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Travelling large in 2008

The carbon footprint of Dutch holidaymakers in 2008 and the development since 2002

A project of NHTV Centre for Sustainable Tourism and Transport in collaboration with NRIT Research and NBTC-NIPO Research

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Imprint

Travelling large in 2008

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Kim de Bruijn & Rob Dirven (NRIT Research)
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Preface

Travelling is enjoying; holidays should inspire. Consumers want to experience more and more. The companies in the tourism industry work daily to provide such inspiration and experience. People want to travel more often, and to more distant destinations, indicating that holidaymaking has become a common activity that we cannot do without. Holidaymaking has become a basic need of many consumers. Of course, this is great news for the industry, but it does
confront the travel industry with several large challenges. The companies that the Dutch Association of Travel Agents and Tour Operators (ANVR) represents, have realised this and are becoming increasingly active in terms of sustainability.

The environmental impact of tourism is increasingly found on our agenda, on everyone's agenda, from holidaymakers to tour operators. And that is a good thing. Because this report shows that the greenhouse gas emissions of Dutch tourists have increased significantly during the last six years.

Therefore, ANVR has expressed its utmost commitment to both reduce the negative environmental impacts as well as to enhance the positive impacts of travel, to a sustainable level. This commitment challenges the industry to find a responsible balance between profit, continuity, and the environmental and social impacts of travel activities.

We believe that one objective should not necessarily exclude the other. It is encouraging to see that an increasing number of tourism companies are working on these issues within their own capacity.

The carbon footprint, as presented in this report, is an interesting tool for realising the above. Not only does it offer good insight into the environmental impact of tourist activities, but in my opinion it also shows how far the "influence" of our businesses reaches. This study shows that the largest impacts are caused by tourism transport, with the chosen destination and transport mode playing key roles. Concerning transport, travel companies are very much dependent on other parties (airlines, etc.), but in regard to the supply side of our business, the carbon footprint could perhaps become a more important factor for choosing destinations and transport modes.

Hence, more environmentally friendly holidaymaking is the responsibility of many stakeholders in the tourism supply chain, whereby each party needs to claim its responsibility within its own sphere of influence. Travel companies are ready to do this. ANVR has been working on a project aiming at sustainability in tourism businesses (Duurzaam Toeristisch Ondernemen, DTO) for some time. This project invites tour operators to become active in the field of sustainability. It specifically addresses the process of influencing accommodation facilities at the destinations. These are small steps, but still… This report emphasises the need for such steps.

I wholeheartedly welcome the intention, expressed in this report, to monitor Dutch tourism emissions on an annual basis. It will only enhance the 'accountability' of our (sustainable) activities.

Frank Oostdam
Director ANVR

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1 Introduction

In 2008, the Centre for Sustainable Tourism & Transport of NHTV Breda University of Applied Sciences and NRIT Research, in collaboration with NBTC-NIPO, published the (Dutch) pilotreport 'Travelling large in 2005' (De Bruijn et al. 2008). This report described the ecological footprint (EF) and the carbon footprint (CF) of Dutch holidaymakers in 2005. Also, the intention was announced to start a series of reports. This is the second volume in the series, in which figures for 2008, 2002, and an update for 2005 are presented. This update was necessary to correct a couple of small errors in the pilot study, and also to implement some new insights. The availability of a range of figures over several years now allows for a presentation of the trend of the environmental impact of Dutch holidaymakers. Moreover, this report focuses solely on the carbon footprint (CF, the emissions of the greenhouse gas CO_2). Though the figures varied for both measures used in the first report, they did amount to the same conclusions. We have selected the CF, as the EF, despite being more comprehensive, is also more widely debated.

The impact of tourism on the environment in general, and on climate in particular, is receiving widespread attention. In 2008, for example, the World Tourism Organisation (UNWTO) published an extensive report describing both the effects of climate change on tourism as well as the effects of tourism on greenhouse gas emissions (UNWTO-UNEP-WMO 2008). Other industry associations have also started to handle the theme more seriously (e.g. WTTC 2009). The UNWTO report estimates the contribution of tourism to climate change at approximately 5% in 2005 (UNWTO-UNEP-WMO 2008). Moreover, UNWTO expects these emissions to increase by a factor 2.6 (or 160%) between 2005 and 2035. 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 continuous implementation of Corporate Social Responsibility.

The aim of this research consists of two parts. Firstly, to provide a complete overview of the effects of Dutch holidaymakers on climate and eco-efficiency in 2008. Secondly, to show some of the changes that have occurred throughout the period 2002-2005-2008. This understanding requires answers to the following questions:

- What is the total carbon footprint of Dutch holidaymakers and what are the developments of this carbon footprint?
- How does the holiday carbon footprint relate to the total carbon footprint of the Netherlands?
- What factors determine the development of the carbon footprint?
- What type of holidays and which parts of tourism are the least/most damaging to the environment?
- What is the eco-efficiency of different types of holidays?

Chapter two of this report briefly describes the method used to calculate the carbon footprint and the eco-efficiency, followed by an overview of Dutch holiday behaviour in the three survey years. Chapter 3 describes the results for 2008. Section 3.1 starts with a number of reference values for the CF in the Netherlands. Section 3.2 provides an overview of the calculated CF for holidays, split for several holiday types and a number of destinations. The chapter continues with a detailed breakdown of the CF by destination, duration, accommodation type, transport mode, and form of organisation, both for domestic holidays (section 3.3) and foreign holidays (section 3.4). Section 3.5 examines the distribution of emissions over the different components of holidays (accommodation, transport and activities). Section 3.6 looks at the eco-efficiency and compares the results with the eco-efficiency of the Dutch economy. Chapter 4 then shows the main changes of the CF during the period 2002-2005-2008. Finally, in chapter 5, the research questions are answered, the results are reflected upon and some conclusions are drawn.

2 Methodology

Data on Dutch travel behaviour from the ContinuVakantieOnderzoek (Continuous Holiday Survey, CVO), the annual holiday survey in the Netherlands, form the basis of this report. 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 CVO. The pilot study of this series (De Bruijn et al. 2008) also used the ecological footprint (EF, expressed in m^2 or hectare) in addition to the CF. In this report, the EF is no longer used because very few differences between the conclusions based on these two indicators were found, thus one indicator provides a sufficient view. Furthermore, the methodology and theory behind the EF is still discussed at large (see e.g. Van den Bergh et al. 1998, Van Kooten et al. 2000). Such problems also exist when determining greenhouse gas emissions (GHG), but here the margins are smaller. Moreover, the CF has been accepted as a legitimate indicator for calculating the environmental impact by a continuously increasing group of stakeholders, both inside and outside the tourism industry. Carbon dioxide (CO_2) currently receives a lot of societal and political attention, and policy is already developed for it. 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, destination, and type of holiday, per trip featured in the CVO database.

2.1 Carbon footprint

The carbon footprint is a measure of the contribution of an activity, country, industry, person, etcetera, 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 385 ppm (parts per million; see Hansen et al. 2008), 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. This factor varies 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 CO2. 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 twice (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, 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). WWF Germany did include an equivalent for air travel in a publication on the footprint of seven "typical" holidays (Grimm et al. 2008). Their figures are therefore not comparable to those in this report.
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, etcetera, and thus considers the entire lifecycle, in addition to the user phase (see Wiedmann et al. 2007). This report solely addresses the primary CO_2 emissions, plus the emissions caused by the production of fuel and/or electricity.

2.2 Calculation model

The CVO data have been processed with SPSS 14.0, which required the development of a syntax (a piece of SPSS code) for the CF. For each single holiday in the CVO, a CF has been calculated. Firstly, the CVO was supplemented with a variable that indicates the amount of kilometres between origin and destination. This concerned 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 holiday component (transport, activities, accommodation) was calculated through the use of an emission factor for CF and based on the number of nights, distance travelled and specific activities. By multiplying these with the duration of the holiday, the CF for each complete holiday was found. Then, by increasing the individual carbon footprints with a weight factor and summation, the total carbon footprint of all holidays was calculated. As weight factors, those provided by the CVO for calculating totals for the entire Dutch population were used. For a detailed description of the calculation method and the emission factors, we refer to the internal NHTV/CSTT-report 'Carbon Footprint emission factors; version 2008 and trends 2002-2005' (Peeters 2009). This report contains a number of corrections in comparison with the emission factor report used for the 2005 CF report (De Bruijn et al. 2008). They consist of an update to values for 2008 and 2002 (in particular for car and aviation emissions) and a few corrections for accommodations in the original database of 2005. Also, based on a preliminary measurement of the occupation rate of cars in the 2009 CVO, a slightly higher value was chosen. Finally, the calculation method of the average emissions per day in 2005

was corrected, which caused some figures to deviate from those in the pilot report. As a result, the numbers for 2005 in this report differ from those published in De Bruijn et al. (2008). The figures in the present report have to be considered the most reliable.

2.3 Key figures holidays

In table 2.1 the key figures for population and holidays are presented for the survey years 2002, 2005 and 2008.

Table 2.1 Key figures holidays 2002, 2005, 2008

	Unit	2002	2005	2008
Dutch population on January 1	million	16.1	16.3	16.4
Categories:				
0-19 years	%	24.6	24.5	24.0
20-64 years	%	61.9	61.5	61.3
65 years and older	%	13.7	14.0	14.7
Holiday participation	%	81	81	82
Categories:				
Long holidays (5 or more days)	%	74	75	75
Short holidays (2-4 days)	%	41	40	40
Number of long holidays by the Dutch population	million	22.4	22.2	23.6
Number of short holidays by the Dutch population	million	13.1	12.2	12.3
Total number of holidays by the Dutch population	million	35.5	34.4	35.9
Average number of holidays per Dutch inhabitant				
For the whole population		2.21	2.11	2.18
For those that go on holidays		2.72	2.61	2.67
Domestic holidays	million	18.7	17.3	17.4
Outbound holidays	million	16.8	17.1	18.5
Of which:				
In France	million	3.3	2.8	2.9
In Germany	million	2.5	2.6	3.0
In Belgium	million	2.2	2.0	2.0
Overnight stays by Dutch	million	275.9	267.5	280.2
Categories:				
Domestic	million	108.9	95.7	91.8
Abroad	million	167.0	171.8	188.3
Expenditure by the Dutch on domestic holidays	billion Euro	2.9	2.5	2.7
Expenditure by the Dutch on outbound holidays	billion Euro	9.7	10.3	12.6
Total distance travelled on holidays by the Dutch*	billion km	45.9	54.7	62.0

Source: CVO 2002, 2005, 2008

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

3 Carbon footprint 2008

3.1 Introduction

In this chapter, the results of the calculations and analyses of the survey year 2008 are presented (in kg CO_2). The values in table 3.1 are used for reference. Official CO_2-values for the Netherlands in 2008 will be published in the course of 2010. However, for 2008 both the Netherlands Environmental Assessment Agency (PBL) and the European Environment Agency (EEA) expect a decrease in CO_2 emissions within the European Union of approximately 1.5% compared to 2007 (EEA 31 August 2009, PBL 25 June 2009). Therefore, this percentage has been applied to the total Dutch CO_2 emissions in 2007, 172.7 Mt (see Van Der Maas et al. 2009). The resulting 170.1 Mt and the population size in 2008 were used to calculate the average CO_2 emissions per person and the CO_2 emissions per person per day in the Netherlands. Especially the last figure is used several times as a reference in this report.

Table 3.1 Reference values carbon footprint, 2008

	2008
CO_2 emissions per average Dutch holiday	433 kg
CO_2 emissions per average Dutch holiday per day	49.1 kg
Total CO_2 emissions Dutch holidays	15.6 Mt
Average annual CO_2 emissions per person in the Netherlands	10,369 kg*
Average CO_2 emissions per person per day in the Netherlands	28.4 kg*
Total Dutch CO_2 emissions**	170.1 Mt*

Source: Van Der Maas et al. 2009; the holiday values have been calculated in this study

*) based on PBL and EEA estimates (EEA 31 August 2009, PBL 25 June 2009)

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

3.2 Total carbon footprint

The total carbon footprint of all Dutch tourists was around 15.6 Mt CO_2 in 2008. This is approximately 9.1% of the total Dutch carbon footprint. The carbon footprint per average holiday is 433 kg CO_2 and per day 49 kg CO_2. Because 18% of the Dutch population did not go on holiday in 2008 (see table 2.1), the average number of holidays for those who did go is 2.67 times. As a result, each person that went on holiday produced average holiday emissions of 1,156 kg CO_2, which is 11.1% of the average annual emissions of a Dutch citizen in 2008. Table 3.2 shows the (average) values of the carbon footprint of Dutch tourists, divided in short (2 to 4 days) and long holidays (5 days and longer), and in domestic and outbound holidays.

Table 3.2 Carbon footprint per day, per holiday and in total, by destination and length of stay, 2008

	Short holiday			Long holiday			All holidays		
Carbon footprint in kg CO_2	Per day	Per holi-day	Total (Mt)	Per day	Per holi-day	Total (Mt)	Per day	Per holi-day	Totaal (Mt)
In the Netherlands	30	95	0.84	24	232	1.98	26	162	2.82
Abroad	55	182	0.61	62	803	12.11	61	690	12.73
Belgium	33	105	0.11	27	241	0.23	29	172	0..34
France	49	167	0.09	34	477	1.13	35	420	1.22
Germany	46	148	0.17	35	332	0.62	37	263	0.79
Average	**37**	**119**	**1.46**	**51**	**596**	**14.09**	**49**	**433**	**15.55**

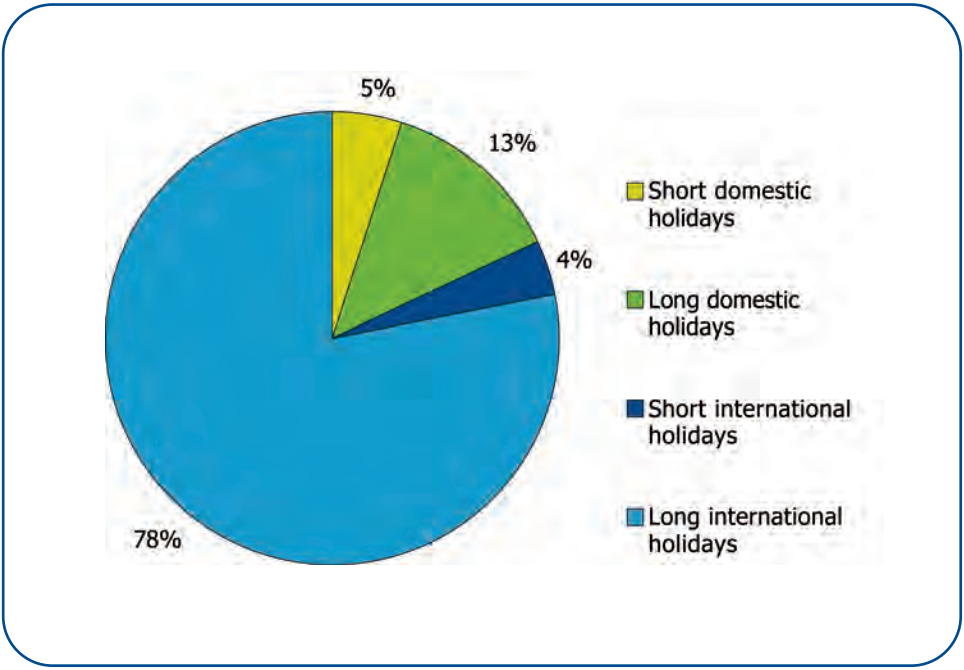
Source: CVO, 2008 (calculation CSTT/NRIT Research)

Domestic holidays produced a total carbon footprint of more than 2.8 Mt CO_2, which is 162 kg per holiday and 26 kg per day. An average outbound holiday has a much larger footprint of 690 kg or 61 kg per day. All outbound holidays produced 12.7 Mt CO_2. Thus, 18% of all holiday emissions were produced by domestic and 82% by outbound holidays (see figure 3.1), whereas the number of domestic holidays (17.4 million) is only slightly lower than that of outbound holidays (18.5 million). The average carbon footprint for all holidays is 49 kg per day; around 20 kg more than the Dutch average per day during the whole year (see table 3.1). This means that on average, the pressure on the environment is 69% times higher during holidays than when staying at home. Moreover, this comparison does not take into account, for example, the emissions from people that leave their heating on in winter when taking a holiday, which would make their total footprint while on holiday a little larger. Still, the per day emissions of a domestic holiday are slightly below the average for staying at home, but only when there is no additional home energy-use.

Per long holiday (5 days or longer) both the domestic and outbound carbon footprints are significantly higher than for short holidays. The differences are not very large on a per day basis. The carbon footprint per day of a long domestic holiday is actually smaller than for a short domestic holiday. The main reason for this is that the transport emissions are divided over a larger number of days. A long outbound holiday does have a larger carbon footprint per day than a short outbound holiday, although here too the contrary would have perhaps seemed logical due to a higher transport footprint per day for short holidays. The main reason here is

the considerably longer distance often noted for long outbound holidays. For destinations like Oceania, South-America and Africa the CVO does not even have short holiday entries. The emissions of long outbound holidays produced 78% of all holiday emissions (see figure 3.1). The carbon footprint of a holiday in Belgium is slightly higher per holiday and day than for domestic holidays. Figures for France and Germany are higher. Germany sees a relatively high number of short Dutch holidays, which results in a lower total holiday footprint than France.

Figure 3.1: Distribution of all CO_2-emissionss by domestic and outbound holidays and holiday length, 2008



Source: CVO, 2008 (calculation CSTT/NRIT Research)

3.3 Carbon footprint of domestic holidays

3.3.1 Length of domestic holidays

Table 3.3 shows that the carbon footprint per day decreases with an increase of the length of stay. The transport component weighs less heavily on the carbon footprint of a longer holiday, because the distance between home and the destination does not differ much between longer and shorter holidays in the Netherlands. Except for short holidays (2-4 days), the CO_2 per day is lower for holidays than for staying at home (28.4 kg/day).

TTable 3.3 Carbon footprint per day, per holiday and in total, by length of stay for domestic holidays in 2008

	Carbon footprint in kg CO_2		
	Per day	Per holiday	Totaal (Mt)
2-4 days	30	95	0.84
5-8 days	27	173	1.02
9 days or more	22	364	0.95
Average	**26**	**162**	**2.82**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

3.3.2 Accommodation type domestic holidays

The influence of touristic and season-dependent recreational accommodations on the holiday footprint can also be detected. Table 3.4 and 3.5 show the corresponding values per day, per holiday and in total. Please note that these are figures for the total holiday, based on the accommodation type used: besides the carbon footprint of the accommodation, those for transport and activities are also included.

One figure that stands out in table 3.4 is the high per day footprint of motel and hotel holidays. Holidays spent in tents or group accommodations (like youth hostels) have the lowest carbon footprint per day. Per holiday the carbon footprint is highest for caravan/tent trailer/campervan; this the accommodation type with the longest length of stay. Finally, the highest total carbon footprint is for holidays spent in second homes or bungalows, which is a result of the high number of holidays spent in this type. Domestic holidays in private homes, a pension/B&B, camp grounds and group accommodations all have a smaller carbon footprint per day than that for staying at home.

Table 3.4 Carbon footprint per day, per holiday and in total, by touristic accommodation type in the Netherlands, 2008

Carbon footprint in kg CO2	Per day	Per holiday	Total (Mt)
Private homes	20	136	0.155
Hotel/motel	38	139	0.414
Pension/B&B	25	111	0.030
Apartment	32	235	0.073
Second home, bungalow	29	178	0.955
Tent, Bungalow tent	14	95	0.078
Caravan, tent trailer, campervan	30	265	0.486
Boat: sailing boat/motor vessel	33	229	0.056
Youth hostel or other group acc.	23	91	0.041
Other	34	181	0.040
Average	**29**	**171**	**2.329**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

The carbon footprints of season-dependent recreational accommodation types do not vary much. Compared to touristic accommodation types, per day figures are lower (except for tents). Probably, season-dependent recreational holidays are taken closer to home. Table 3.5 clearly shows that these kinds of holidays are always better for the environment than staying at home, although it must be noted that the figure for staying at home is a daily average, whereas the accommodation types referred to here are often only used during weekends. A better comparison would therefore be based on the average carbon footprint at home during the weekend, but such a figure is not available.

Table 3.5 Carbon footprint per day, per holiday and in total, by recreational accommodation type (permanent pitch, private accommodation) in the Netherlands, 2008

Carbon footprint in kg CO_2	Per day	Per holiday	Total (Mt)
Second home, bungalow	19	130	0.156
Caravan, tent trailer, campervan	18	131	0.262
Boat (with cabin for overnight stays)	17	128	0.068
Other	6	56	0.005
Average	**18**	**129**	**0.491**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

3.3.3 Transport mode domestic holidays

As in the previous section, values presented in table 3.6 are for the complete holiday, and not just the transport mode used. The total carbon footprint shows that the car is by far the most used transport mode for domestic holidays. The carbon footprint per holiday and per day is highest for a holiday by boat. Holidays by bicycle have the lowest footprint, followed by those by train. However, the differences are not significant due to the short distances in the Netherlands. A reason for the relatively high figures for the touring car may be the frequent use of high end accommodation types during this type of holiday, compared to for instance holidays by bicycle or car, which are often combined with staying in tents.

Table 3.6 Carbon footprint per day, per holiday and in total, by transport mode for domestic holidays in 2008

Carbon footprint in kg CO_2	Per day	Per holiday	Total (Mt)
Car	26	165	2.594
Train	22	113	0.099
Touring car/shuttle bus	26	147	0.019
Boat	30	286	0.032
Bicycle	12	80	0.025
Other	25	173	0.050
Average	**26**	**162**	**2.820**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

3.3.4 Organisation type domestic holidays

Regarding the organisation type, the carbon footprint per day for domestic holidays is lowest for a non-organised holiday (see the list of terms for an explanation of organisation types). Specified by length of stay, non-organised holidays longer than nine days stand out with their low per day footprint. A short organised holiday by car shows the highest carbon footprint per day.

Table 3.7 Carbon footprint per day, per holiday and in total, by organisation type and length of stay in the Netherlands, 2008

	2-4 days			5-8 days			9 days or more			Total		
Carbon footprint in kg CO_2	Per day	Per holiday	Total (Mt)	Per day	Per holiday	Total (Mt)	Per day	Per holiday	Total (Mt)	Per day	Per holiday	Total (Mt)
Organised car	33	109	0.326	29	189	0.429	27	402	0.198	30	166	0.954
Organised other	28	87	0.034	25	163	0.043	25	414	0.020	26	137	0.096
Non-organised	28	87	0.483	25	163	0.551	21	354	0.736	24	161	1.770
Average	**30**	**95**	**0.843**	**27**	**173**	**1.022**	**22**	**364**	**0.954**	**26**	**162**	**2.820**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

3.4 Carbon footprint of outbound holidays

3.4.1 Length of outbound holidays

Section 3.3.1 showed that for domestic holidays, the carbon footprint per day decreases as the length of stay increases. For outbound holidays the opposite is observed: the carbon footprint per day increases with longer stays. An important factor here is the often considerably longer distance travelled on long(er) holidays, and the subsequent higher use of the airplane as transport mode, which increases the share of the transport component in the total carbon footprint.

Table 3.8 Carbon footprint per day, per holiday and in total, by length of stay for outbound holidays in 2008

Carbon footprint in kg CO_2	Per day	Per holiday	Total (Mt)
2-4 days	55	182	0.613
5-8 days	61	422	2.370
9 days or more	62	1.028	9.744
Average	**61**	**690**	**12.728**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

3.4.2 Outbound destination

The carbon footprint strongly relates to the destination, as well as the distance travelled and transport mode used to get to each destination. Table 3.9 shows the carbon footprint of several outbound destinations, split by short and long holidays. It is obvious that more distant destinations have larger carbon footprints. In general, the carbon footprint per day is smaller with longer than with shorter outbound holidays. A longer holiday is often one which is taken further away. The carbon footprint per day of, for instance, a holiday to the USA or Canada does show that the transport component has a larger impact on the total footprint of a short holiday than a long holiday. Spain has the largest total carbon footprint of all destinations. Spain's popularity (large number of holidays), plus the relatively long distance and frequent use of air transport are the main reasons for this. The apparent role of the airplane is even more visible in the carbon footprint per holiday for destinations like Turkey and Asia. Table 3.9 also shows that an average holiday to Australia or Oceania has a carbon footprint, per holiday, that exceeds that of a holiday to France by a factor 13. Per day the difference is only a factor five, because holidays to Australia are much longer on average.

Tabel 3.9 Carbon footprint per dag, per vakantie en totaal, naar bestemming in het buitenland, 2008

	Short holiday			Long holiday			Total holidays		
Carbon footprint in kg CO_2	Per day	Per holi-day	Total (Mt)	Per day	Per holi-day	Total (Mt)	Per day	Per holi-day	Total (Mt)
Belgium	33	105	0.106	27	241	0.234	29	172	0.339
Luxembourg	54	183	0.011	31	380	0.033	34	298	0.045
France	49	167	0.089	34	477	1.132	35	420	1.221
Spain	115	426	0.049	62	794	1.375	63	771	1.424
Portugal	158	544	0.005	72	912	0.274	73	901	0.279
Austria	85	320	0.009	38	434	0.464	38	431	0.473
Switserland	79	259	0.007	32	467	0.156	33	452	0.163
United Kingdom	82	278	0.063	42	438	0.160	48	377	0.223
Ireland	92	290	0.004	54	489	0.046	56	464	0.050
Norway	104	311	0.001	53	809	0.135	53	804	0.135
Sweden	96	372	0.008	47	688	0.070	49	632	0.078
Finland	-	-	-	59	641	0.034	59	641	0.034
Denmark	62	220	0.006	40	477	0.095	41	445	0.102
Germany	46	148	0.165	35	332	0.623	37	263	0.788
Italy	112	396	0.027	43	619	0.586	44	604	0.612
Greece	138	553	0.001	77	958	0.699	77	957	0.699
Turkey	186	724	0.015	80	1010	0.767	81	1002	0.782
Former Yugoslavia	142	474	0.002	43	770	0.167	44	765	0.168
Hungary	68	272	0.002	40	559	0.065	41	543	0.066
Czech Rep.	82	318	0.012	31	374	0.143	32	369	0.155
Rest of Europe	152	524	0.014	67	795	0.257	69	774	0.272
Africa	-	-	-	103	1501	0.856	103	1501	0.856
Asia	298	893	0.003	139	2680	1.114	140	2664	1.118
USA and Canada	480	1921	0.014	140	2480	1.119	141	2471	1.133
Rest of Americas	-	-	-	151	2782	1.068	151	2782	1.068
Australia, Oceania	-	-	-	169	5738	0.444	169	5738	0.444
Average outbound	**55**	**182**	**0.613**	**62**	**803**	**12.11**	**61**	**690**	**12.73**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

3.4.3 Accommodation type outbound holidays

For outbound holidays it is also possible to measure the carbon footprint related to the accommodation used, both for touristic and season-dependent recreational (permanent) accommodation types. Table 3.10 and 3.11 show the values per day, holiday and in total. Again, these figures are for the total holiday footprint, depending on the accommodation used, i.e. including transport and activities.

As with domestic holidays, the carbon footprint per day is relatively large for outbound holidays spent in a motel or hotel (see table 3.10). This accommodation type also causes the largest total carbon footprint. Holidays spent on a boat produce the largest footprint per day; those in a tent the lowest.

Table 3.10 Carbon footprint per day, per holiday and in total, by touristic accommodation type for outbound holidays in 2008

Carbon footprint in kg CO_2	Per day	Per holiday	Total (Mt)
Private home of friends or relatives	61	679	1.104
Private home (other)	33	358	0.300
Hotel/motel	87	815	5.924
Pension/B&B	61	540	0.255
Apartment	61	721	1.444
Second home, bungalow	41	410	0.843
Tent, Bungalow tent	29	443	0.407
Caravan, tent trailer, campervan	46	824	1.502
Boat: sailing boat/motor vessel/cruise*	179	1900	0.386
Youth hostel or other group accommodation	58	496	0.096
Other	66	824	0.123
Average	**63**	**706**	**12.384**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

* These values are high because cruises use large amounts of energy per day or night

Season-dependent recreational accommodations outside the Netherlands mainly concern second homes or bungalows, and caravans, tent trailers or campervans on permanent pitches. Per day, the carbon footprint for the latter type is a little lower than for the first. The total footprint is larger for holidays spent in second homes and bungalows, because more outbound holidays are spent in this type. Except for second homes and bungalows, the carbon footprint per day is lower than for staying at home in the Netherlands.

Table 3.11 Carbon footprint per day, per holiday and in total, for outbound holidays in season-dependent recreational accommodation types (on a permanent pitch), 2008

Carbon footprint in kg CO_2	Per day	Per holiday	Total (Mt)
Second home, bungalow	33	424	0.280
Caravan, tent trailer, campervan	23	267	0.060
Average	26	204	0.004
Average	**31**	**380**	**0.344**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

3.4.4 Transport mode outbound holidays

Per day, the largest carbon footprint was found for outbound holidays taken by airplane. The popularity of the airplane also gives these holidays the largest footprint per holiday and in total. The average holiday by plane produces three times more emissions than that by car. Holidays by train, having the lowest carbon footprint per day based on the transport mode used, only produce a relatively small share of the total carbon footprint of outbound holidays. An explanation for the high per day and per holiday values for the category "other" is the inclusion of cruise ships (as mode of transport).

Table 3.12 Carbon footprint per day, per holiday and in total, by transport mode for outbound holidays in 2008

Carbon footprint in kg CO_2	Per day	Per holiday	Total (Mt)
Car	36	398	3.981
Airplane	99	1.256	7.980
Train	29	191	0.142
Touring car/shuttle bus	38	332	0.317
Other	80	773	0.308
Average	**61**	**690**	**12.728**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

3.4.5 Organisation type outbound holidays (longer than 4 days)

The strong influence of the transport mode used is also apparent in the carbon footprint of outbound holidays per organisation type: an organised holiday by plane has the largest carbon footprint per day and per holiday (see table 3.13; see the list of terms for an explanation of organisation types). This footprint is even a fraction larger than that of the average holiday by plane, i.e. based on the transport mode used (see table 3.12). Organised holidays by plane produce by far the highest share of the total carbon footprint of outbound holidays by organisation type. Organised holidays by car (e.g. including accommodation booked with a travel agency) have a slightly lower carbon footprint per holiday than non-organised outbound holidays.

Table 3.13 Carbon footprint per day, per holiday and in total, for outbound holidays (longer than 4 days) by organisation type in 2008

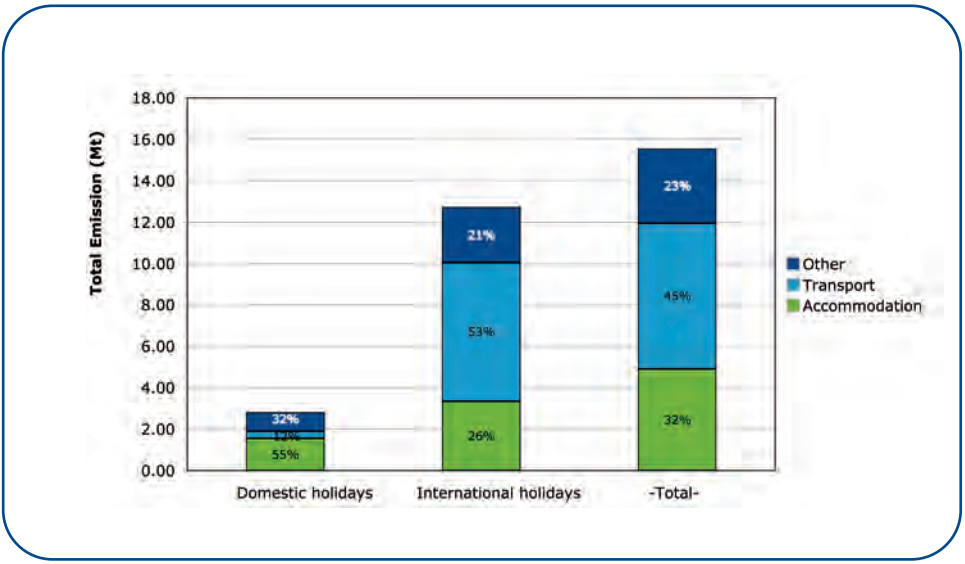
Carbon footprint in kg CO_2	Per day	Per holiday	Total (Mt)
Organised car	38	450	1.372
Organised touring car	39	371	0.296
Organised airplane	100	1.325	7.691
Organised other	53	508	0.298
Non-organised	36	506	2.457
Average	**62**	**803**	**12.114**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

3.5 Carbon footprint per holiday component

The environmental impact of a holiday can be divided over the components transport, accommodation, and other aspects. These 'other aspects' are also called 'entertainment', and concern local activities (that also include local transport used for excursions etcetera). Figure 3.2 shows the division over these three categories. For all holidays, the transport used to and from the destination has the largest impact on the holiday carbon footprint (45%). Accommodation is responsible for almost a third of all holiday emissions.

Figure 3.2: Carbon footprint per holiday component in 2008



Source: CVO, 2008 (calculation CSTT/NRIT Research)

Figure 3.2 also shows large differences between domestic and outbound holidays. For the carbon footprint of domestic holidays, accommodation is particularly relevant (55%), whereas transport is similarly important for outbound holidays (53%). All three components have a significantly larger environmental impact with outbound holidays than with domestic holidays. In table 3.14 the carbon footprint of the three components is shown for various destinations. One figure that stands out is the large share of transport in the holiday carbon footprint of more distant destinations. This is particularly valid for countries and regions that are mainly accessed by plane. Intercontinental holidays also have a relatively large carbon footprint for the category 'other', mainly caused by the longer duration of these holidays, but also because of round trips made at the destination (involving long distances and often local flights). In the right (percentage) column this share is not very significant, because the transport component still weighs much heavier.

Table 3.14 Share of the components transport, accommodation and 'other' of the carbon footprint per destination, in kg per holiday and in percentage of total, 2008

	Carbon footprint per holiday in kg CO_2			Share of total carbon footprint in %*		
	transport	*accommodation*	*other*	*transport*	*accommodation*	*other*
Netherlands	20	89	52	12	55	32
Belgium	29	83	61	17	48	35
Luxembourg	70	127	101	24	43	34
France	136	153	131	32	36	31
Spain	430	210	131	56	27	17
Portugal	501	231	169	56	26	19
Austria	173	175	83	40	41	19
Switzerland	149	189	114	33	42	25
United Kingdom	117	140	121	31	37	32
Ireland	186	102	175	40	22	38
Norway	186	339	279	23	42	35
Sweden	244	185	203	39	29	32
Finland	343	153	145	54	24	23
Denmark	118	173	154	27	39	35
Germany	66	116	81	25	44	31
Italy	221	226	156	37	37	26
Greece	564	256	136	59	27	14
Turkey	643	248	112	64	25	11
Former Yugoslavia	237	237	291	31	31	38
Hungary	245	147	151	45	27	28
Czech Republic	122	142	105	33	38	28
Rest of Europe	380	216	178	49	28	23
Africa	958	285	257	64	19	17
Asia	1893	335	435	71	13	16
USA and Canada	1760	289	421	71	12	17
Rest of Americas	2023	365	394	73	13	14
Australia, Oceania	4171	498	1068	73	9	19
Average	**196**	**137**	**100**	**45**	**32**	**23**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

* total share not always 100% because component figures are rounded off

Table 3.15 shows the shares of the components transport, accommodation and 'other' per holiday by transport mode. Logically, the transport component of holidays taken by plane is the largest, whereas it is low for holidays taken by boat. The latter is because the carbon footprint of cruises has been completely attributed to accommodation, so holidays by boat only concern other boat types (pleasure yachts, sailing boats, etcetera).

Table 3.15 Share of the components transport, accommodation and 'other' of the carbon footprint per transport mode, in kg per holiday and in percentage of total, 2008

	Carbon footprint per holiday in kg CO_2			**Share of total carbon footprint in %***		
	transport	*accommodation*	*other*	*transport*	*accommodation*	*other*
Car	63	112	81	25	44	32
Airplane	829	231	196	66	18	16
Train	21	82	46	14	55	31
Touring car/shuttle bus	41	162	107	13	52	35
Boat	6	134	145	2	47	51
Bicycle	0	64	15	0	81	19
Other	114	305	100	22	59	19
Average	**196**	**137**	**100**	**45**	**32**	**23**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

*total share not always 100% because component figures are rounded off

The next table (3.16) shows the shares of transport, accommodation and 'other' aspects of the holiday footprint and total footprint by accommodation type. Hotel holidays have the largest impact on the environment. However, the share of accommodation of the total carbon footprint of hotel holidays is relatively low (25%), because they are often taken by plane, which weighs heavier on the total carbon footprint. Of interest is also the higher share of transport for camping than for bungalow holidays. Most likely, this could be caused by the transport of camping equipment (like a caravan).

Table 3.16 Share of the components transport, accommodation and 'other' of the carbon footprint per accommodation type, in kg per holiday and in percentage of total, 2008

	Carbon footprint per holiday in kg CO_2			Share of total carbon footprint in %*		
	transport	*accommodation*	*other*	*transport*	*accommodation*	*other*
Hotel	335	152	116	56	25	19
Bungalow	61	120	60	25	50	25
Camping	106	134	126	29	37	34
Other	249	137	101	51	28	21
Average	**196**	**137**	**100**	**45**	**32**	**23**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

Finally, table 3.17 shows the division of the three components per organisation type (see the list of terms for an explanation of organisation types). The share of transport of the total carbon footprint is largest for holidays for which only the transport is booked in advance. To a lesser degree, this is also valid for combined trips and package holidays. In all three cases the airplane plays a major role.

Table 3.17 Share of the components transport, accommodation and 'other' of the carbon footprint per organisation type, in kg per holiday and in percentage of total, 2008

	Carbon footprint per holiday in kg CO_2			Share of total carbon footprint in %*		
	transport	*accommodation*	*other*	*transport*	*accommodation*	*other*
Package trip	624	265	172	59	25	16
Combined trip	569	193	145	63	21	16
Only transport organised	700	131	199	68	13	19
Only accommodation organised via booking agency	52	112	76	21	47	32
Only accommodation directly booked	61	114	84	24	44	32
Non-organised	71	108	75	28	43	29
Average	**196**	**137**	**100**	**45**	**32**	**23**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

3.6 Eco-efficiency

The carbon footprint of a holiday can be compared with holiday spending. This is called 'eco-efficiency', expressed in kg CO_2 per Euro. The lower the figure, i.e. the least emissions per Euro spent, the better the eco-efficiency. Table 3.18 gives an overview of eco-efficiency values for holidays made by the Dutch. Despite higher emissions outbound holidays have a slightly better eco-efficiency overall, thanks to considerably higher spending compared to domestic holidays.

Table 3.18 Eco-efficiency, by destination and length of stay, 2008

Eco-efficiency in kg CO_2 per Euro	Short holiday	Long holiday	Total holidays
Domestic	0.94	1.10	1.05
Outbound	0.81	1.00	0.99
Average	**0.88**	**1.02**	**1.00**

Source: CVO, 2008 (calculation CSTT/NRIT Research)

However, between outbound destinations the eco-efficiency varies considerably (see table 3.19). With 0.60 kg CO_2/€, Ireland has the most favourable eco-efficiency, whereas Australia has the least favourable (1.44 kg CO_2/€). The differences between destinations are smaller in eco-efficiency than in the carbon footprint per holiday or per day. Apparently, tourists' spending increases along with their emissions.

Table 3.19 Eco-efficiency, by destination, 2008

Eco-efficiency in kg CO_2 per euro	Totaal holidays
Belgium	0.81
Luxembourg	1.11
France	0.86
Spain	0.98
Portugal	0.95
Austria	0.62
Switzerland	0.64
United Kingdom	0.74
Ireland	0.60
Norway	0.69
Sweden	0.95
Finland	0.70
Denmark	0.91
Germany	0.92
Italy	0.79
Greece	0.96
Turkey	1.23
Former Yugoslavia	1.02
Hungary	0.91
Czech Republic	0.84
Rest of Europe	0.95
Africa	1.13
Asia	1.19
USA and Canada	1.22
Rest of Americas	1.37
Australia, Oceania	1.44
Average outbound	

Source: CVO, 2008 (calculation CSTT/NRIT Research)

The eco-efficiency of the whole Dutch economy is approximately 0.3 kg CO_2/€ (total CO_2 emissions of 170.1 Mt divided by the 2008 GDP of € 596 billion, CBS 2009). Hence, nearly all holiday types and destinations are less eco-efficient. It is impossible to choose a more eco-efficient domestic or outbound holiday, as is shown in table 3.20. The average outbound holiday per train, the most eco-efficient holiday type based on the transport mode used, has a 45% higher emission per Euro than the Dutch economy. Again, domestic holidays are generally less eco-efficient than outbound holidays due to lower spending, though holidays by bus and train are relatively eco-efficient domestic alternatives.

Table 3.20 Eco-efficiency of domestic and outbound holidays by mode of transport, 2008

Eco-efficiency in kg CO_2 per Euro	Domestic holidays	Outbound holidays
Car	1.08	0.89
Airplane	-	1.12
Train	0.62	0.42
Touring car/shuttle bus	0.50	0.54
Boat	1.82	-
Bicycle	0.87	-
Other	0.97	0.82

Source: CVO, 2008 (calculation CSTT/NRIT Research)

4 Developments 2002 – 2008

4.1 Introduction

This chapter shows the most important changes of the carbon footprint during the years 2002, 2005 and 2008. As reference values, the average and total emissions for Dutch holidays and for the Dutch on an annual basis are shown in table 4.1.
The most prominent development is seen in this table: from 2002 to 2008 total Dutch CO_2 emissions have decreased by 3.2%, but total holiday emissions have increased by 16.5%. This has resulted in an increase of the share of holiday emissions of the Netherlands' total emissions from 7.6% to 9.1%. Emissions per day followed the same development: annual emissions per capita per day in the Netherlands have decreased by 5%, whereas those for holidays have increased by 15%.

Table 4.1 Reference values carbon footprint, 2002-2005-2008

	2002	2005	2008
Dutch average CO_2 emission per holiday (kg)	375	416	433
Dutch average CO_2 emission per holiday per day (kg)	42.7	47.3	49.1
Total Dutch holiday CO_2 emissions (Mt)	13.3	14.3	15.5
Average CO_2 emissions per person per year in the Netherlands (kg) PBL/CBS	10,910	10,782	10,369*
Average CO_2 emissions per person per day in the Netherlands (kg) PBL/CBS	29.9	29.5	28.4*
Total Dutch CO_2 emissions (Mt) according to PBL**	175.7	175.8	170.1*
Contribution of Dutch holiday CO_2 emissions to total Dutch CO_2 emissions (PBL)	7.6%	8.1%	9.1%

Source: Van der Maas et al. 2009; CVO 2002, 2005, 2008 (calculation CSTT/NRIT Research)

* based on PBL en EEA estimates (EEA 31 August 2009, PBL 25 June 2009)
** excl. LULUCF (emissions from forestry and land use)

Travelling large in 2008

4.2 Developments in distance, transport modes, organisation, and accommodation

The next table provides insight into the shares of different modes of transport of the total holiday market (number of holidays), and of the total distance travelled on holidays. For distance, the great circle distance between home and destination is used; the real distances are 5-15% longer. Looking at the total holiday market, it appears that the number of holidays has increased by 1%, whereas the total distance travelled on holiday increased by 35% between 2002 and 2008. Thus the average return distance for a holiday increased from 1,293 to 1,726 km. The Dutch obviously keep travelling further away.
The most relevant development here is the increase of holidays by plane with 49% between 2002 and 2008. The total distance travelled on holidays by plane increased even more during the same period (63%). The Dutch have not only started travelling more by plane, but also travelled further with this transport mode. The average return distance for holidays by plane increased from 6,149 km in 2002 to 6,776 km in 2008. Consequently, the airplane is now used for some 70% of the total holiday distance travelled, whereas holidays by plane still only make up 18% of all holidays.

Table 4.2 Holidays and distance per transport mode used

Share of total Dutch holidays by transport mode used, per year				
	Unit	**2002**	**2005**	**2008**
Car	%	75.4	73.0	71.6
Airplane	%	12.1	16.0	17.8
Train	%	4.2	4.1	4.5
Touring car/shuttle bus	%	3.4	3.2	3.1
Boat	%	0.3	0.3	0.3
Bicycle	%	0.8	1.2	0.8
Other	%	3.7	2.3	1.9
Total	**million holidays**	**35.4**	**34.4**	**35.9**
Share of holidays of total distance travelled per transport mode per year*				
Car	%	34.1	26.3	24.5
Airplane	%	57.4	67.3	69.4
Train	%	2.0	1.6	1.6
Touring car/shuttle bus	%	3.7	3.1	2.7
Boat	%	0.0	0.0	0.0
Bicycle	%	0.2	0.2	0.2
Other	%	2.6	1.5	1.6
Total	**billion km**	**46.0**	**54.8**	**62.1**

Source: CVO 2002, 2002 en 2005 (calculation CSTT/NRIT Research)

* not the actual distance travelled between home and destination, but the great circle distance; the actual distance will be between 5 and 15% higher

The influence of the increasing amount of holidays by plane and flight kilometres is also clearly visible in the degree of organisation (see list of terms for an explanation). Package trips have the largest share of the total distance travelled on holidays (40% in 2008). The distance travelled on package trips increased by 50% between 2002 and 2008. Combined trips show the greatest increase in distance travelled (126%), which is partly due to the increase of this type of trips (67%). Only non-organised holidays saw a decrease in the total distance travelled (-38%). This can be entirely attributed to a decrease of this type of holidays (also -38%).

Table 4.3 Holidays and distance by degree of organisation

Share of holidays (by the Dutch) of total holidays by organisation type per year

	Unit	2002	2005	2008
Package trip	%	10.7	13.1	12.8
Combined trip	%	3.4	4.1	5.6
Only transport organised	%	4.5	4.9	5.6
Only accommodation directly booked through booking office	%	20.6	27.0	28.1
Only accommodation directly organised	%	16.9	22.1	20.9
Non-organised	%	44.1	28.8	27.0
Total	**million holidays**	**35.4**	**34.4**	**35.9**

*Share of holidays of total distance travelled *) by degree of organisation per year*

Package trip	%	36.5	43.3	40.3
Combined trip	%	9.2	11.9	15.3
Only transport organised	%	17.9	17.6	18.5
Only accommodation directly booked through booking office	%	9.4	9.7	9.0
Only accommodation directly organised	%	6.8	7.7	7.4
Non-organised	%	20.3	9.9	9.4
Total	**billion km**	**45.8**	**54.7**	**62**

Source: CVO 2002, 2002 en 2005, calculation CSTT/NRIT Research

Table 4.4 shows holidays and distance by accommodation type. Here, holidays spent in hotels have the largest share in total distance travelled (52% in 2008). The number of holidays of this type increased by 25% since 2002, and the distance by 77%. Needless to say that many holidays by airplane are spent in hotels.

Table 4.4 Holidays and distance by accommodation type

Source: CVO 2002, 2002 en 2005, calculation CSTT/NRIT Research

Share of holidays (by the Dutch) of total holidays by accommodation type per year				
	Unit	**2002**	**2005**	**2008**
Hotel	%	24.8	29.1	30.6
Bungalow	%	25.1	23.8	25.8
Camping	%	26.8	24.1	21.4
Other	%	23.4	23.0	22.2
Total	**million holidays**	**35.5**	**34.4**	**36.0**
*Share of holidays of total distance travelled * by accommodation type per year*				
Hotel	%	39.5	51.7	51.6
Bungalow	%	11.4	8.8	9.0
Camping	%	14.0	10.6	11.0
Other	%	35.2	28.9	28.4
Total	**billion km**	**45.8**	**54.7**	**62.0**

* not the actual distance travelled between home and destination, but the great circle distance

4.3 Developments in CO_2 emissions

The developments shown in the previous section can also be seen in the development of CO_2 emissions. Figure 4.1 displays the development of emissions for domestic and outbound holidays, in total, per holiday and per day. Total emissions have increased with an average of 2.6% per year; the increase being slightly larger between 2005 and 2008 than between 2002 and 2005. The increase in emissions can be completely attributed to the growth of outbound holidays (4% per year). The emissions of domestic holidays have actually decreased by 2.4% per year; the strongest decrease took place between 2002 and 2005 (see also figures in table 4.5).

Figure 4.1: Emission trends of domestic, outbound and total holidays, in total, per holiday, and per day

Source: CVO (2002, 2005, 2008) and calculations CSTT/NRIT Research

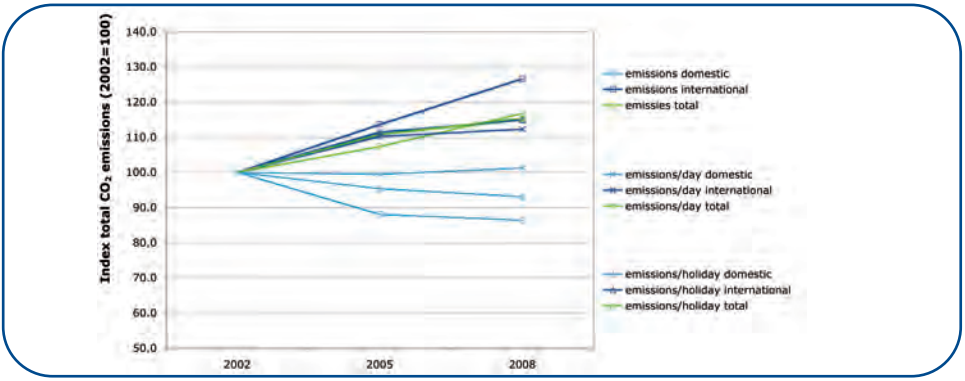
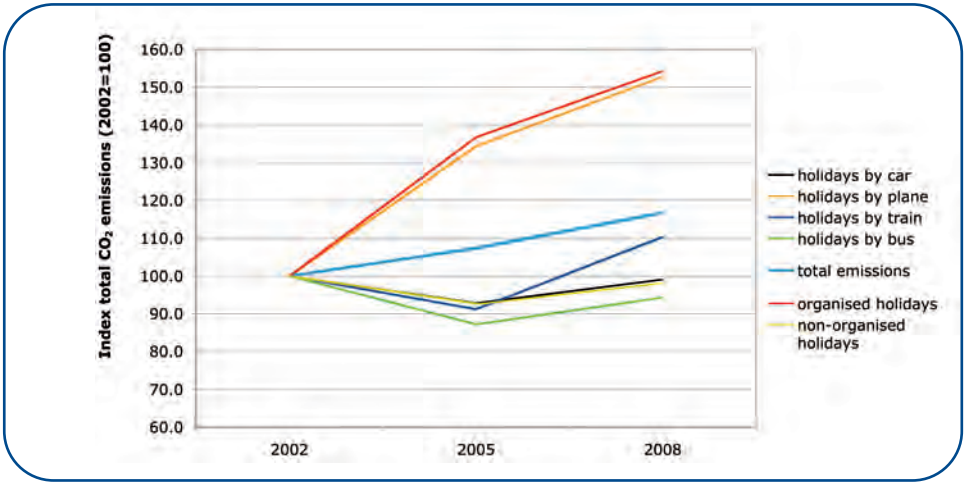


Figure 4.2 shows emission trends for holidays with different transport modes and organisation types. The very strong growth of emissions of holidays by plane, with 10.4% per year in the first period and 5.8% in the second period, is obvious. The emissions of holidays by car, bus and train all decreased during the first period and increased afterwards, specifically those by train. The change of the latter type can mainly be attributed to changes in the volume of holidays by train, from 633,000 in 2002 down to 607,000 in 2005, and then up to 743,000 in 2008. Of particular interest is the very similar development in emissions of holidays by plane and organised holidays, and of holidays by car and non-organised holidays. The share of holidays by plane of all organised holidays is rather large, and a large number of holidays by plane is offered by tour operators. Holidays by car are mainly taken non-organised.

Figure 4.2: Emission trends by transport mode and degree of organisation



Source: CVO (2002, 2005, 2008) and calculation CSTT/NRT Research

When taking a closer look at the growth of emissions, it becomes evident that most of the total growth of 2.3 Mt between 2002 and 2008, namely 2.1 Mt, is caused by holidays taken outside of Europe (intercontinental). The emissions of holidays to Asia, Australia/Oceania and the rest of the Americas have grown by 80% between 2002 and 2008 (see table 4.5). The share of emissions of intercontinental holidays has grown from 21% (in 2002) to 33% (in 2008) of all holiday emissions. This development is also visible in the total distance that people travelled to their destinations (+4.9% per year). Consequently, the emissions of transport have grown faster (+4.2% per year) than average, whereas those from accommodations (+1.7% per year) and other holiday activities (+1.0% per year) grew slower. The total number of holidays showed almost no increase between 2002 and 2008 (+1.0% per year), following a decrease of 3% between 2002 and 2005, and an increase of 4% between 2005 and 2008. It can therefore be concluded that the growth of the carbon footprint is due to changes in the way of holidaymaking (mainly a change in destinations), and not due to a growth in the number of holidays.

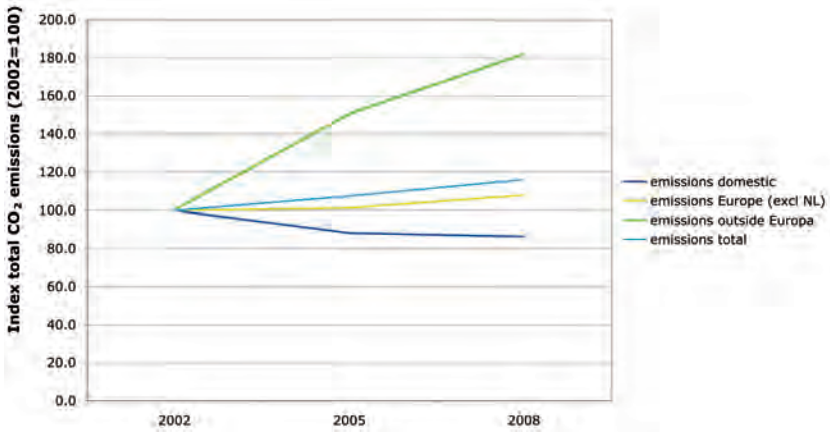
Table 4.5 Carbon footprint by destination

Carbon footprint in kg CO_2 (Mt)	**2002**	**2005**	**2008**
The Netherlands	3.262	2.878	2.820
Europe (excl. the Netherlands)	7.513	7.602	8.109
Outside Europe (intercontinental)	2.536	3.821	4.619
- of which Africa	0.400	0.683	0.856
- of which Asia	0.615	1.035	1.118
- of which the USA and Canada	0.788	0.908	1.133
- of which the rest of the Americas	0.508	0.931	1.068
- of which Australia and Oceania	0.225	0.264	0.444
Total	**13.311**	**14.301**	**15.548**

Source: CVO 2002, 2002 en 2005, calculation CSTT/NRIT Research

Besides the decrease in emissions of domestic holidays, figure 4.3 also shows the strong increase of the emissions of intercontinental holidays, and their influence on total holiday emissions. The growth of emissions of intercontinental holidays can be attributed to the increase of the share of holidays by plane and the growth of the distance travelled on these holidays (see above). The emissions of long (nine days or more) outbound holidays by plane increased from 3.8 Mt in 2002 to 6.3 Mt in 2008. This type of holiday was solely responsible for 41% of all holiday emissions in 2008.

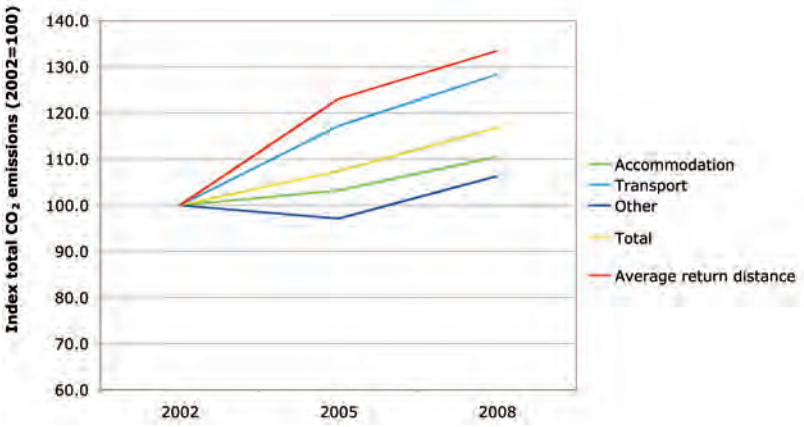
Figure 4.3: Emission trends by destination



Source: CVO (2002, 2005, 2008) and calculation CSTT/NRIT Research

Finally, the developments per tourism component are of interest (see figure 4.4). Clearly, transport emissions have increased above average, whereas those of accommodation and other activities grew below average. Emissions have increased slightly less than distances, mainly due to technological developments in global aviation (see Peeters 2009). Therefore, the average emissions per km travelled has improved slightly.

Figure 4.4: Development of emissions per tourism component and of average travel distance

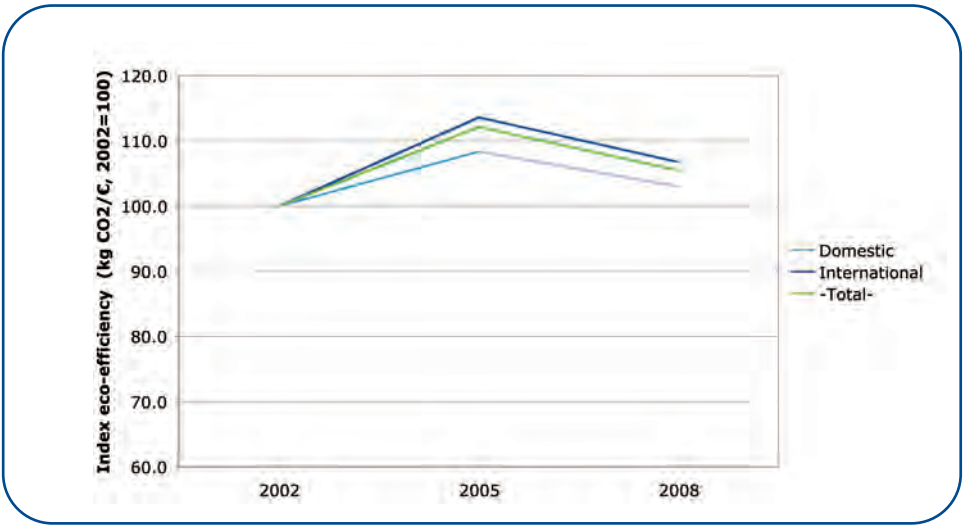


Source: CVO (2002, 2005, 2008) and calculation CSTT/NRIT Research

4.4 Developments in eco-efficiency

This final section addresses the eco-efficiency of tourism, expressed in kg CO_2 emissions per Euro spent. Tourist spending has been measured in real prices in the CVO and corrected for the consumer price index CPI for the Netherlands (CBS Statline). Between 2002 and 2005, emissions per Euro have grown by 12.2%, whereas the eco-efficiency has improved by 6% between 2005 and 2008. During the entire 2002-2008 period, emissions have increased faster than spending, making the sector 5.5% less eco-efficient. The good news is that eco-efficiency has improved in the past three years. It will be interesting to see whether this trend has continued in the recession year 2009.

Figure 4.5: Eco-efficiency by destination



Source: CVO (2002, 2005, 2008) and calculation CSTT/NRIT Research

5 Discussion and conclusions

For years, comprehensive statistics on Dutch domestic and outbound holiday behaviour have been collected, including information on the number of holidays, overnight stays, and spending per day and holiday, specified for characteristics like destination, transport mode, accommodation type and type of booking (see e.g. CBS 2003, CBS 2004, CBS 2006a, CBS 2006b, CBS 2008a, CBS 2008b). Until 2008, when the pilot study *Travelling large in 2005* (De Bruijn et al. 2008, only in Dutch) was published, this kind of information was lacking for the environmental impact of these holidays. That report confirmed the interest in the topic: it was mentioned in various newspapers and other media. The new report is also based on the Continuous Holiday Survey (CVO) of NBTC-NIPO Research. Additionally, information on the carbon footprint of various touristic activities and holiday components, collected by the Centre for Sustainable Tourism & Transport of NHTV Breda University of Applied Sciences over the years, has been used (see also Peeters 2009).

In 2008, the total contribution of CO_2 emissions by Dutch holidaymakers was 15.55 Mt or 9.1% of all CO_2 emissions of the Dutch economy. It is not easy to define a sustainable level for CO_2, but it is gradually becoming clear that substantial reductions are needed to prevent 'dangerous climate change'. For the moment, the EU has set the goal of a 20% reduction by 2020 compared to 1990 levels. The Netherlands is aiming at 30% in 2020. In the period leading to the climate summit in Copenhagen in December 2009, where a post-Kyoto protocol was discussed, more and more scientific information appeared that 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). This implies ending our fossil fuel-based economy within this century. These kinds of targets make the results for Dutch holidaymakers look rather meagre: total emissions increased by 16.8% and the eco-efficiency decreased by 5.5% between 2002 and 2008, although the improvement of the eco-efficiency between 2005 and 2008 leaves some hope for the future. The main reason for the growth in emissions is the increase of the average distance between home and destination (+32% between 2002 and 2008), which is caused by the strong increase in long-haul trips (with more than 80%).

The differences in carbon footprint per holiday and per day are large: in 2008, 76.7% of all holidays had a carbon footprint per day that stayed below the individual annual holiday average of 49.1 kg, whereas only 23.3% of all holidays stayed above that average.

The holiday types with the **highest** average environmental impact per day are the following (between brackets the deviation of the average footprint of Dutch holidays, 49 kg CO_2 per day):

- cruises (+265%)
- intercontinental (long-haul) holidays (ca. +200%)
- holidays by airplane (+102%)
- holidays in hotels/motels (ca. +78%)
- organised holidays (+35%)
- outbound holidays (+27%)

The holiday types with the **lowest** environmental impact per day are:

- domestic cycle holidays (-76%)
- outbound holidays by train (-55%)
- all camping holidays with a tent (-50%)
- domestic holidays (-47%)
- all non-organised holidays (-39%)
- all nearby outbound holidays (e.g. in Belgium: -31%)

Again, the large influence of the destination choice on the environmental impact of tourism is obvious, followed by the choice of transport mode, though the latter is closely related to the chosen destination as the airplane is the only realistic choice for long-haul destinations for most tourists. However, the choice of accommodation and degree of organisation also plays a considerable role, probably caused by the large share of long-haul holidays and holidays by plane in the offer of tour operators and travel agencies.

The calculation of the eco-efficiency of holidays, expressed in holiday CO_2 emissions per Euro spent, primarily shows that the average Dutch holidaymaker produces more than three times as many emissions per Euro as the Dutch economy (1 kg CO_2/€ compared to 0.3 kg CO_2/€; see table 4.1). Here also, there are large differences between various holiday destinations and types. Long-haul destinations have the worst eco-efficiency (1.13 kg/€ for Africa up to 1.44 kg/€ for Australia), while destinations like Austria and Ireland have the best (0.6 kg/€). Still, these differences are smaller than for instance the holiday carbon footprint per day, because most high impact holidays are also more expensive. Interestingly, only holidays by train come close to the eco-efficiency of the Dutch economy (0.42 kg CO_2/€ compared to 0.3 kg CO_2/€).

The fast growth of the carbon footprint of Dutch holidaymakers (2.6% per year on average) contrasts starkly to the international climate crisis that demands significant reductions of the carbon footprint (by at least 3% per year) in order to prevent the worst impacts. The emissions growth is almost completely caused by the 35% increase in the total distance travelled between 2002 and 2008. This growth can be largely attributed to the increased use of the airplane for holiday purposes, due to the strong growth of intercontinental long-haul holidays. Many of these trips are made with a tour operator or through a travel agency. This puts a large responsibility on the Dutch outbound sector, also with respect to corporate social responsibility (CSR). Although

the Dutch travel sector is an international front-runner in regards to CSR, this engagement is apparently not sufficient to avert the growth of CO_2 emissions.
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 holidays. This insight will hopefully contribute to new policies on the sustainable development of outbound tourism. The report also indicates how the industry can reduce its environmental impact and how it can look for products that are less dependent on fossil fuels. The results of this research clearly show the importance of tourism for climate policy, specifically in regards to CO_2 reduction.
The results can aid policymakers with the development of mitigation policy. For example the impacts of emissions trading for aviation, to be introduced by the European Commission in 2011, can be assessed using the data for carbon footprints. They could also be used to develop a tool for consumers, helping them to take their holiday carbon footprint more into account.

List of terms and abbreviations

Term, abbreviation	*Description*
CF	Carbon footprint; expressed in kg CO_2 emissions
Combined trip	Holidays where transport and accommodation have been booked separately in advance
CSR	Corporate Social Responsibility
CSTT	Centre for Sustainable Tourism & Transport (part of NHTV Breda University of Applied Sciences)
CVO	Continuous Holiday Survey (ContinuVakantieOnderzoek)
EEA	European Environmental Agency
Great circle distance	Shortest route between two points measured along the earth's surface
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
Non-organised	Holidays where accommodation or transport is not booked in advance, apart from e.g. train tickets bought in advance and/or accommodation booked directly with the accommodation facility itself
Organised car	All organised holidays with the car as transport mode. The car can be the tourist's own vehicle, but then the accommodation is booked through a travel agency
Organised holidays	Holidays where an agency or booking office has been used for the reservation of transport and/or accommodation in advance
Organised other	All organised holidays with a transport mode other than the airplane, the car or the touring car. The transport is not directly booked with a transport company
Organised plane	All organised holidays with the airplane as transport mode. The flight is not directly booked with the airline
Organised touring car	All organised holidays with the touring car as transport mode. The touring car is not directly booked with a touring car company
Package trip	Holidays from tour operator brochures where accommodation and transport are paid in one price in advance
PBL	Netherlands Environmental Assessment Agency (Planbureau voor de Leefomgeving)
Ppm	Part per million (one in a million parts)
Season-dependent recreational holidays	A season-dependent recreational holidays, also called "permanent pitch holiday", is a holiday where someone stays in his/her own accommodation on a permanent pitch (tent/caravan), a permanent mooring (boat), or in a second home

References

Van den Bergh, J. C. J. M. & Verbruggen, H. (1998) *Spatial sustainability, trade and indicators: an evaluation of the "ecological footprint".* TI 98-105/3 Amsterdam, Netherlands: Tinbergen Institute.

CBS (2003) *Toerisme en recreatie in cijfers 2003 [Tourism and recreation in figures 2003].* The Hague, Netherlands: Statistics Netherlands (CBS).

CBS (2004) *Toerisme en recreatie in cijfers 2004 [Tourism and recreation in figures 2004].* ISBN 903572539 5 The Hague, Netherlands: Statistics Netherlands (CBS).

CBS (2006a) *Kerncijfers vakanties van Nederlanders 2005 [Core figures Dutch holidays 2005].* The Hague, Netherlands: Statistics Netherlands (CBS).

CBS (2006b) *Toerisme en recreatie in cijfers 2006 [Tourism and recreation in figures 2006].* ISBN 10: 90-357-1806-2 The Hague, Netherlands: Statistics Netherlands (CBS).

CBS (2008a) *Toerisme en recreatie in cijfers 2008 [Tourism and recreation in figures 2008].* ISBN 978-90-357-2047-3 The Hague, Netherlands: Statistics Netherlands (CBS).

CBS (2008b) *Vakanties van Nederlanders 2007 [Dutch Holidays 2007].* ISBN: 978-90-357-1910-1 The Hague, Netherlands: Statistics Netherlands (CBS).

CBS (2009) *Nationale rekeningen 2008 [National accounts 2008].* ISBN: 978-90-357-2008-4 The Hague/Heerlen, Netherlands: Statistics Netherlands (CBS).

De Bruijn, K., Dirven, R., Eijgelaar, E. & Peeters, P. (2008) *Reizen op grote voet 2005. De milieubelasting van vakanties van Nederlanders. Een pilot-project in samenwerking met NBTC-NIPO Research [Travelling large in 2005. The environmental impact of Dutch holiday-makers. A pilot-project in cooperation with NBTC-NIPO Research].* Breda, Netherlands: NHTV Breda University of Applied Sciences.

EEA (31 August 2009) *New estimates confirm the declining trend in EU greenhouse gas emissions.* Online documents at URL http://www.eea.europa.eu/highlights/new-estimates-confirm-the-declining-trend-in-eu-greenhouse-gas-emissions [7 September 2009].

Forster, P. M. D. F., Shine, K. P. & Stuber, N. (2006) *It is premature to include non-CO_2 effects of aviation in emission trading schemes. Atmospheric Environment,* 40 (6), 1117-1121.

Graßl, H. & Brockhagen, D. (2007) *Climate forcing of aviation emissions in high altitudes and comparison of metrics* Online documents at URL http://www.mpimet.mpg.de/fileadmin/download/Grassl_Brockhagen.pdf [10 November 2008].

Grimm, B., Beer, H., Günther, W. & Weerts, B. (2008) *Der touristische Klima-Fußabdruck. WWF-Bericht über die Umweltauswirkungen von Urlaubsreisen [The tourism climate footprint. WWF report on the environmental impacts of holidays].* Frankfurt, Germany: WWF Germany.

Hansen, J., Sato, M., Kharecha, P., Beerling, D., Masson-Delmotte, V., Pagani, M., Raymo, M., Royer, D. L. & Zachos, J. C. (2008) Target Atmospheric CO_2: Where Should Humanity Aim? *eprint arXiv*: 0804.1126.

IPCC (2007) *Climate Change 2007: The physical science basis. Summary for policy makers. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.* Geneva: International Panel on Climate Change.

Van Kooten, G. C. & Bulte, E. H. (2000) The ecological footprint: useful science or politics?

Ecological Economics, 32, 385-389.
Lee, D. S., Fahey, D. W., Forster, P. M., Newton, P. J., Wit, R. C. N., Lim, L. L., Owen, B. & Sausen, R. (2009) Aviation and global climate change in the 21st century. *Atmospheric Environment*, 43, 3520-3537.
Van der Maas, C. W. M., Coenen, P. W. H. G., Zijlema, P. J., Brandes, L. J., Baas, K., Van Den Berghe, G., Van Den Born, G. J., Guis, B., Geilenkirchen, G., Te Molder, R., Nijdam, D. S., Olivier, J. G. J., Peek, C. J., Van Schijndel, M. W. & Van Der Sluis, S. M. (2009) *Greenhouse Gas Emissions in the Netherlands 1990-2007: National Inventory Report 2009*. Bilthoven, Netherlands: Netherlands Environmental Assessment Agency (PBL).
Meinshausen, M., Meinshausen, N., Hare, W., Raper, S. C. B., Frieler, K., Knutti, R., Frame, D. J. & Allen, M. R. (2009) Greenhouse-gas emission targets for limiting global warming to 2° C. *Nature*, 458 (7242), 1158-1162.
Parry, M., Palutikof, J., Hanson, C. & Lowe, J. (2008) Squaring up to reality. *Nature Reports Climate Change,* 2 (June 08), 68-70.
PBL (2009) *Prijzen en crisis verminderen aardolieverbruik en verminderen groei kolenverbruik; mondiale CO_2-emissies: jaarlijkse stijging gehalveerd in 2008 [Prices and crisis reduce oil use and reduce growth in coal use; global CO_2 emissions: annual increase halved in 2008]* . Online documents at URL http://www.pbl.nl/nl/nieuws/persberichten/2009/20090625-Mondiale-CO_2-emissies.html [3 September 2009].
Peeters, P., Szimba, E. & Duijnisveld, M. (2007a) Major environmental impacts of European tourist transport. *Journal of Transport Geography,* 15, 83-93.
Peeters, P., Williams, V. & Gössling, S. (2007b) Air transport greenhouse gas emissions. IN
Peeters, P. M. (Ed.) *Tourism and climate change mitigation. Methods, greenhouse gas reductions and policies,* 29-50. Breda, Netherlands: NHTV.
Peeters, P. M. (2009) *Carbon footprint emissiefactoren; versie 2008 en trends 2002-2005 [Carbon footprint emission factors; version 2008 and trends 2002-2005)*. Breda, Netherlands: NHTV.
UNWTO-UNEP-WMO (2008) *Climate change and tourism: Responding to global challenges.* Madrid, Spain: UNWTO.
Wiedmann, T. & Minx, J. (2007) *A Definition of 'Carbon Footprint'*. Durham, UK: ISAUK Research & Consulting.
WTTC (2009) *Leading the challenge on climate change.* London, UK: World Travel & Tourism Council.

The impact of tourism on the environment, in general and specifically on the climate, is receiving plenty of attention. In 2008, NHTV en NRIT Research, in collaboration with NBTC-NIPO, 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 responsible for climate change. We now present you the follow-up report, presenting the carbon footprint of holidays by the Dutch in 2002, 2005 and 2008. This report not only contains a complete overview of the impacts of Dutch tourists on the climate in 2008, but also presents the development of the holiday carbon footprint through the years 2002-2005-2008.

This report is a translation of the Dutch theme report compiled by the Centre for Sustainable Tourism and Transport, NHTV Breda University of Applied Sciences, in collaboration with NRIT Research and NBTC-NIPO Research, published in 2009. The original theme report is a publication of the Knowledge Centre for Coastal Tourism and made possible by a contribution of 'Peaks in the Delta South-west Netherlands'.

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