch Antilles added to 'Rest of Americas'

2.2.3 Other assumptions

Following assumptions were made:

- Regarding transport mode there was an issue where intercontinental subjects (apparently) submitted the transport mode with which they entered the Netherlands while on a tour through Europe. However, for the carbon footprint it is important to use the transport mode to travel to Europe. Therefore we assumed all trips from outside Europe to have been by air.
- The accommodation emission factors have been corrected for the typical Dutch values based on data from Peeters (2015). The values are shown in Table 2.1.
- The emissions for local activities were based on emission factors for different types of holidays. ITR2014 does not provide these holiday types but we defined these using the most important activity reported by the subjects in the survey. In this way, the emission factors per tourist-day for inbound travel could be coupled to the outbound holiday types.

Table 2.1: Accommodation emission factors

Accommodation type	kg CO_2 per night
Hotel/pension	20.6
Bed-and-breakfast	7.9
Holiday homes*	15.1
Campsite	7.9
Group accommodation	7.9
Other	15.6

Source: Peeters (2015).

**) The emission factor of holiday homes is based on the average emissions of standalone holiday homes and those on a holiday park.*

2.3 Trip duration and length of stay in the Netherlands

Inbound tourists may spend part of their trip outside the Netherlands, for instance travelling to Germany, staying there a couple of days, then visiting the Netherlands for a number of days and after that several other countries. The CF of the entire trip is more relevant to specific characteristics of inbound trips and overall tourism emissions, while the CF over the length of stay in the Netherlands is more relevant to the CF of inbound tourism to the Netherlands as a whole and for example for comparing with outbound tourism emissions.

Visits to more than one country pose a problem for calculating the emissions per day. What to do with the emissions of the travel from home to the first destination (Germany in this example)? To solve this, we have defined two forms of emissions per day: one taking all travel emissions into account and one that only takes emissions that can be attributed to the stay in the Netherlands into account. In general, this problem only occurs with intercontinental trips, where tourists may come to visit 'Europe' rather than the Netherlands, for instance on a two-week trip that includes a one-day visit to Amsterdam. We dealt with this in the following way:

$$CF\ per\ day = \frac{distance\ travelled \cdot emission\ factor}{length\ of\ entire\ trip} + CF_{acco}\ per\ day + CF_{other}\ per\ day$$

$$CF\ of\ entire\ trip = CF\ per\ day \cdot length\ of\ entire\ trip$$

$$CF\ of\ stay\ in\ the\ Netherlands = CF\ per\ day \cdot length\ of stay\ in\ the\ Netherlands$$

Both values are relevant depending on the situation. Figure 2.1 shows the average length of stay of inbound trips by country of origin. Much of the length of stay of inbound intercontinental trips is spent outside the Netherlands. We will use the term 'entire trip' for emissions of the whole trip and 'attributable to NL' for emissions weighted to the share of the trip stayed in the Netherlands.

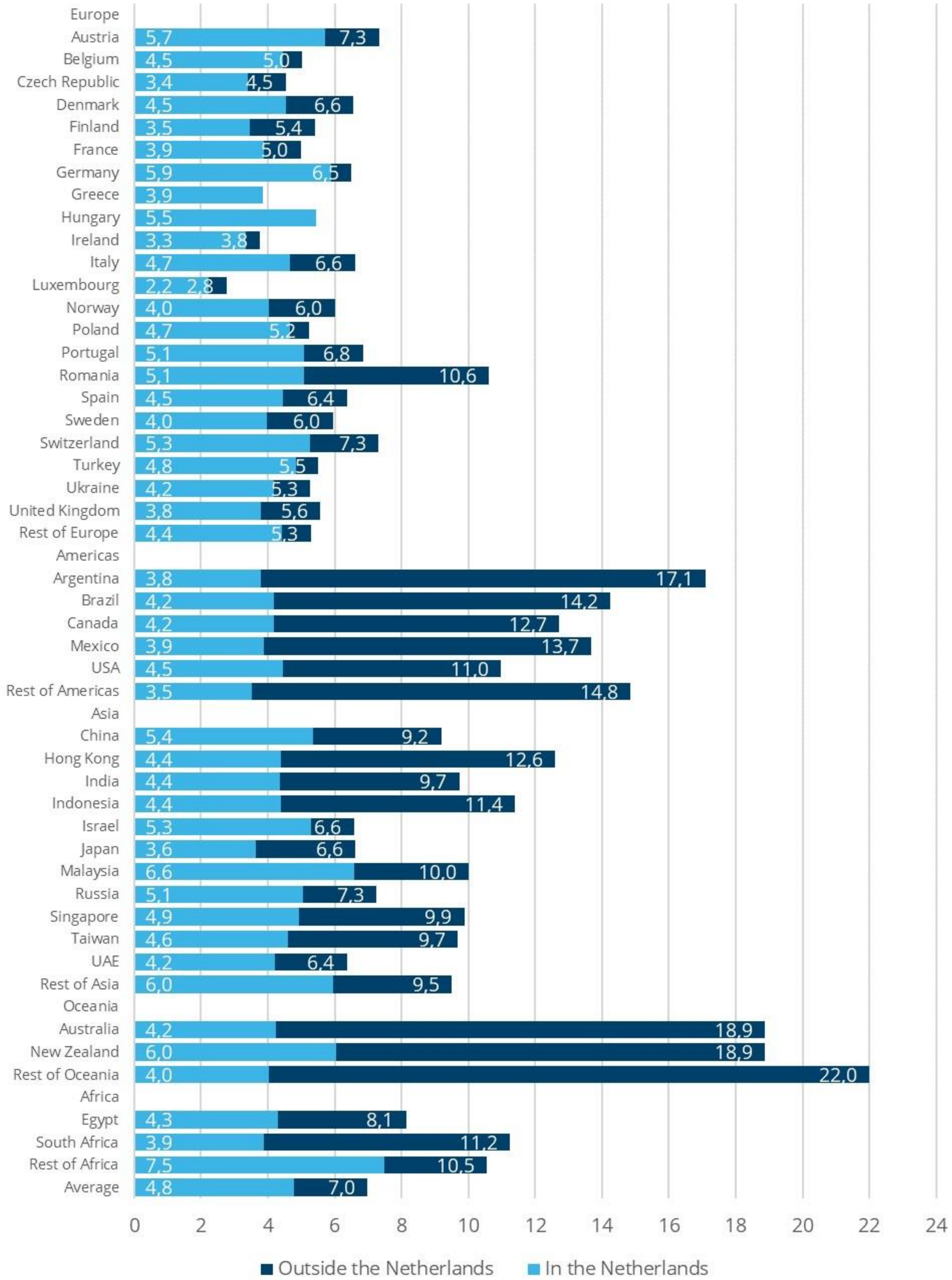
2.4 Method-related deviations from earlier published data

NBTC Holland Marketing (2015) published figures about the total number of international inbound tourists and their spending within the Netherlands. Though these numbers are mainly based on the same data as we have used for our carbon footprint assessment, we come up with different numbers. We would therefore like to stress that our calculations are tentative at this moment. The ITR2014 was not designed to accommodate the kind of analyses we present in this report. Therefore, the officially published data (NBTC Holland Marketing 2015) for numbers of trips, nights and spending should be used when citing inbound data. Therefore, our method causes the total number of trips to be lower than published by NBTC Holland Marketing (2015). Numbers of European countries tend to be overestimated by NBTC (by up to 17.7 per cent for Switzerland), whereas compound markets such as Australia and Oceania and Africa were underestimated (respectively 3.3 and 9.3 per cent). The overall differences are around 1 per cent.

Second, the database is known to give an overestimate due to the collection method at accommodations instead of country borders. NBTC included a weighting method in the dataset which considers quarterly tourist numbers, the type of accommodation, the tourist area, and the mode of transport, so that the numbers match those published by CBS (2015). This causes a (small) deviation in the distribution of other statistics (e.g. total number of guests and nights). The differences in tourist numbers can be found in Appendix II.

Last, our calculation method for travel expenses differs from that of NBTC. As the data was only provided on a per-day basis, calculations were needed to eventually derive eco-efficiencies. The exact calculation method of NBTC is unknown and therefore NBTC data should be used when citing inbound data.

Figure 2.1: Average length of stay, by country of origin, 2014



Source: analyses of NBTC ITR2014

3 Overview inbound tourism 2014

This chapter presents a number of key figures on inbound tourism to the Netherlands in 2014 (see Table 3.1).

Table 3.1: Key figures inbound tourism 2014)*

	Unit	Entire trip	Attributable to NL**
Total number of tourists to the Netherlands	million trips	13.81	13.81
By length of stay:			
1-3 nights	million trips	8.68	8.68
4-7 nights	million trips	4.10	4.10
more than 8 nights	million trips	1.03	1.03
By transport mode:			
airplane	million trips	6.67	6.67
car	million trips	5.69	5.69
other	million trips	1.44	1.44
By accommodation type:			
hotel/pension	million trips	10.39	10.39
bed-and-breakfast	million trips	0.47	0.47
holiday homes	million trips	1.97	1.97
camping	million trips	0.88	0.88
group accommodation	million trips	0.09	0.09
other accommodation type	million trips	0.01	0.01
European tourists	million trips	11.12	11.12
Of which:			
from Germany	million trips	3.89	3.89
from the United Kingdom	million trips	1.85	1.85
from Belgium	million trips	1.80	1.80
from other European countries	million trips	3.58	3.58
Intercontinental tourists	million trips	2.69	2.69
Of which:			
from America	million trips	1.37	1.37
from Asia	million trips	0.98	0.98
from Oceania	million trips	0.19	0.19
from other countries	million trips	0.15	0.15
Expenditure by inbound tourists	billion Euro		12.46
Categories:			
European	billion Euro		8.11

	Unit	Entire trip	Attributable to NL**
Intercontinental	billion Euro		4.35
Overnight stays by inbound tourists	million nights	82.62	52.21
Categories:			
European	million nights	54.80	42.46
Intercontinental	million nights	27.81	9.76
Total distance travelled on holidays by inbound tourists*)**	billion km	59.11	37.52
Categories:			
European	billion km	13.24	11.84
Intercontinental	billion km	45.87	25.69

Source: analyses of NBTC ITR2014

**) Some of the data for arrivals, nights and spending in this table differ from those published by NBTC Holland Marketing (2015). Total number of arrivals is lower in this report with 13.81 million compared to 13.91 million and total expenses by tourists are higher with €12.46 billion compared to €10.1 billion. The causes for these differences are described in Section 2.4.*

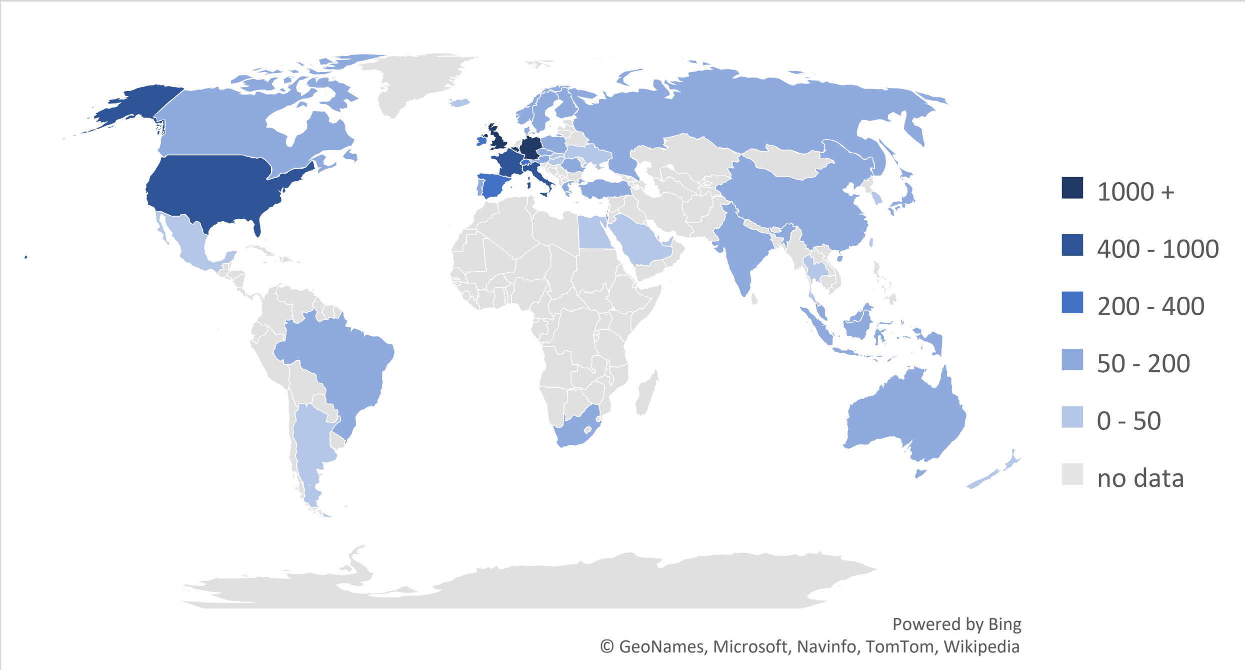
***) The carbon footprint in the Netherlands is calculated by allocation of emissions from transport for the length of stay in the Netherlands only.*

****) These are not the actual distances, but the great circle distance between home and destination; the real distances are between 5% and 15% longer.*

The majority of inbound tourists that visit the Netherlands originate from Europe. Most visitors (28.1%) come from Germany. Other important countries of origin within Europe are Great Britain and Belgium. The majority – one-third - of intercontinental tourists come from the United States. Overall, the travel motive for incoming tourists to the Netherlands is 68.7% leisure, 25.5% business, 1.5% sports, and 4.2% 'other' (analyses of NBTC ITR2014).

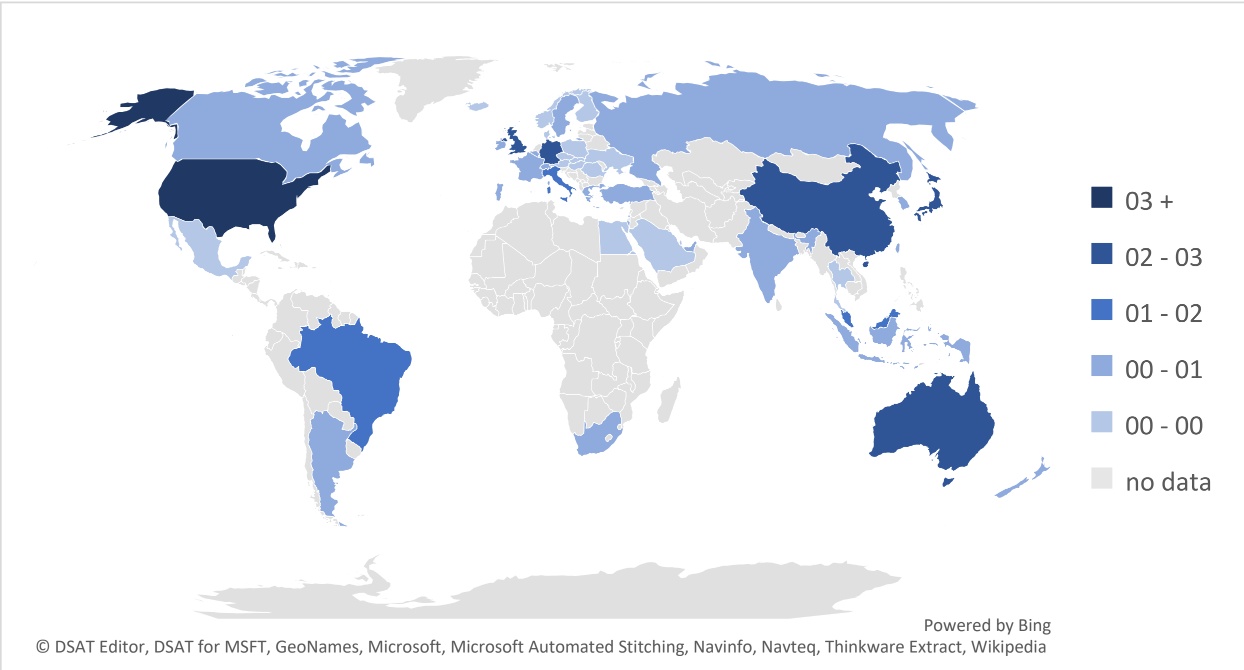
Figure 3.1 shows the number of arrivals from various countries (or regions) of origin on a geostatistical map. Figure 3.2 shows a geostatistical map of the total distance travelled from each origin to the Netherlands and back.

*Figure 3.1: Number of arrivals (*1000) by country of origin, 2014*



Source: analyses of NBTC ITR2014

Figure 3.2: Total distance (billion kilometres) by country of origin, 2014



Source: analyses of NBTC ITR2014

4 Carbon footprint 2014

4.1 Introduction

In this chapter, the results of the calculations and analyses of the year 2014 are presented (in kg CO_2). The values in Table 4.1 are used for reference and offer perspective on the numbers found for inbound tourist trips. Overall Dutch CO_2 emissions are taken from the Dutch Emission Register (Pollutant Release and Transfer Register) website (Emissieregistratie 2020), which covers the process of collecting, processing and reporting emission data in the Netherlands. The 159.2 Mt figure and the population size in 2014 were used to calculate the average CO_2 emissions per person and the CO_2 emissions per person per day in the Netherlands.

Table 4.1: Reference values carbon footprint, 2014

	2014	
CO_2 emissions per average Dutch outbound holiday	421	kg
CO_2 emissions per average Dutch outbound holiday per day	49.0	kg
Total CO_2 emissions Dutch outbound holidays	14.8	Mt
Average annual CO_2 emissions per person in the Netherlands	9.46	ton
Average CO_2 emissions per person per day in the Netherlands	25.9	kg
Total Dutch CO_2 emissions*	159.2	Mt

Sources: Eijgelaar et al. (2015), CBS (2020a), and Emissieregistratie (2020).

**) excluding LULUCF (forestry- and land use)*

4.2 Total carbon footprint

Table 4.2 shows the (average) values of the carbon footprint of inbound tourists. The total carbon footprint of all inbound tourists to the Netherlands was around 6.6 Mt CO_2 in 2014 (or 10.2 Mt if we include the emissions attributed to time spent outside the Netherlands).

Table 4.2: Carbon footprint per day, per trip and in total, 2014

Carbon footprint in kg CO_2	Per day	Per trip	Total (Mt)
Inbound trips of European origin	67	316	3.51
of which attributable to NL*)	67	271	3.01
Inbound trips of intercontinental origin	321	2,478	6.68
of which attributable to NL*)	321	1,339	3.61
Inbound trips (total)	116	738	10.19
of which attributable to NL*)	116	480	6.62

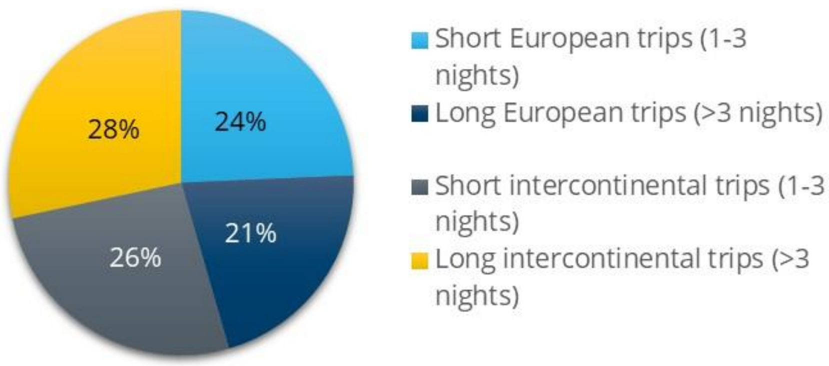
Source: analyses of NBTC ITR2014

**) The carbon footprint in the Netherlands is calculated by allocation of emissions from transport for the length of stay in the Netherlands only.*

Tourism CO_2 emissions are not directly comparable with national CO_2 emissions, as part of the transport emissions occur in other countries, whereas the national emissions are only caused within the Netherlands. However, measured as part of Dutch emissions (159.2 Mt CO_2 in total and over 9 ton CO_2 per person in 2014), inbound tourism emissions attributable to the Netherlands would amount to 4.2% of the total Dutch carbon footprint. The carbon footprint attributable to the Netherlands per average trip is 480 kg CO_2 and 116 kg CO_2 per day.

European tourism trips to the Netherlands produced a total carbon footprint of 3.51 Mt CO_2, of which 3.01 Mt CO_2 is attributable to the Netherlands. The average emissions per trip and per day, respectively, are 316 kg and 67 kg CO_2, of which 271 kg per trip and 67 kg per day can be attributed to the Netherlands. An average intercontinental trip has a much larger footprint of 2,478 kg or 321 kg per day. Taking the entire length of the trip, all intercontinental trips to the Netherlands produced 6.68 Mt CO_2. 3.61 Mt CO_2 of this can be attributed to the Netherlands. Thus, 45% of inbound tourism emissions were produced by European and 55% by intercontinental trips (see Figure 4.1), whereas the number of European trips (11.12 million, 81%) is much larger than the number of intercontinental trips (2.69 million, 19%). The average carbon footprint attributable to the Netherlands is 116 kg per day, which is 67 kg more than the average Dutch outbound holiday (see Table 4.1). When looking at the length of the entire trip, there is a large number of short inbound trips of 3 nights or less (8.7 million, 63%) compared to long trips of more than 3 nights (5.1 million, 37%). However, long trips have a larger carbon footprint per trip. If we include only CO_2 emissions attributed to the length of stay in the Netherlands, long trips are responsible for 49% of all inbound tourism emissions (see Figure 4.1).

Figure 4.1: Distribution of CO_2-emissions by inbound tourists attributed to the Netherlands by origin and LOS, 2014



Source: analyses of NBTC ITR2014

4.3 Length of stay

The carbon footprint for long trips is much higher than for short trips (see Table 4.3). However, the differences are not very large on a per day basis. The carbon footprint per day of a long trip is actually smaller than for a short trip. The main reason for this is that the transport emissions are divided over a larger number of days. Short trips (1-3 nights) have a relatively large carbon footprint per day. This carbon footprint decreases, as the length of stay increases. Opposite to 2009, where medium-length trips (4-7 nights) have the lowest carbon footprint per day (Pels et al. 2014), it appears that the average length of stay increases relatively fast, compared to the emissions per trip. Consequently, longer average lengths of stay are associated with more distant countries of origin. This is illustrated by a geostatistical map of the average length of stay of the entire trip to the Netherlands by country or region of origin (Figure 4.2), where far away countries show higher average lengths of stay than countries or regions situated nearer to the Netherlands. Trips of eight nights or more tend to be mostly spent outside the Netherlands.

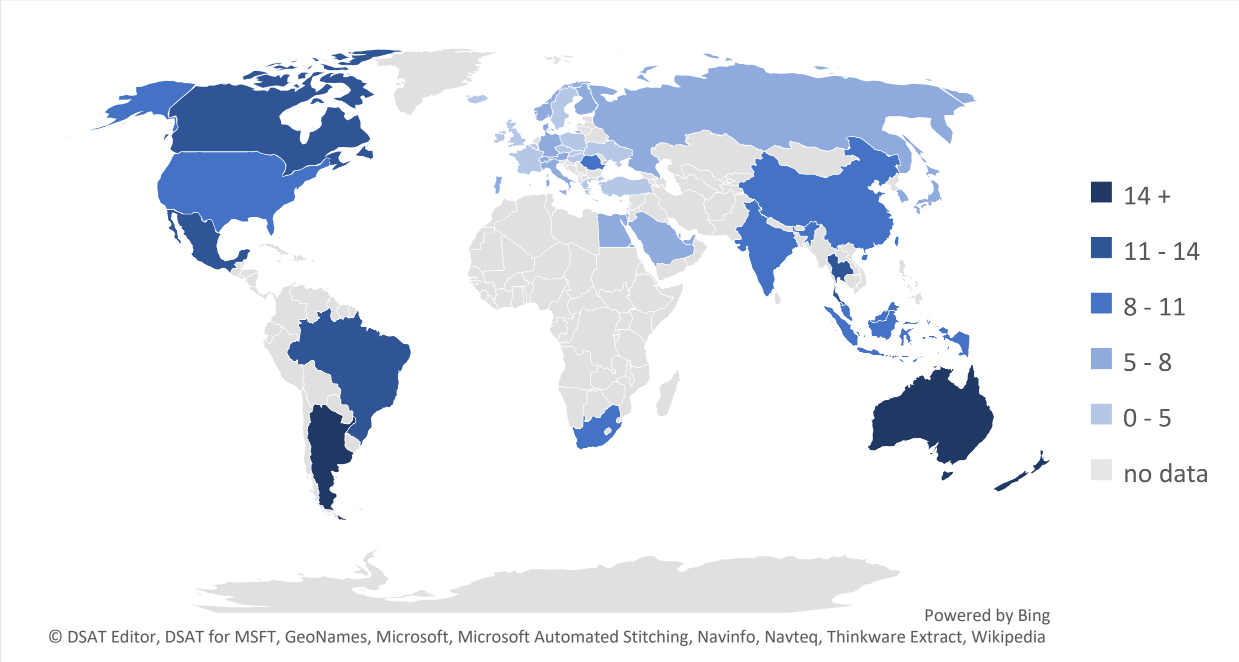
Table 4.3: Carbon footprint per day, per trip and in total for both entire trip and attributable to the Netherlands, by length of stay, 2014

		Entire trip		Attributable to NL*)	
Length of stay (entire trip)	**Per day**	**Per trip**	**Total (Mt)**	**Per trip**	**Total (Mt)**
1-3 nights	127	380	2.502	375	2.470
4-7 nights	109	666	2.721	581	2.373
8 nights or more	104	1,585	4.967	568	1.780
Average	116	738	10.190	480	6.623

Source: analyses of NBTC ITR2014

**) The carbon footprint in the Netherlands is calculated by allocation of emissions from transport for the length of stay in the Netherlands only.*

Figure 4.2: Average length of stay (number of nights for entire trip) by origin, 2014



Source: analyses of NBTC ITR2014

4.4 Country of origin

The carbon footprint strongly relates to the distance travelled and transport mode used, and thus the country of origin. Table 4.4 shows the carbon footprint per day, per trip and in total, for both the entire trip and for the length of stay in the Netherlands by country of origin, and in Table 4.5 by total distance travelled from the country of origin to the Netherlands and back (return distance). It is obvious that more distant countries have larger carbon footprints per day and per trip. The majority of total CO_2 emissions are from trips with over 2,000 km travel distance (return), even though the number of trips with less than 2,000 km travelled is much higher (67% of trips). The average carbon footprint of short distance inbound trips (< 500 km return, i.e. from Germany and Belgium) is only slightly higher per day than the average CO_2 emissions per person per day in the Netherlands. Germany's large total carbon footprint is due to a high number of inbound trips from this country (3.9 million out of 13.8 million in total). The USA has the largest total carbon footprint of intercontinental countries. The long distance and use of air transport are the main reasons for this, in addition to large number of trips from the USA (0.98 million). The apparent role of the airplane is also visible in the carbon footprint per trip from longer distance European countries like Spain, Greece, Turkey, and Russia. An average trip from Oceania has a carbon footprint, per entire trip, that exceeds the average European trip by a factor 15. Per day the difference is only a factor five, because trips from Oceania have a much longer average length of stay.

Table 4.4: Carbon footprint (kg CO2/day), per trip and in total for both entire trip and attributable to the Netherlands, by country of origin, 2014

		Entire trip		Attributable to NL *)	
Country	**kg/day**	**kg/trip**	**Total (Mt)**	**kg/trip**	**Total (Mt)**
Europe					
Austria	91	448	0.033	378	0.028
Belgium	34	157	0.283	141	0.254
Czech Republic	86	318	0.017	263	0.014
Denmark	60	310	0.044	237	0.034
Finland	146	557	0.030	471	0.026
France	78	324	0.232	279	0.200
Germany	42	235	0.912	213	0.827
Greece	168	528	0.041	528	0.041
Hungary	133	602	0.025	602	0.025
Ireland	115	375	0.078	355	0.073
Italy	110	519	0.258	432	0.215
Luxembourg	65	157	0.008	143	0.007
Norway	104	480	0.050	391	0.040
Poland	118	467	0.023	426	0.021
Portugal	150	698	0.096	598	0.082
Romania	87	559	0.046	378	0.031
Spain	112	555	0.220	464	0.184
Sweden	107	471	0.080	373	0.063
Switzerland	74	384	0.081	305	0.064
Turkey	145	670	0.086	618	0.079
Ukraine	153	671	0.028	590	0.025
United Kingdom	76	324	0.600	261	0.483
Rest of Europe	123	551	0.083	498	0.075
Americas					
Argentina	331	3,533	0.113	1,252	0.040
Brazil	370	2,834	0.401	1,305	0.185
Canada	260	2,000	0.283	966	0.137
Mexico	278	2,751	0.069	986	0.025
USA	290	2,181	2.132	1,210	1.184
Rest of Americas	284	2,319	0.134	925	0.053
Asia					
China	376	2,324	0.305	1,658	0.217
Hong Kong	265	2,738	0.287	1,251	0.131
India	292	1,883	0.169	1,144	0.000
Indonesia	376	3,227	0.204	1,583	0.100
Israel	186	999	0.075	887	0.067
Japan	492	2,564	0.377	1,688	0.248
Malaysia	399	3,088	0.250	2,168	0.175

		Entire trip		Attributable to NL *)	
Country	**kg/day**	**kg/trip**	**Total (Mt)**	**kg/trip**	**Total (Mt)**
Russia	141	810	0.159	639	0.125
Singapore	424	2,966	0.179	1,820	0.110
Taiwan	352	2,681	0.114	1,571	0.067
UAE	296	1,477	0.061	1,136	0.047
Rest of Asia	369	2,487	0.356	1,843	0.264
Oceania					
Australia	336	4,565	0.757	1,410	0.234
New Zealand	316	4,938	0.127	1,576	0.041
Rest of Oceania	194	4,274	0.011	792	0.002
Africa					
Egypt	210	1,144	0.031	813	0.022
South Africa	416	2,680	0.139	1,464	0.076
Rest of Africa	219	1,551	0.106	1,203	0.082
Europe	67	316	3.512	271	3.015
Intercontinental	321	2,478	6.677	1,339	3.608
World	116	738	10.190	480	6.623

*Source: analyses of NBTC ITR2014. *) The carbon footprint in the Netherlands is calculated by allocation of emissions from transport for the length of stay in the Netherlands only.*

Table 4.5: Carbon footprint (kg/day), per trip and in total for both entire trip and attributable to the Netherlands, by return distance, 2014

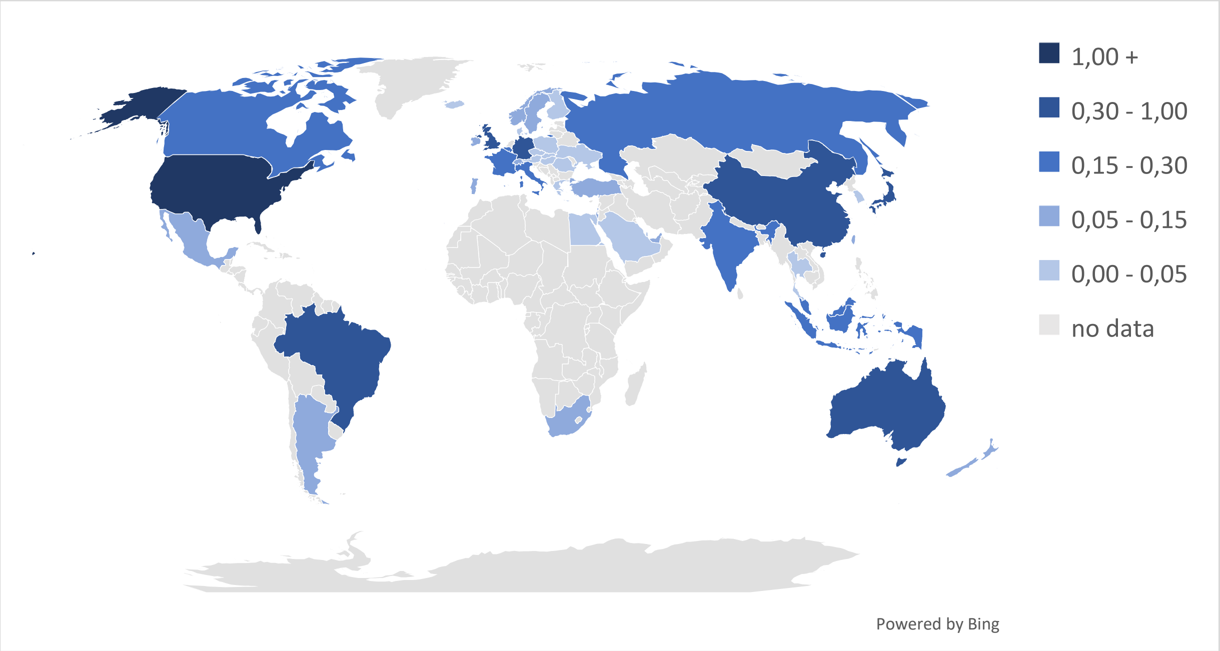
		Entire trip		Attributable to NL*	
Return distance (km)	**Per day**	**Per trip**	**Total (Mt)**	**Per trip**	**Total (Mt)**
< 500 km	35	176	0.634	165	0.593
500 - 1000 km	53	266	0.654	229	0.562
1000-1500 km	75	334	0.879	273	0.720
1500-2000 km	104	417	0.228	372	0.204
> 2000 km	240	1,703	7.794	993	4.545
Average	116	738	10.190	480	6.623

Source: analyses of NBTC ITR2014

**) The carbon footprint in the Netherlands is calculated by allocation of emissions from transport for the length of stay in the Netherlands only.*

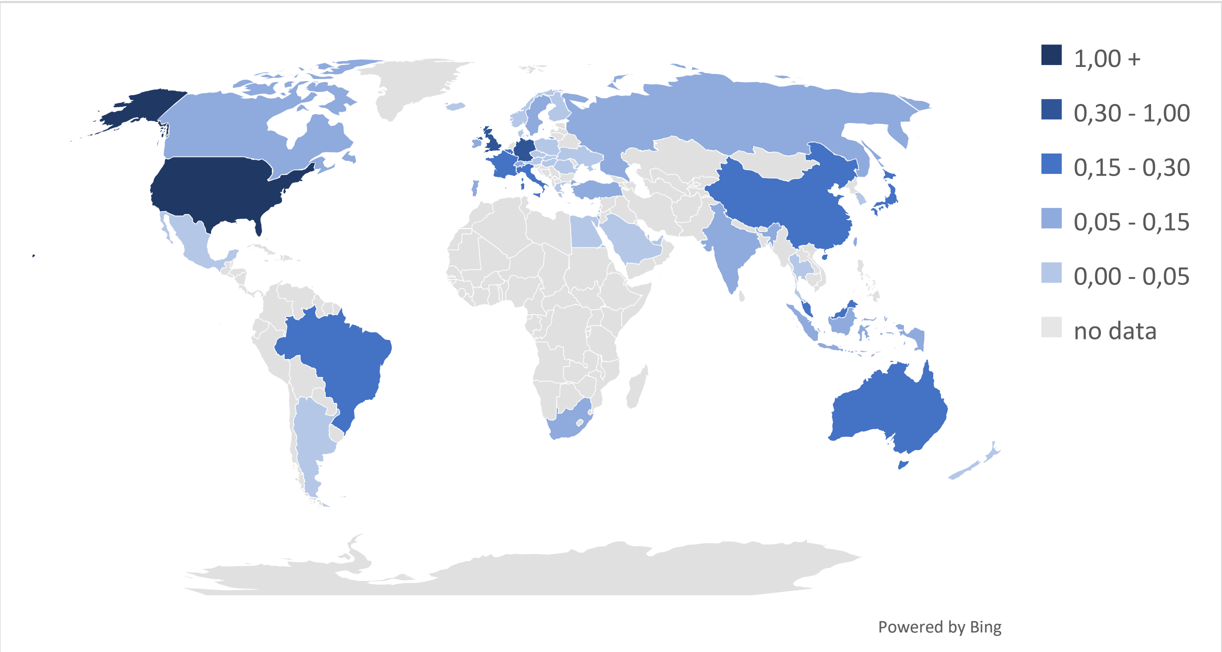
Figure 4.3 and Figure 4.4 show the total carbon footprint on geostatistical maps for the entire trip and the stay in the Netherlands respectively. The graphs show that large source markets (e.g. Germany and the United Kingdom) and distant source markets (e.g. Australia and Brazil) have the biggest CF. The CF attributable to the Netherlands decreases considerably for distant source markets, since these trips to the Netherlands are often combined with visits to other countries. The CF of these trips is partly attributed to the other countries.

Figure 4.3: Total carbon footprint (Mton) of the entire trip by origin, 2014



Source: analyses of NBTC ITR2014

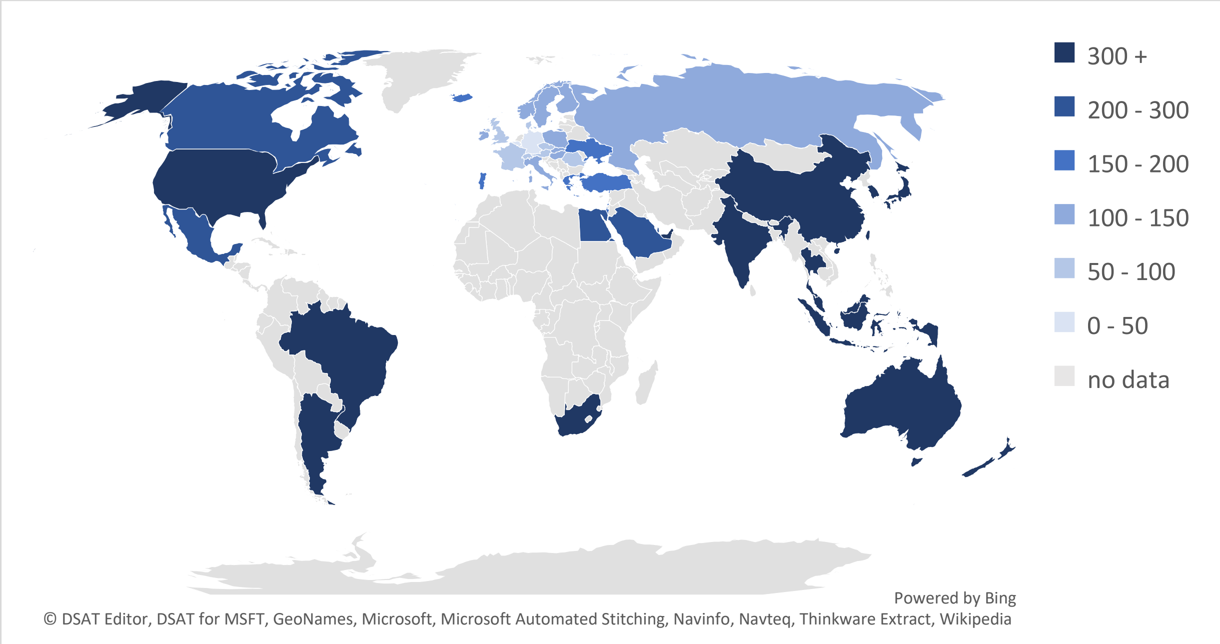
Figure 4.4: Total carbon footprint (Mton) attributable to the Netherlands by origin, 2014



Source: analyses of NBTC ITR2014

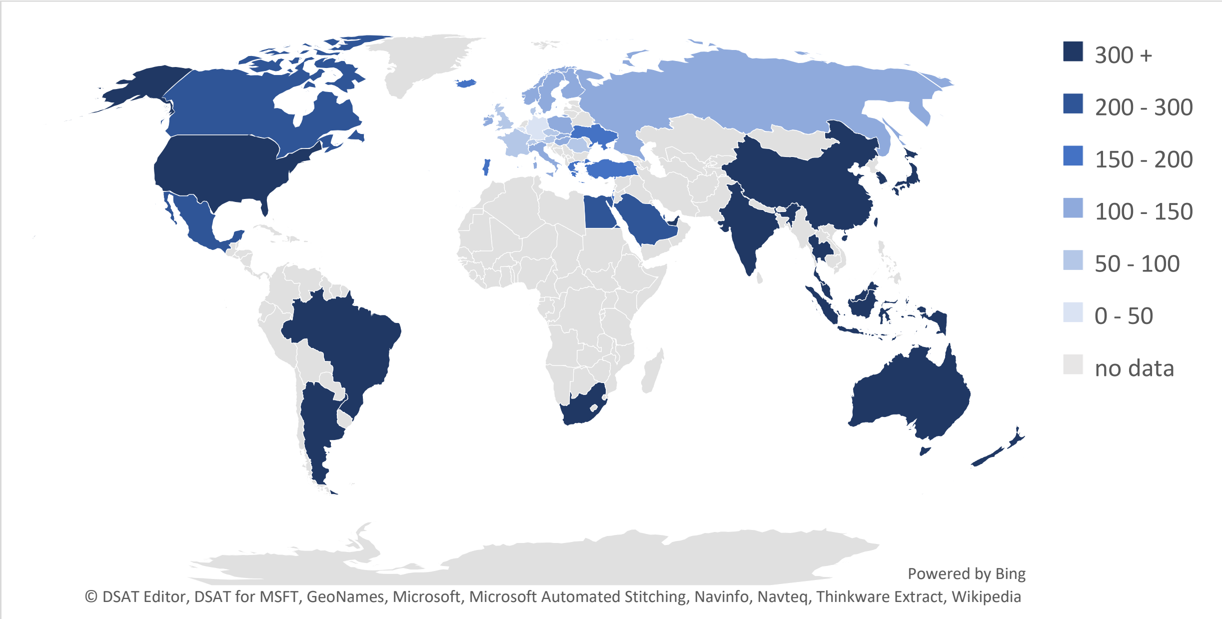
Geostatistical maps in Figure 4.5 and Figure 4.6 display the carbon footprint per day for the entire trip and for the stay in the Netherlands respectively. Even though these trips are often longer, trips from faraway source markets have the largest daily CF. This means that the CF does not proportionately increase with distance. This can be attributed to the prevalent use of the airplane as the mode of transportation of these source markets. Both the relative and absolute contribution of this mode of transport to the CF is very large (see also Figure 4.9).

Figure 4.5: Carbon footprint (kg CO_2/day) of the entire trip by origin, 2014



Source: analyses of NBTC ITR2014

Figure 4.6: Carbon footprint attributable to the Netherlands (kg CO_2/day) by origin, 2014



Source: analyses of NBTC ITR2014

4.5 Accommodation type

Table 4.6 shows the influence of accommodations on the carbon footprint per day, per trip and in total. Please note that these are figures for the total trip, based on the accommodation type used: the carbon footprint for transport and activities is also included besides that of the accommodation.

The carbon footprint per day is largest for inbound tourists staying in a hotel (see Table 4.6). Users of this accommodation type also cause the largest total carbon footprint and it is by far the most popular form of accommodation (10.4 million trips). Tourists staying in a bed-and-breakfast (0.5 million), bungalow parks (2 million), or on a camping (0.9 million) produce less CO_2 per day and per trip, and much less in total. Group accommodations have the lowest total carbon footprint, as well as a low CF per day and per trip. The low total carbon footprint can be explained by the relatively small number of inbound tourists staying in group accommodations (0.09 million). The small CF per day originates from a high share of short distance holidays by car or bus. The CF per trip is slightly increased by a higher average length of stay in group accommodations.

Table 4.6: Carbon footprint per day, per trip and in total for both entire trip and attributable to the Netherlands, by touristic accommodation type, 2014

		Entire trip		Attributable to NL*)	
Carbon footprint in kg CO2	**Per day**	**Per trip**	**Total (Mt)**	**Per trip**	**Total (Mt)**
Hotel/pension	141	875	9.094	553	5.749
Bed-and-Breakfast	74	551	0.258	316	0.148
Bungalow park	34	267	0.526	265	0.523
Camping	38	319	0.279	204	0.178
Group accommodation	27	204	0.018	174	0.015
Other	109	962	0.014	625	0.009
Average	116	738	10.190	480	6.623

Source: analyses of NBTC ITR2014

**) The carbon footprint in the Netherlands is calculated by allocation of emissions from transport for the length of stay in the Netherlands only.*

4.6 Transport mode

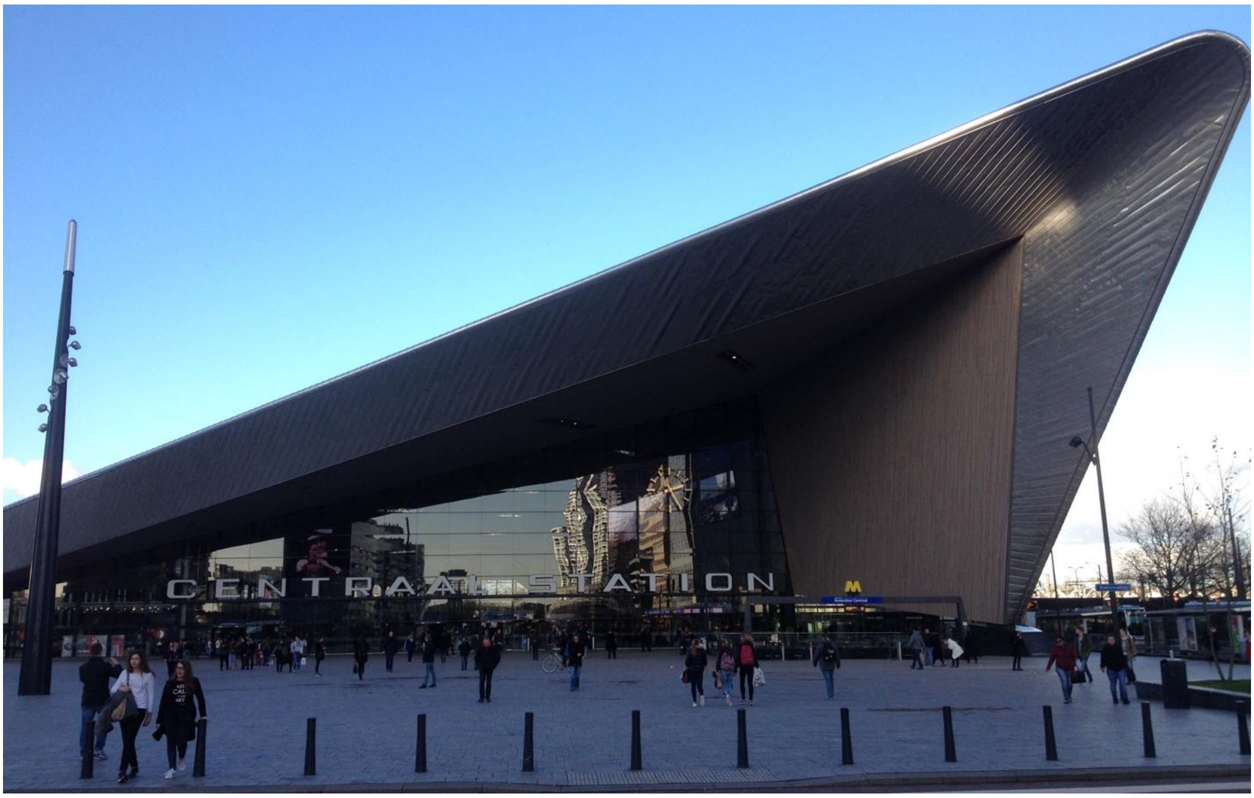
Based on transport mode, the largest carbon footprint per day and per trip was found for inbound tourists travelling by airplane. The popularity of the airplane (6.7 million trips) and the long distances associated with this type of fast transport also gives these trips the largest footprint in total. The average trip by plane produces over five times more emissions than that by car. Also, the total emissions by air are more than six times higher than those by car, even though the number of inbound tourists travelling by car (5.7 million) is only about 20 per cent lower than those by air (6.7 million). Inbound holidays based on all other transport modes have a very low total footprint compared to those by air and car.

Table 4.7: Carbon footprint per day, per trip and in total for both entire trip and attributable to the Netherlands, by transport mode, 2014

	Entire trip			Attributable to NL*)	
Carbon footprint in kg CO_2	**Per day**	**Per trip**	**Total (Mt)**	**Per trip**	**Total (Mt)**
Airplane	194	1,275	8.511	789	5.263
Boat/ferry	87	295	0.032	220	0.024
Train	32	182	0.148	124	0.101
Car	45	243	1.384	207	1.176
Coach/bus	34	193	0.068	112	0.039
Bicycle/moped	31	273	0.019	67	0.005
Other	29	287	0.028	154	0.015
Average	116	738	10.190	480	6.623

Source: analyses of NBTC ITR2014

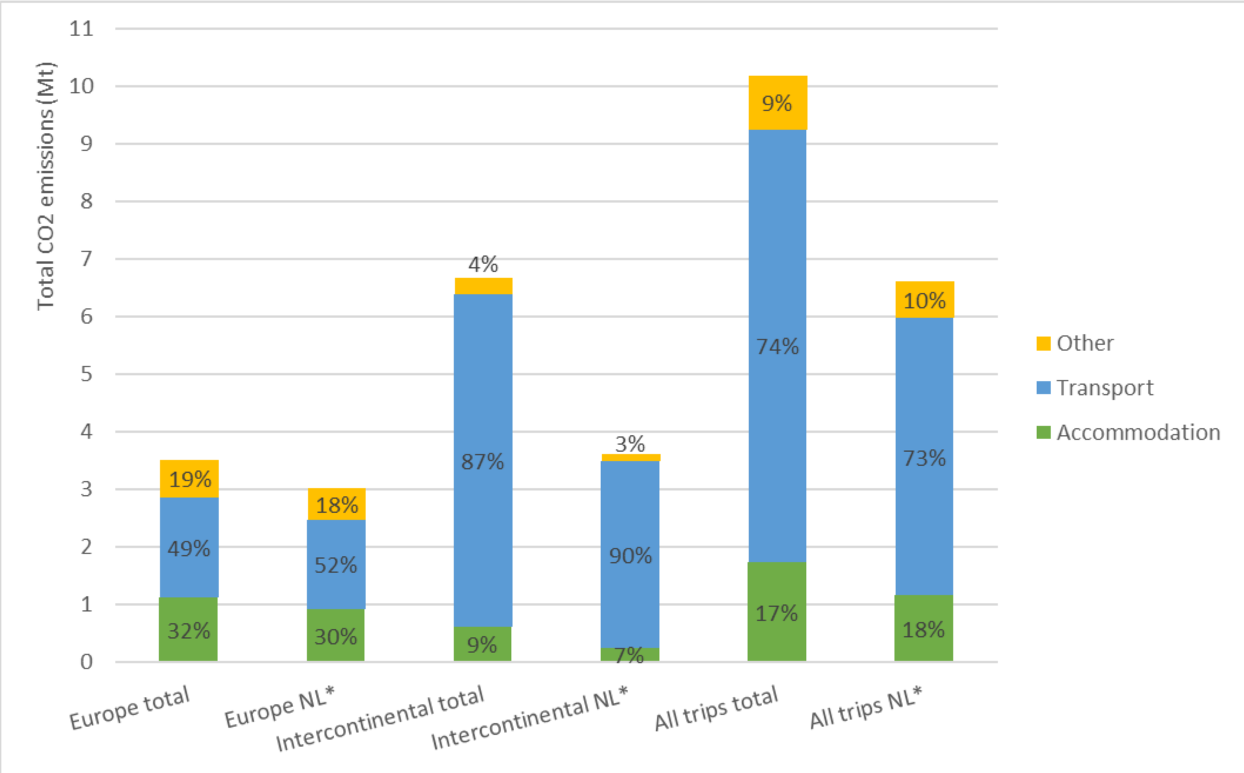
**) The carbon footprint in the Netherlands is calculated by allocation of emissions from transport for the length of stay in the Netherlands only.*



4.7 Carbon footprint per tourist trip component

The carbon footprint of a tourist trip can be divided over the components transport, accommodation, and other aspects. These 'other aspects' are also called 'leisure activities', and concern local activities (that also include local transport used for excursions, business activities, etc.). Figure 4.7 shows the division over these three categories for European and intercontinental inbound trips, and all inbound trips in total. Transport used from and to the country of origin has the largest impact on the tourist carbon footprint for all inbound trips (74%). Accommodation is responsible for one-sixth of all inbound tourist trip emissions (16%) and leisure activities make up the rest of the emissions (9%).

Figure 4.7: Carbon footprint per tourist trip component for both entire trip and attributable to the Netherlands in 2014



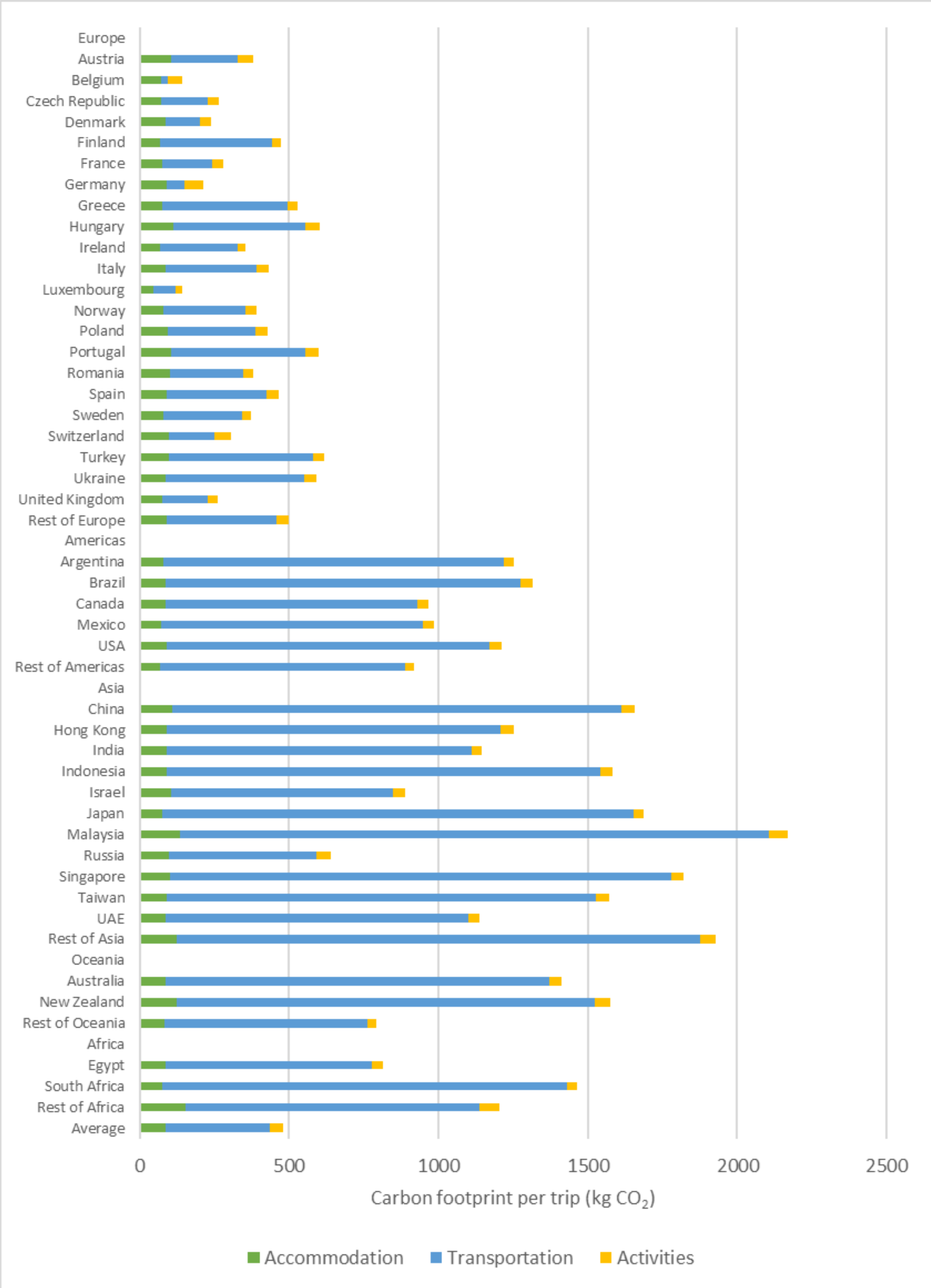
Source: analyses of NBTC ITR2014

**) The carbon footprint in the Netherlands is calculated by allocation of emissions from transport for the length of stay in the Netherlands only. Per specific trip the shares are equal, but due to averaging and weighting the overall average shares differ.*

Figure 4.7 also shows large differences between European and intercontinental inbound holidays. Transport contributes significantly more to intercontinental holiday emissions (87%) than to those of European holidays (49%). As a result, accommodation and other aspects contribute significantly more to European holidays, but this does not mean that accommodation contributes more per day or per trip compared to intercontinental holidays.

In Figure 4.8 the carbon footprint attributable to the Netherlands of the three components is shown for various countries or origin. One figure that stands out is the large share of transport in the tourist carbon footprint of more distant countries. This is particularly valid for countries and regions that are mainly accessed by plane, where the transport share is typically at least around 60%, starting with e.g. the UK and France, and reaching up to around 95% for faraway intercontinental trips.

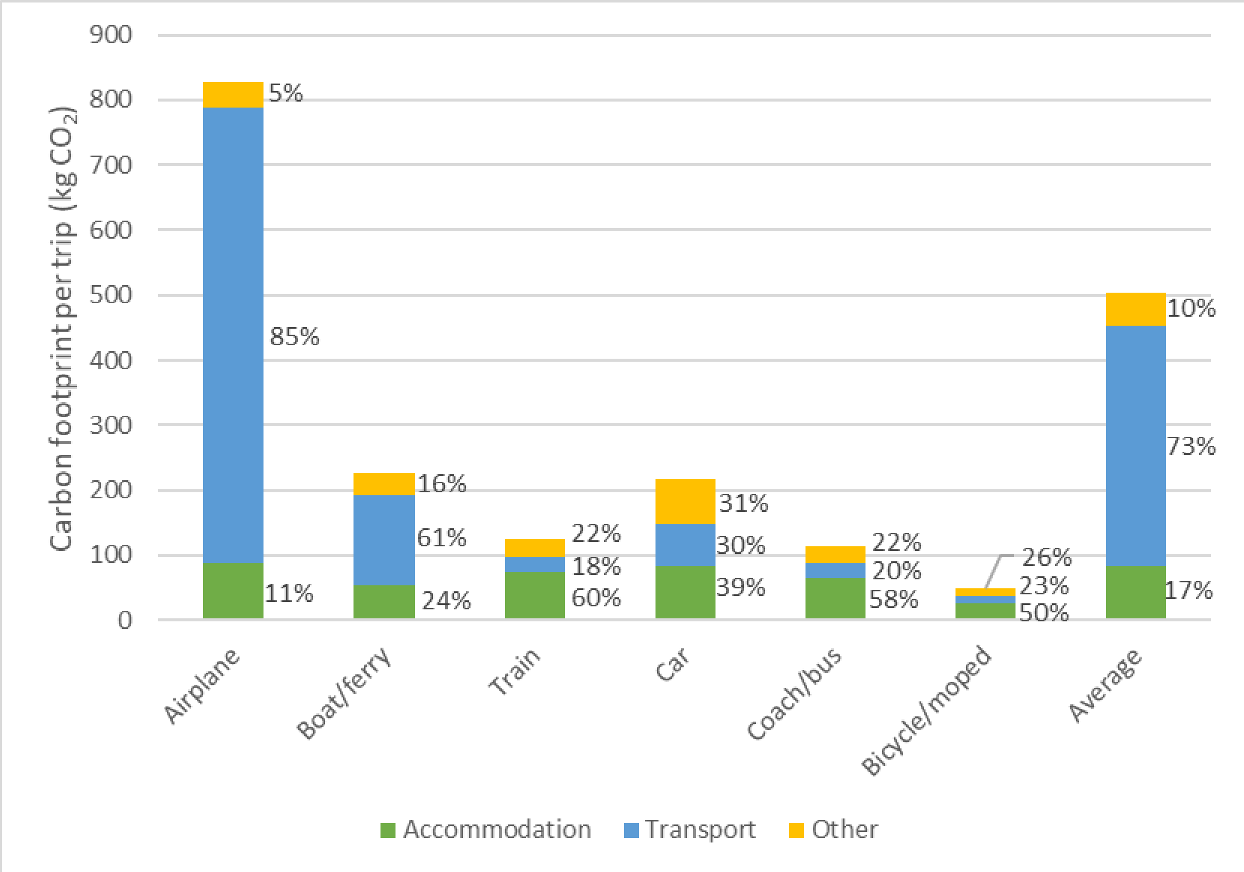
Figure 4.8: Share of the components transport, accommodation and 'other' of the carbon footprint attributable to the Netherlands per country of origin, in kg CO2 per trip, 2014



Source: analyses of NBTC ITR2014

Figure 4.9 shows the shares of the components transport, accommodation and 'other' per average inbound trip based on the transport mode used. Unsurprisingly, the transport component of trips by plane is the largest, whereas it is low for trips by bicycle/moped.

Figure 4.9: Share of the components transport, accommodation and 'other' of the carbon footprint attributable to the Netherlands per transport mode, in kg CO2 per trip, 2014

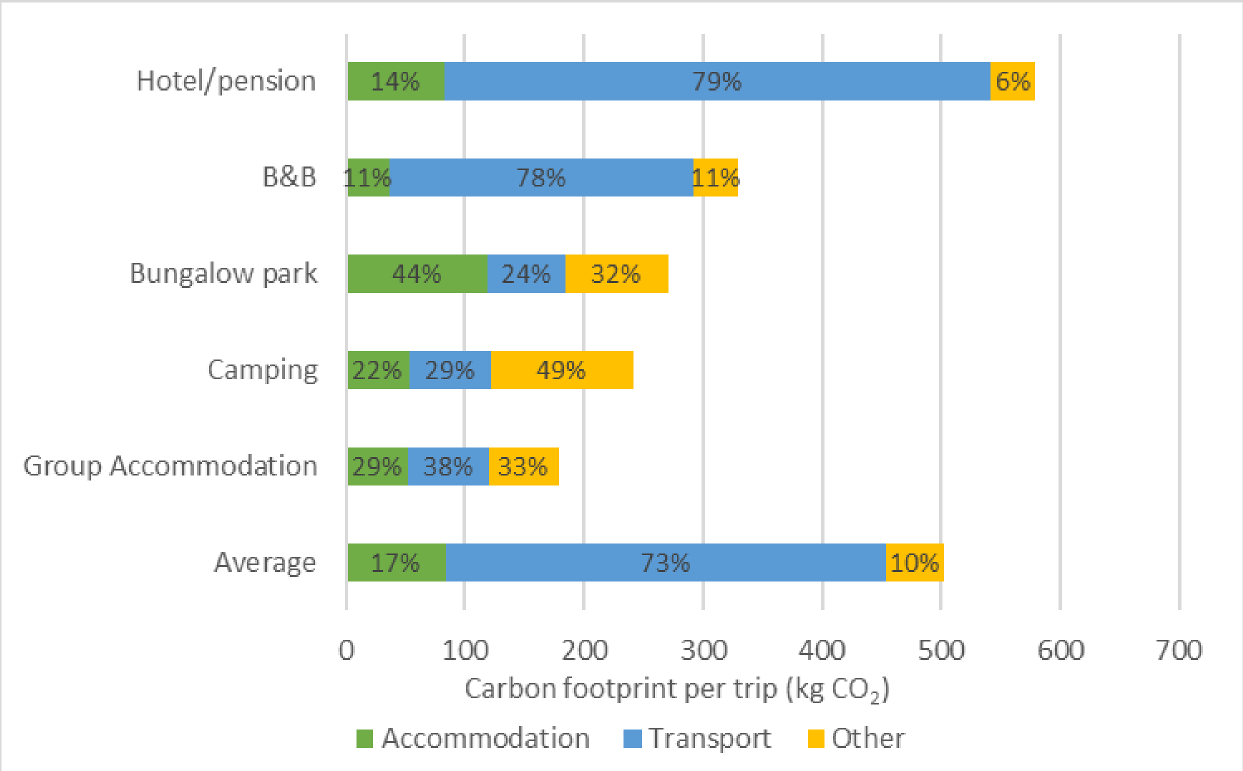


Source: analyses of NBTC ITR2014

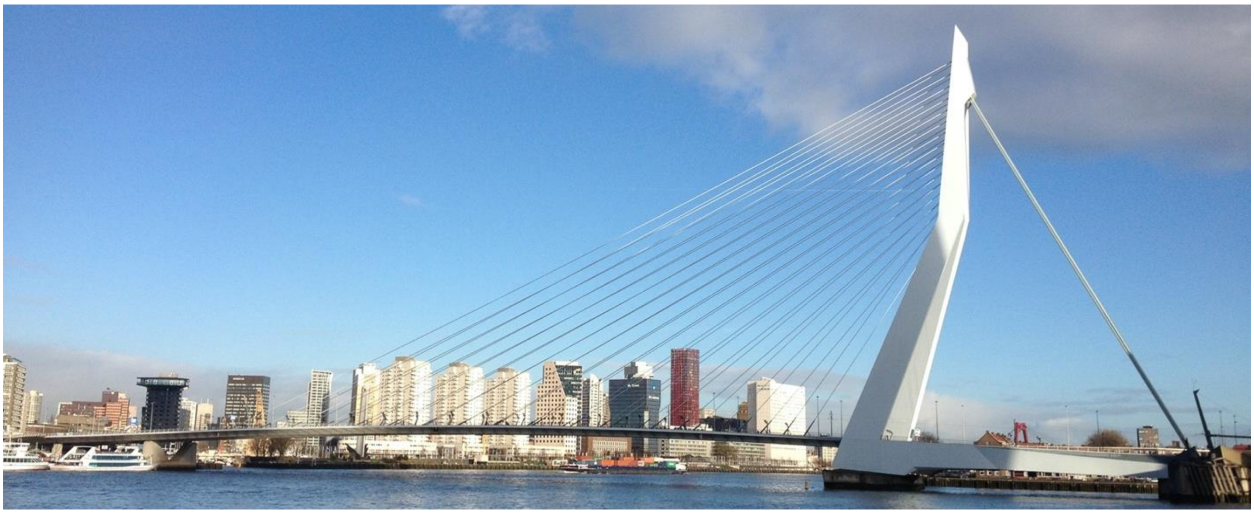
Note: percentages are in order 'accommodation', 'transport', and 'other'.

Finally, Figure 4.10 shows the shares of transport, accommodation, and 'other' aspects of the carbon footprint per trip and the total footprint based on the accommodation type used. Inbound trips spent in hotels have the largest impact on the environment. The share of accommodation of the total carbon footprint of hotel stays is relatively low (14%), because they are more frequently combined with air transport, which weighs heavier on the total carbon footprint. Because of a shorter average travel distance and higher than average length of stay in bungalow parks, the CF of accommodation is the largest (both absolute and percentage), while the CF of transport is the lowest.

Figure 4.10: Share of the components transport, accommodation and 'other' of the carbon footprint attributable to the Netherlands per accommodation type, in kg CO2 per trip, 2014



Source: analyses of NBTC ITR2014



5 Eco-efficiency attributable to the Netherlands

The carbon footprint attributable to the Netherlands of a trip (or per day) can be compared with tourist spending attributable to the Netherlands. This is called 'eco-efficiency', expressed in kg CO_2 per Euro. The lower the figure, i.e. the fewer emissions per Euro spent, the better the eco-efficiency. Table 5.1 gives an overview of eco-efficiency values for trips to the Netherlands. The average eco-efficiency of inbound trips is 0.56 kg CO_2 per Euro. Despite the lower average amount of spending per trip, European trips have a much better eco-efficiency than intercontinental trips because of a significant difference in carbon footprint.

Table 5.1: Eco-efficiency, carbon footprint and spending per trip attributable to the Netherlands, 2014

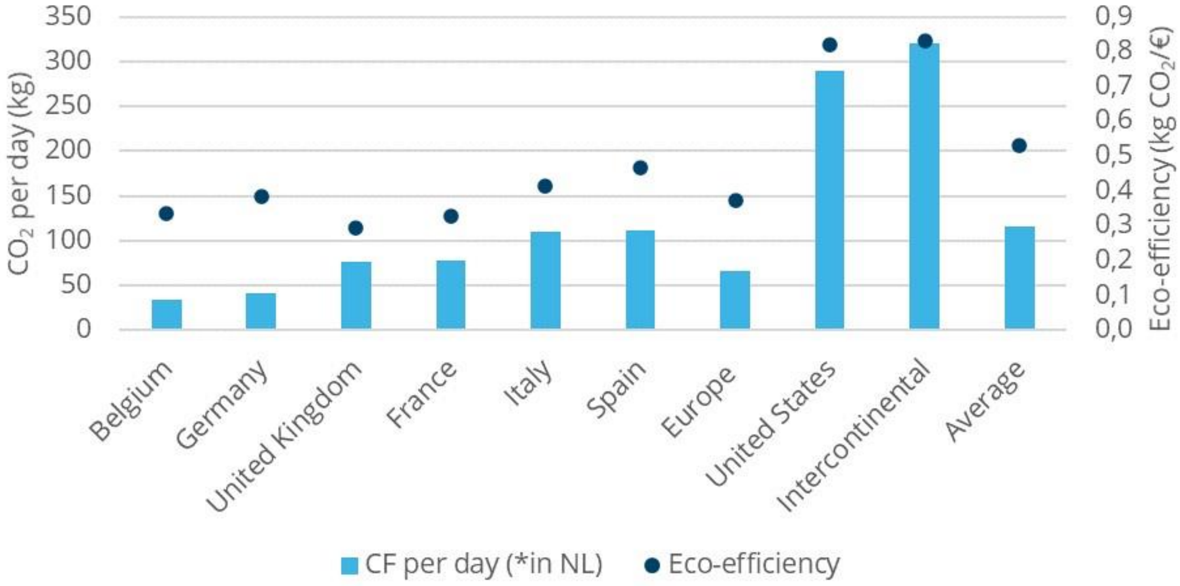
	CF attributable to NL per trip* (kg CO_2)	Spending attributable to NL per trip (€)	Eco-efficiency (kg CO_2/€)
Europe	271	730	0.37
Intercontinental	1,339	1,614	0.83
Average	480	902	0.53

Source: analyses of NBTC ITR2014

**) The carbon footprint in the Netherlands is calculated by allocation of emissions from transport for the length of stay in the Netherlands only.*

The eco-efficiency attributable to the stay in the Netherlands varies considerably between countries of origin (see Figure 5.1 for the largest markets and Figure 5.2 for a geostatic map of all markets). Luxembourg has the most favourable eco-efficiency with around 0.24 kg CO_2 per Euro. Trips from Germany have a lower carbon footprint per trip compared to France, UK and Scandinavia, but the eco-efficiency is slightly higher due to the difference in average spending per trip. Intercontinental trips generally have a worse eco-efficiency than European trips because of significantly higher carbon emissions. Trips from the United States have an eco-efficiency of 0.82 kg CO_2 per Euro, close to the average for intercontinental trips. In general, the differences between destinations are smaller in eco-efficiency than in the carbon footprint per trip or per day. Apparently, tourist spending increases along with their emissions.

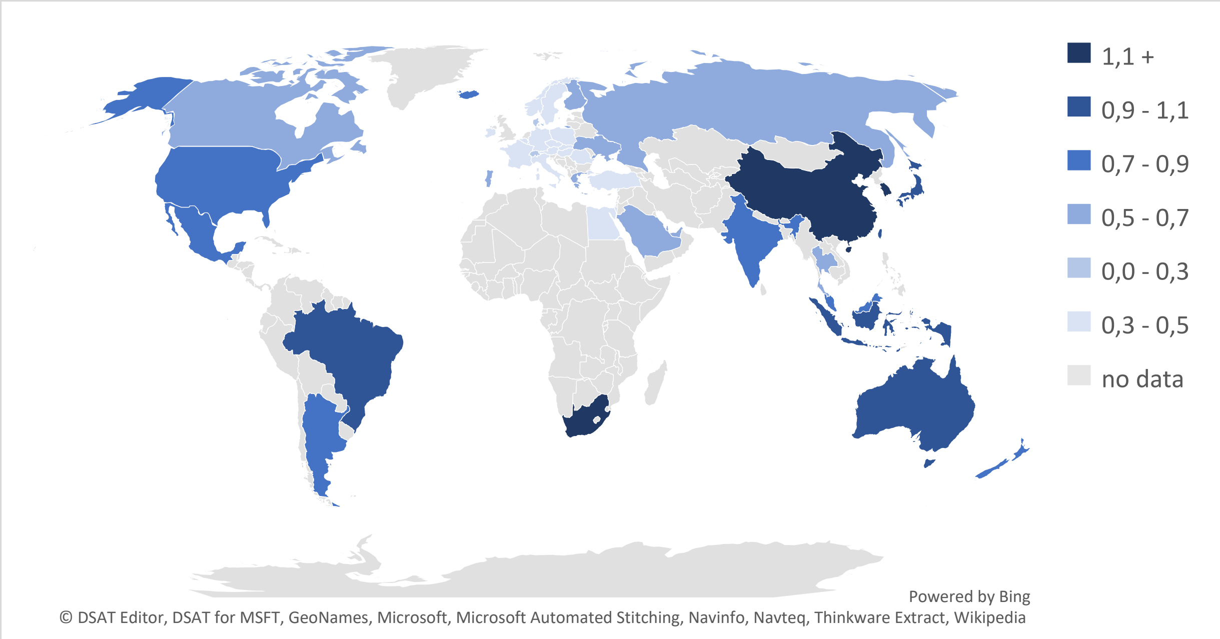
Figure 5.1: Eco-efficiency per trip and carbon footprint per day attributable to the Netherlands, by country of origin, 2014



Source: analyses of NBTC ITR2014

**) The carbon footprint in the Netherlands is calculated by allocation of emissions from transport for the length of stay in the Netherlands only.*

Figure 5.2: Eco-efficiency (kg CO_2/€) attributable to the Netherlands by origin, 2014



Source: analyses of NBTC ITR2014

The eco-efficiency of the whole Dutch economy is approximately 0.24 kg CO_2/€ derived by dividing the total CO_2 emissions of 159.2 Mt (see Table 4.1) by the 2014 GDP of € 671 billion

(CBS 2020b). Hence, most accommodation types, modes of transport, and destinations presented in this section are less eco-efficient, as is shown in Table 5.2 and Table 5.3. The average inbound trip per coach/bus or by train, the most eco-efficient trip types based on the transport mode used, are lower than the amount of emissions per Euro of the Dutch economy. Camping trips have the worst eco-efficiency. Although this accommodation type has the lowest average CF per trip attributable to the Netherlands, the relatively low spending associated with this accommodation type makes for a relatively bad eco-efficiency. Trips by airplane have a worse eco-efficiency compared to most other transport modes. The large amount of spending per trip by airplane is not enough to fully compensate for the large carbon footprint associated with this transport mode.

Table 5.2: Eco-efficiency, carbon footprint and spending per trip attributable to the Netherlands, based on accommodation type used, 2014

Accommodation type	CF attributable to NL per trip* (kg CO_2)	Spending attributable to NL per trip (€)	Eco-efficiency (kg CO_2/€)
Hotel/pension	553	1,029	0.54
Bed-and-Breakfast	316	740	0.43
Bungalow park	265	554	0.48
Camping	204	307	0.66
Group accommodation	174	563	0.31
Average	480	902	0.53

Source: analyses of NBTC ITR2014

**) The carbon footprint in the Netherlands is calculated by allocation of emissions from transport for the length of stay in the Netherlands only.*

Table 5.3: Eco-efficiency, carbon footprint and spending per trip attributable to the Netherlands, based on mode of transport used, 2014

Main transport mode	CF attributable to NL per trip* (kg CO_2)	Spending attributable to NL per trip (€)	Eco-efficiency (kg CO_2/€)
Airplane	789	1,290	0.61
Boat/ferry	220	629	0.35
Train	124	770	0.16
Car	207	498	0.41
Coach/bus	112	725	0.15
Bicycle/moped	67	168	0.40
Average	480	902	0.53

Source: analyses of NBTC ITR2014

**) The carbon footprint in the Netherlands is calculated by allocation of emissions from transport for the length of stay in the Netherlands only.*

6 Conclusions and recommendations

This report was based on the Inbound Tourism Research (ITR2014) of the Netherlands Board of Tourism & Conventions (NBTC). Additionally, information on the carbon footprint of various touristic activities and tourist trip components, collected and calculated by the Centre for Sustainable Tourism & Transport of Breda University of Applied Sciences over the years, has been used (Peeters 2014).

In 2014, the total contribution of CO_2 emissions by inbound tourists to the Netherlands, i.e. only the part of inbound trips attributable to the Netherlands, was 6.95 Mt. It is not easy to define a sustainable level for CO_2, but it has become clear that substantial reductions are needed to prevent 'dangerous climate change'. The latter has been linked to more than 1.5-2 degrees warming in the 2015 Paris Agreement (UNFCCC 2015), which entered into force in November 2016 (UN 2016). For the moment, the EU has set the goal of a 20% reduction of GHG emissions by 2020 (and 40% in 2030) compared to 1990 levels (EC 2016). The new Dutch government has adopted a more ambitious target of 49% in 2030 (VVD et al. 2017); a target that has been confirmed in the national Climate Agreement published in 2019 (EZK 2019). Scientific publications have addressed the necessity of reducing CO_2 emissions by 3 to 6% per year and a total reduction of 80% by the end of this century (see e.g. Meinshausen et al. 2009, Parry et al. 2008, Scott et al. 2010, van Vuuren et al. 2010). However, more recent analyses show that regardless "of the carbon budget, emissions need to reach zero between 2050 in 2100 (as specified by the Paris Agreement). An earlier achievement of this goal will lead to lower temperature. And equity requires rich countries to reach zero before poor countries" (Peters 2018: 380). This implies ending our fossil fuel-based economy in the west within three-four decades. In terms of achieving this ambition, results of the Paris Agreement are more promising than those of previous COPs. In this respect, the emissions of inbound tourists to the Netherlands show the opposite of what is needed: total emissions attributable to the Netherlands increased from 2.62 Mt in 2009 (Pels et al. 2014) to 6.62 Mt in 2014. The year 2009 may have been under influence from the global economic crisis, but forecasts see at least a doubling of inbound trips numbers in 2030 compared to 2014 (NBTC Holland Marketing 2019), posing a huge challenge for mitigating CO_2 emissions.

The inbound tourist trip types with the **highest** average environmental impact per day are the following (between brackets the deviation of the average footprint attributable to the Netherlands of inbound tourism to the Netherlands, 116 kg CO_2 per day):

- short intercontinental trips (+490%)
- trips from extreme long-haul countries, e.g. Japan (+322%) and Singapore (+264%)
- the average trip of intercontinental origin (+176%), e.g. from the USA (+149%)
- trips by airplane (+67%)
- trips spent in hotels/pensions (+21%)

The inbound tourist trip types with the **lowest** carbon footprint attributable to NL per day are:

- trips by bicycle or moped (-73%)
- trips by train (-72%)
- trips from nearby countries, e.g. from Belgium (-71%), Germany (-64%), and Denmark (-48%)
- trips by coach (-71%) or car (-61%)
- trips spent in a bungalow park (-71%), camping (-68%), or group accommodation (-77%)
- the average trip of European origin (-43%).

The large influence of the country of origin on the environmental impact of tourism is obvious, followed by the choice of transport mode, though the latter is closely related to the country of origin, as the airplane is the only realistic choice for long-haul trips. The choice of accommodation also has an impact, but it is likely that the type of accommodation is also associated with the distance tourists travel and the transport mode used. For instance, camp sites and bungalow parks are often associated with short-distance holidays, whereas hotels and group accommodations are more commonly associated with long-haul trips by air transport.

The calculation of the eco-efficiency of holidays, expressed in holiday CO_2 emissions per Euros spent, primarily shows that the average inbound tourist to the Netherlands produces more than twice as much emissions per Euro as the Dutch economy (0.53 kg CO_2/€ compared to 0.24 kg CO_2/€; see chapter 5). Here also, there are large differences between various tourist origins and trip types. Intercontinental trips have the least favourable eco-efficiency (e.g. around 0.82 kg/€ for trips from the USA), while countries such as Belgium have the most favourable (around 0.34 kg/€). Still, these differences are smaller than for instance the holiday carbon footprint per day, because most high impact holidays are taken by high spenders. Only inbound trips from tourists by coach/bus and train are lower than the eco-efficiency of the Dutch economy (0.15 and 0.16 kg CO_2/€ for respectively coach/bus and train, compared to 0.24 kg CO_2/€).

The authors hope that this report will provide the sector and the government with insight into the most important contributing factors of the environmental impact of inbound tourism and the Netherlands as international destination. This insight may help to develop policies towards more sustainable inbound tourism. There already is increasing awareness of the importance of CO_2 emissions and on encouraging sustainable mobility by for example improving the accessibility of the Netherlands by train in Dutch inbound tourism strategies (NBTC Holland Marketing 2019). Likewise, national climate policy aims at replacing air travel by train on distances under 700 km (EZK 2019). Decision makers will not only have to assess the total economic and environmental impacts, but also the eco-efficiency and for instance the future market potential. All these variables may give contradicting signals to the policymaker. Such insights might be taken in consideration when developing the strategy for Dutch inbound tourism promotion.
The results can aid policymakers with the development of mitigation policy. For example, the consequences of emissions trading for aviation, for the commercial viability of certain markets can be assessed using the data on carbon footprints.

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Appendix 1: List of terms and abbreviations

Term, abbreviation	Description
B&B	Bed and breakfast
CF	Carbon footprint; expressed in kg CO_2 emissions
CO_2	Chemical formula of carbon dioxide
CSR	Corporate Social Responsibility
CSTT	Centre for Sustainable Tourism & Transport (part of BUas Breda University of Applied Sciences)
Eco-efficiency	The ratio of the carbon footprint to tourist spending; expressed in kg CO_2 per Euro spent
GDP	Gross domestic product
Great circle distance	Shortest route between two points measured along the earth's surface
ITR	Inbound Tourism Research
LOS	Length of Stay
LULUCF	Greenhouse gas emissions from forestry and land use
Mitigation policy	Policy aimed at preventing or reducing climate change, like emissions trading or the stimulation of alternative energy forms
Mt	Megaton or 1 million ton, equivalent to 1 billion kg
NBTC	Netherlands Board of Tourism & Conventions
NL	the Netherlands
ppm	Part per million (one in a million parts)
VFR	Visiting friends and relatives

Appendix 2: Discrepancies in data

	Data NBTC (2015)	Our data	Absolute difference	% Difference
EU(+Russia)	11,195,000	11,113,696	-81,304	-0,7
Germany	3,894,000	3,886,850	-7,150	-0,2
United Kingdom	1,857,000	1,848,471	-8,529	-0,5
Belgium	1,828,000	1,804,810	-23,190	-1,3
France	725,000	715,841	-9,159	-1,3
Italy	503,000	497,125	-5,875	-1,2
Spain	396,000	396,000	0	0,0
Switzerland	256,000	210,678	-45,322	-17,7
Scandinavia	472,000	469,572	-2,428	-0,5
Russia	196,000	196,000	0	0,0
Americas	1,431,000	1,375,787	-55,213	-3,9
United States of America	991,000	977,891	-13,109	-1,3
Canada	143,000	141,398	-1,602	-1,1
Brazil	139,000	141,427	2,427	1,7
Asia	976,000	979,227	3,227	0,3
Japan	147,000	147,000	0	0,0
China+Hong Kong	249,000	236,078	-12,922	-5,2
India	87,000	89,668	2,668	3,1
Australia+Oceania	188,000	194,130	6,130	3,3
Africa	135,000	147,559	12,559	9,3
Total	13,925,000	13,810,399	-114,601	-0,8

Games

Media

Hotel

Facility

Built Environment

Logistics

Tourism

Leisure & Events

The impact of tourism on the environment, in general and specifically on the climate, is receiving plenty of attention. In 2008, the Centre for Sustainable Tourism and Transport of BUas Breda University of Applied Sciences and NRIT Research, in collaboration with NBTC-NIPO Research, published the (Dutch) pilot report 'Travelling large in 2005'. In this report the environmental impact of Dutch holiday behaviour was calculated. The carbon footprint was one tool used for this: the emissions of carbon dioxide are largely responsible for climate change. For the second time we now present a detailed report on the carbon footprint of *inbound tourism*, for the year 2014, and roughly compare the results with the carbon footprint of outbound tourism in the same year.

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