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atmosfair



# CO<sub>2</sub> REPORT BUSINESS TRAVEL

FOR: ..... Testclient atmosfair  
REPORTING PERIOD: ..... 01.01.2016 - 31.12.2016

This report covers the following  
travel activity types:

FLIGHT CAR RAIL HOTEL



The calculations in this report are compliant with the following standards:



Audited by:



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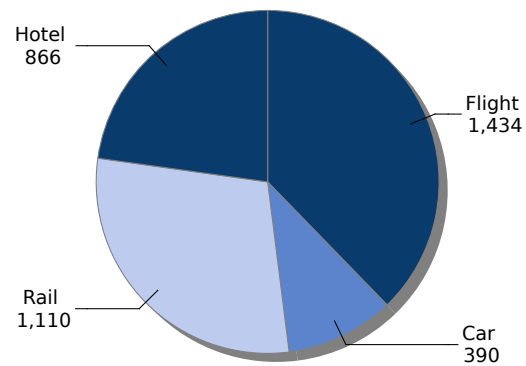
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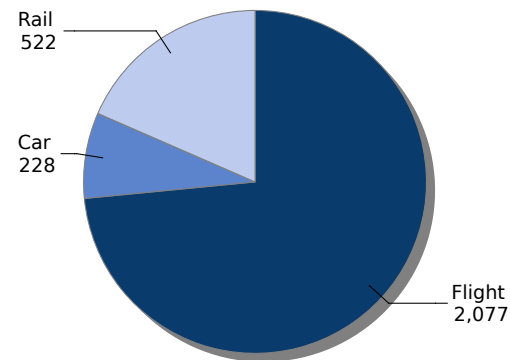
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# SUMMARY

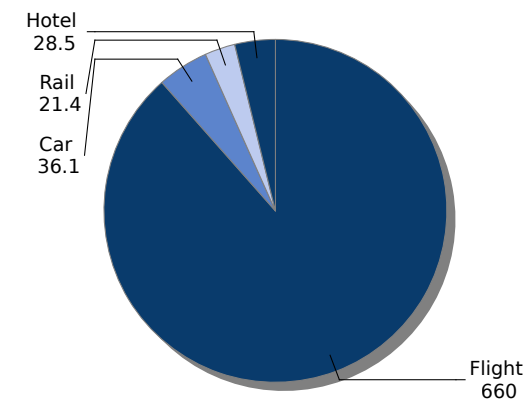
**PASSENGERS (PAX) TOTAL:**



**DISTANCE TOTAL [1,000 KM]:**



**CO<sub>2</sub> EMISSIONS<sup>1</sup> TOTAL [TONS]:**



<sup>1</sup> CO<sub>2</sub> emissions calculated according to VDR methodology. CO<sub>2</sub> emissions for category FLIGHT include RFI 2.7 addition.

# SUMMARY

	Pax [total]	Pax [% of total]	Distance [1,000 km]	Distance [% of total]	CO <sub>2</sub> emissions <sup>1</sup> [tons]	CO <sub>2</sub> emissions <sup>1</sup> [% of total]
<b>FLIGHT</b>	1,434	37.7	2,077	73.5	660	88.5
<b>CAR</b>	390	10.3	228	8.1	36.1	4.8
<b>RAIL</b>	1,110	29.2	522	18.5	21.4	2.9
<b>HOTEL</b>	866	22.8			28.5	3.8
<b>TOTAL</b>	3,800	100	2,827	100	746	100.0

<sup>1</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

<sup>2</sup> Category FLIGHT includes RFI 2.7 addition.



# FLIGHT

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TRAVEL	Amount	Unit
Kilometres	2,077	1,000 km
Miles <sup>1</sup>	1,291	1,000 miles
Segments <sup>2</sup>	1,434	
City Pairs	269	
Average segment distance in km <sup>3</sup>	1,448	km
Average segment distance in miles <sup>3</sup>	900	miles

CO <sub>2</sub> EMISSIONS	Amount	Unit
<b>According to VDR</b>		
CO <sub>2</sub>	259	tons CO <sub>2</sub>
CO <sub>2</sub> per segment, average	0.18	tons CO <sub>2</sub>
CO <sub>2</sub> per passenger kilometre, average	125	g CO <sub>2</sub> /pkm
CO <sub>2</sub> per passenger mile, average	201	g CO <sub>2</sub> /pm
<b>According to other methods</b>		
CO <sub>2</sub> GRI / GHG Protocol	289	tons CO <sub>2</sub>
CO <sub>2</sub> DEFRA	278	tons CO <sub>2</sub>
CO <sub>2</sub> ICAO	264	tons CO <sub>2</sub>
CO <sub>2</sub> VFU	233	tons CO <sub>2</sub>

FUEL	Amount	Unit
Fuel consumption total	82.0	tons fuel
Fuel consumptions in altitudes > 9 km	63.4	tons fuel
Fuel share in altitudes > 9 km	77.4	%
Average fuel consumption (per 100 pkm <sup>4</sup> )	5.9	litres

GLOBAL WARMING IMPACT <sup>5</sup>	Amount	Unit
<b>According to VDR</b>		
CO <sub>2</sub> in altitudes < 9 km	58.6	tons CO <sub>2</sub>
CO <sub>2</sub> in altitudes > 9 km	200	tons CO <sub>2</sub>
CO <sub>2</sub> + RFI 2	459	tons CO <sub>2</sub>
CO <sub>2</sub> + RFI 2.7	660	tons CO <sub>2</sub>
CO <sub>2</sub> + RFI 4	860	tons CO <sub>2</sub>

<sup>1</sup> American miles

<sup>2</sup> One person, one way, from origin to destination

<sup>3</sup> Total distance of all segments divided by number of segments

<sup>4</sup> Product of number of passengers and kilometres travelled

<sup>5</sup> For further information on other methods and global warming impact see glossary.

# FLIGHT

## Top 10 city pairs by segments<sup>1</sup> and CO<sub>2</sub> emissions

Origin	Destination	Segments	Segments % of total	Flight segment length [km]	Flight segment length [miles]	Total distance [km]	Total distance [miles]	Cruise altitude [m]	CO <sub>2</sub> emissions <sup>2</sup> [tons CO <sub>2</sub> ]	CO <sub>2</sub> emissions <sup>2</sup> + RFI 2.7 [tons CO <sub>2</sub> ]	CO <sub>2</sub> + RFI 2.7 % of total
<b>TOP 10 CITY PAIRS SORTED BY SEGMENTS</b>											
CLT	IAH	61	4.3	1,564	972	95,404	59,294	12,500	11.2	29.9	4.5
ATL	SDF	57	4.0	567	352	32,319	20,086	12,500	4.87	9.98	1.5
CLT	ORD	54	3.8	1,064	661	57,456	35,709	12,100	5.19	12.9	2.0
CLE	CLT	43	3.0	792	492	34,056	21,166	12,500	3.68	8.54	1.3
CLT	CVG	42	2.9	589	366	24,738	15,375	12,500	2.90	6.04	0.9
CLT	SDF	37	2.6	589	366	21,793	13,544	12,500	5.98	12.5	1.9
BOS	CLT	31	2.2	1,268	788	39,308	24,430	12,500	5.12	13.2	2.0
DTW	SDF	30	2.1	541	336	16,230	10,087	12,500	3.67	7.34	1.1
ABQ	PHX	29	2.0	576	358	16,704	10,382	12,500	1.90	3.92	0.6
ORD	SDF	25	1.7	510	317	12,750	7,924	12,500	3.66	7.10	1.1
Other		1,025	71.5	--	--	1,726,109	1,072,784	--	211	549	83.1
<b>TOP 10 CITY PAIRS SORTED BY CO<sub>2</sub> EMISSIONS</b>											
CLT	MUC	24	1.7	7,472	4,644	179,328	111,453	12,500	14.3	41.8	6.3
CDG	DTW	17	1.2	6,480	4,027	110,160	68,465	12,500	12.0	34.9	5.3
CLT	IAH	61	4.3	1,564	972	95,404	59,294	12,500	11.2	29.9	4.5
ATL	MUC	9	0.6	7,822	4,861	70,398	43,753	13,100	6.91	20.2	3.1
HND	LAX	6	0.4	8,935	5,553	53,610	33,319	13,100	6.74	19.8	3.0
DTW	PEK	2	0.1	10,712	6,657	21,423	13,315	10,700	6.52	18.8	2.9
LAX	ORD	19	1.3	2,900	1,802	55,100	34,245	12,800	5.79	16.3	2.5
IAH	LHR	4	0.3	7,884	4,900	31,536	19,600	13,100	4.69	13.7	2.1
BOS	CLT	31	2.2	1,268	788	39,308	24,430	12,500	5.12	13.2	2.0
CLT	ORD	54	3.8	1,064	661	57,456	35,709	12,100	5.19	12.9	2.0
Other		1,207	84.2	--	--	1,363,144	847,199	--	181	438	66.4

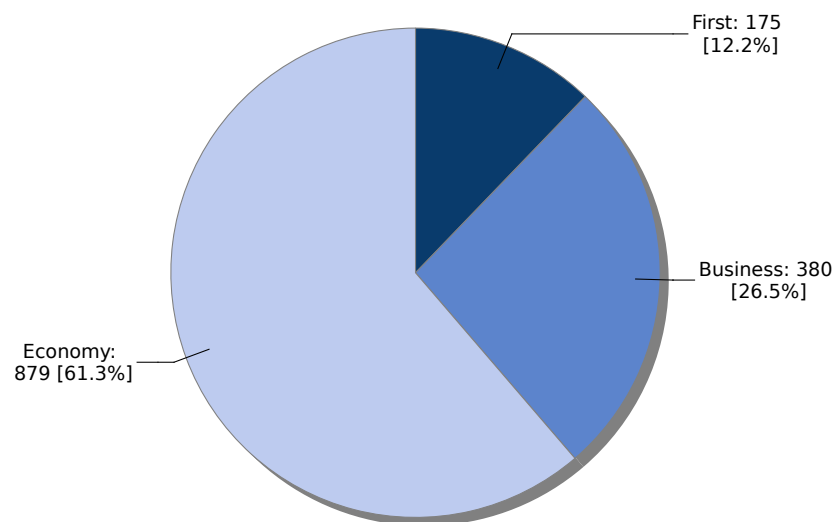
<sup>1</sup> One person, one way, from origin to destination

<sup>2</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

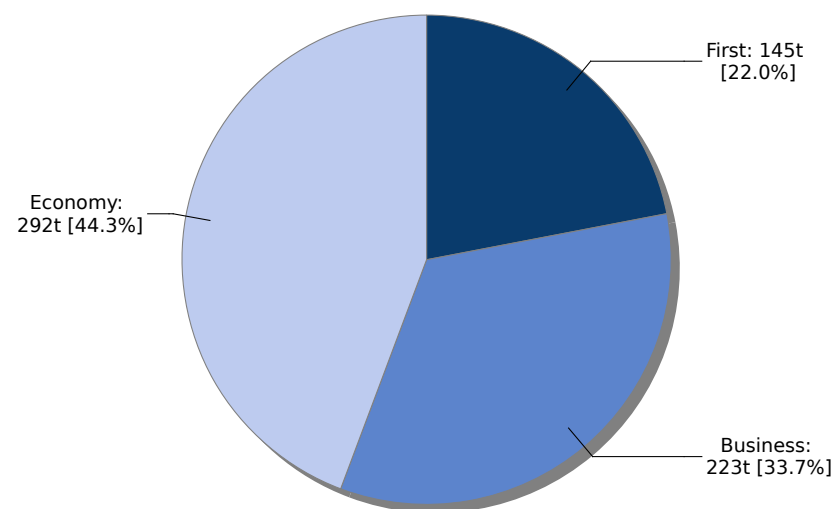
# FLIGHT

Seat class compared by segments<sup>1</sup> and CO<sub>2</sub> emissions

SEGMENTS PER SEAT CLASS:



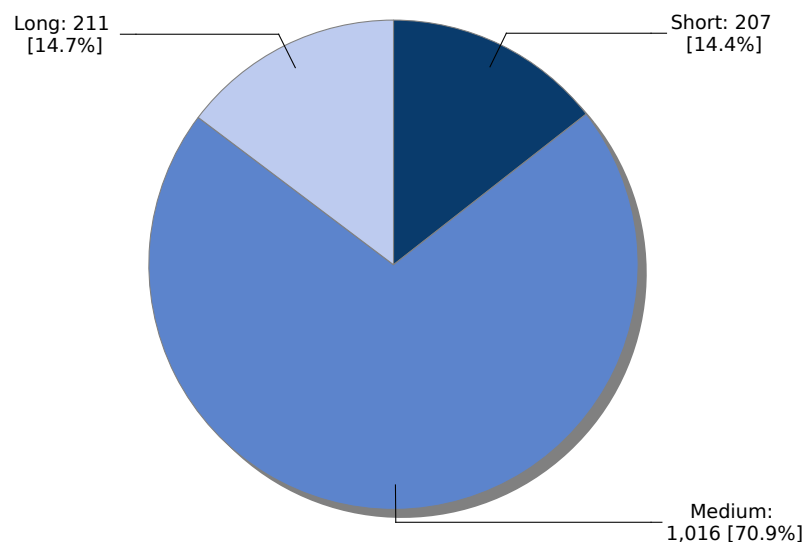
CO<sub>2</sub> EMISSIONS<sup>2</sup> PER SEAT CLASS [CO<sub>2</sub> + RFI 2.7]:



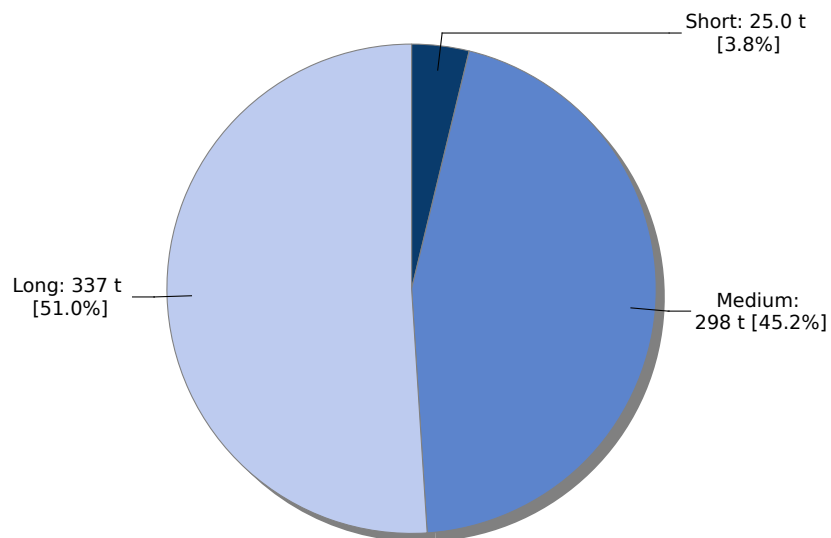
<sup>1</sup> One person, one way, from origin to destination

<sup>2</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

### SEGMENTS PER DISTANCE CLASS:



### CO<sub>2</sub> EMISSIONS<sup>3</sup> PER DISTANCE CLASS [CO<sub>2</sub> + RFI 2.7]:



<sup>1</sup> Short: < 500 km, < 310 miles; Medium: 500 km - 1600km, 310 - 1000 miles;  
Long: > 1600 km, > 1000 miles

<sup>2</sup> One person, one way, from origin to destination

<sup>3</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

	Short Range [< 500 km] [< 310 miles]	Medium Range [500 - 1,600 km] [310 - 1,000 miles]	Long Range [> 1,600 km] [> 1,000 miles]
<b>Segments<sup>1</sup></b>	207	1,016	211
<b>Total distance in kilometres [1,000 km]</b>	83	919	1,076
<b>Total distance in miles [1,000 miles]<sup>2</sup></b>	51	571	669
<b>CO<sub>2</sub> EMISSIONS ACCORDING TO VDR STANDARD<sup>3</sup></b>			
CO <sub>2</sub> [tons CO <sub>2</sub> ]	15.3	127	117
CO <sub>2</sub> + RFI 2 [tons CO <sub>2</sub> ]	20.2	213	227
CO <sub>2</sub> + RFI 2,7 [tons CO <sub>2</sub> ]	25.0	298	337
CO <sub>2</sub> + RFI 4 [tons CO <sub>2</sub> ]	29.8	384	447
<b>CO<sub>2</sub> EMISSIONS ACCORDING TO GRI / GHG PROTOCOL</b>			
CO <sub>2</sub> [tons CO <sub>2</sub> ]	13.5	105	170
<b>CO<sub>2</sub> EMISSIONS ACCORDING TO DEFRA</b>			
CO <sub>2</sub> [tons CO <sub>2</sub> ]	12.5	101	164
<b>CO<sub>2</sub> EMISSIONS ACCORDING TO ICAO<sup>3</sup></b>			
CO <sub>2</sub> [tons CO <sub>2</sub> ]	17.5	144	103
<b>CO<sub>2</sub> EMISSIONS ACCORDING TO VFU<sup>3</sup></b>			
CO <sub>2</sub> [tons CO <sub>2</sub> ]	16.1	99.7	117

<sup>1</sup> One person, one way, from origin to destination

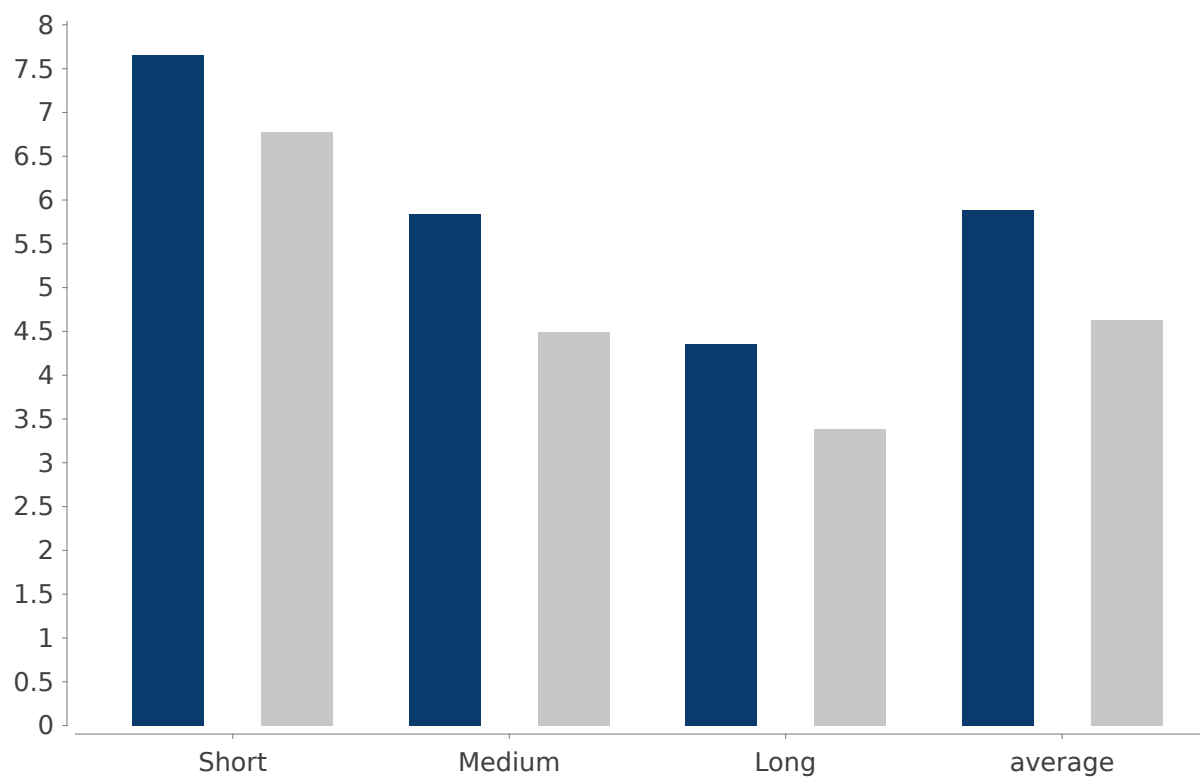
<sup>2</sup> American miles

<sup>3</sup> For further information on other methods and RFI, see glossary



# FLIGHT

Fuel per 100 pkm<sup>1</sup> vs. international benchmarks



■ Current fuel usage: Calculated for flights contained in this report

■ Worldwide average<sup>2</sup>

<sup>1</sup> Product of number of passengers and kilometres travelled

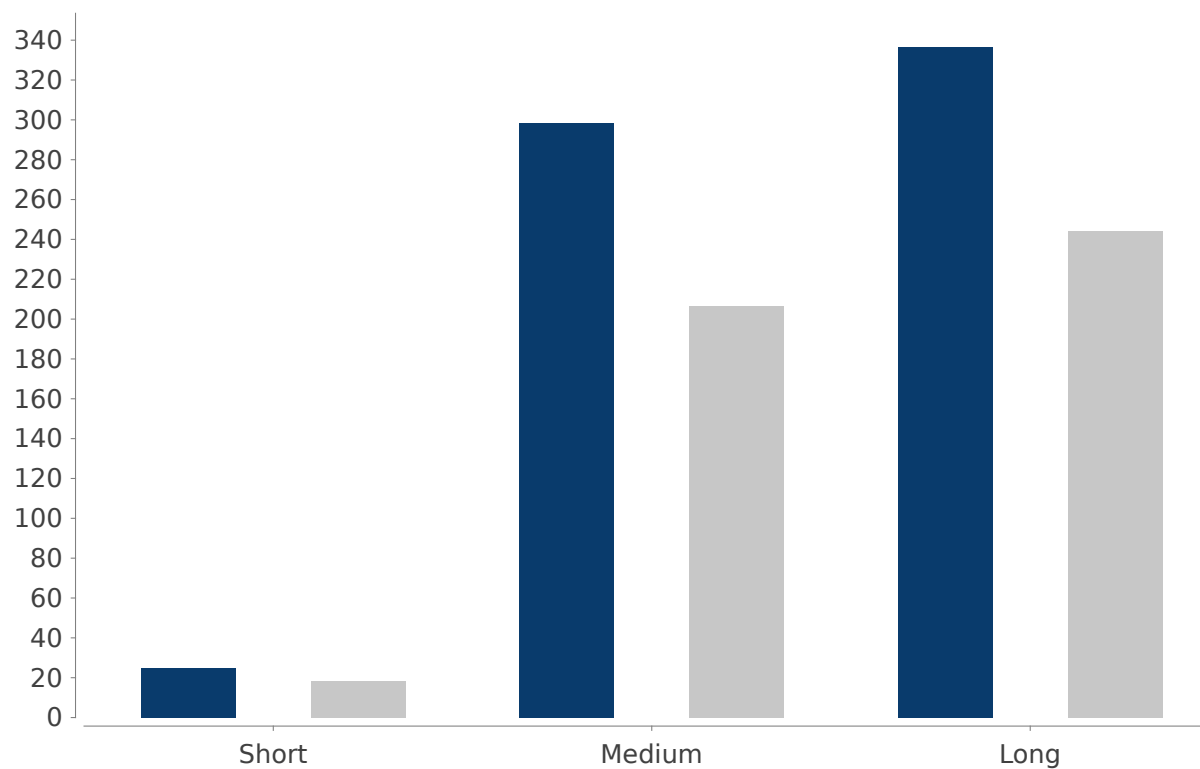
<sup>2</sup> According to atmosfair Airline Index;

More information on the AAI: [www.atmosfair.de/en/atmosfair\\_airline\\_index](http://www.atmosfair.de/en/atmosfair_airline_index)



# FLIGHT

CO<sub>2</sub> reduction potential by switching to economy class



■ Current CO<sub>2</sub> emissions<sup>1</sup>: Calculated for flights contained in this report

■ Reduced CO<sub>2</sub> emissions<sup>1</sup>: All flights changed to economy class

<sup>1</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

### Flight selected from your upload data: DL1205, 21.03.2014, ATL-SDF, First Class

Airline <sup>1</sup> of your choice	Aircraft your staff flew with	Resulting CO <sub>2</sub> emissions <sup>1,2</sup> in tons (CO <sub>2</sub> + RFI 2.7)
Delta Air Lines	Boeing 737-800 (winglets) Passenger	0.52
Alternative airlines	Aircraft that would have been used	Alternative CO <sub>2</sub> emissions <sup>2</sup> in tons (CO <sub>2</sub> + RFI 2.7)
Southwest Airlines	Boeing 737-500 Passenger	0.36
Delta Connection	Canadair Regional Jet 900	0.36

The atmosfair Airline Index compares airlines based on their climate efficiency. This allows us to identify more climate efficient carriers on any specific connection as shown in the example above.

For obvious reasons we would focus on your company's most emission intensive citypairs in a full analysis. But

we don't stop there. We also compare the price structure of the most climate efficient carriers to show you real win-win-potentials: a reduction of emissions while saving travel expenses at the same time. This cost saving effect can of course be even enhanced further if your company limits the number of airlines to achieve additional quantity rebates with cleaner and cheaper carriers.

**Are you interested in assessing the CO<sub>2</sub> efficiency of airlines serving your top city pairs? Contact us at [airlineindex@atmosfair.de](mailto:airlineindex@atmosfair.de)**

<sup>1</sup> Code share partner are not listed. They appear in detailed atmosfair airline reportings.

<sup>2</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

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TRAVEL	Amount	Unit
Kilometres	228	1,000 km
Miles <sup>1</sup>	142	1,000 miles
Days of use	906	days
Average kilometres per rental day	252	km
Average miles per rental day	157	miles

DAYS OF USE AS % OF TOTAL PER CATEGORY	Share
Economy	9.2
Compact	36.8
Intermediate	0
Special	0
Other	54.1

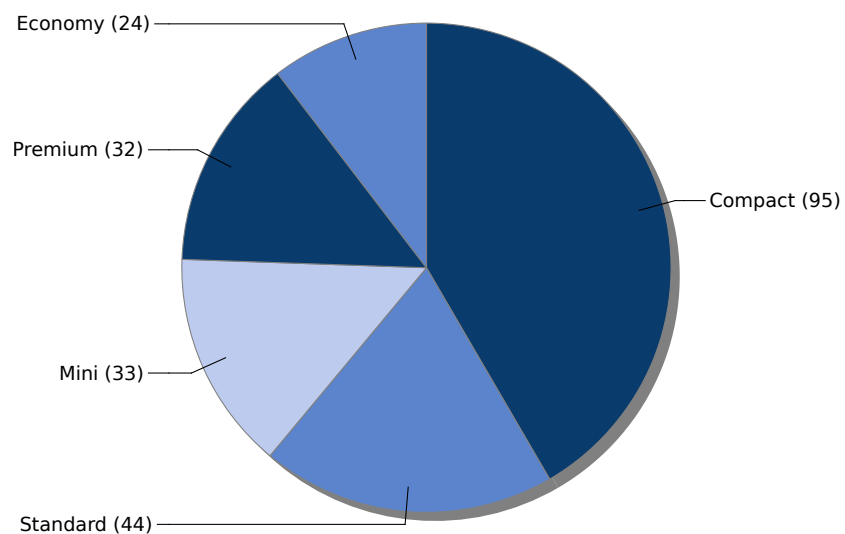
CO <sub>2</sub> EMISSIONS <sup>2</sup>	Amount	Unit
CO <sub>2</sub>	36.1	tons CO <sub>2</sub>
CO <sub>2</sub> per day, average	39.8	kg CO <sub>2</sub>
CO <sub>2</sub> per kilometre, average	158	g CO <sub>2</sub> /km
CO <sub>2</sub> per mile, average	254	g CO <sub>2</sub> /mile

CO <sub>2</sub> EMISSIONS <sup>2</sup> PER CATEGORY	CO <sub>2</sub>	Unit	Share
Economy	3.26	tons CO <sub>2</sub>	9.0
Compact	14.3	tons CO <sub>2</sub>	39.8
Intermediate	0	tons CO <sub>2</sub>	0
Special	0	tons CO <sub>2</sub>	0
Other	18.4	tons CO <sub>2</sub>	51.2

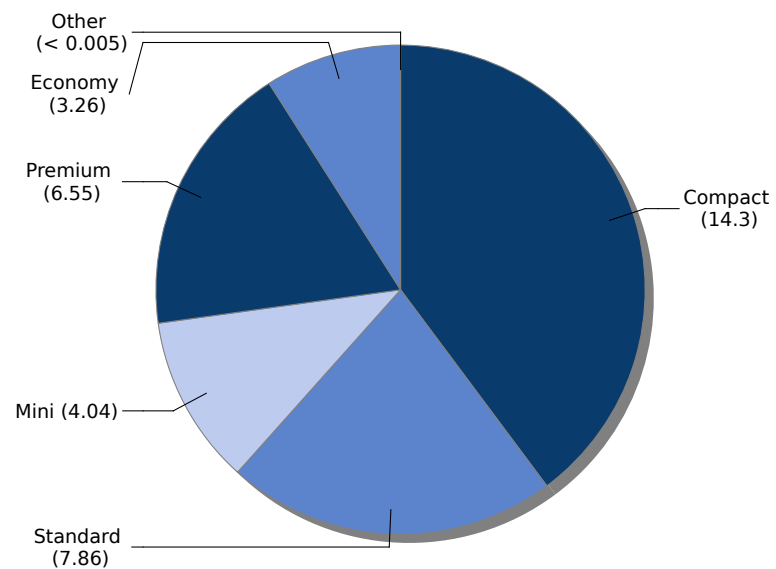
<sup>1</sup> American miles

<sup>2</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

## KILOMETRES PER CATEGORY (1000 KM):



## CO<sub>2</sub> EMISSIONS<sup>1</sup> BY CATEGORY (TONS):



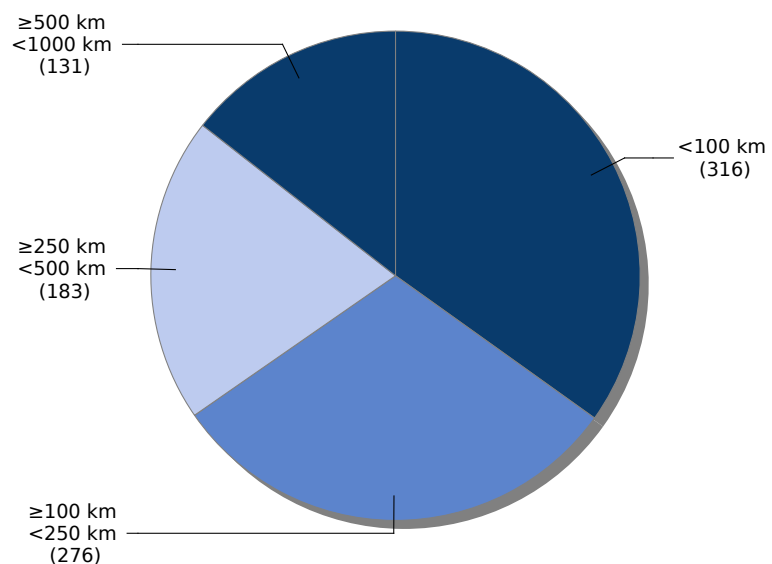
<sup>1</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.



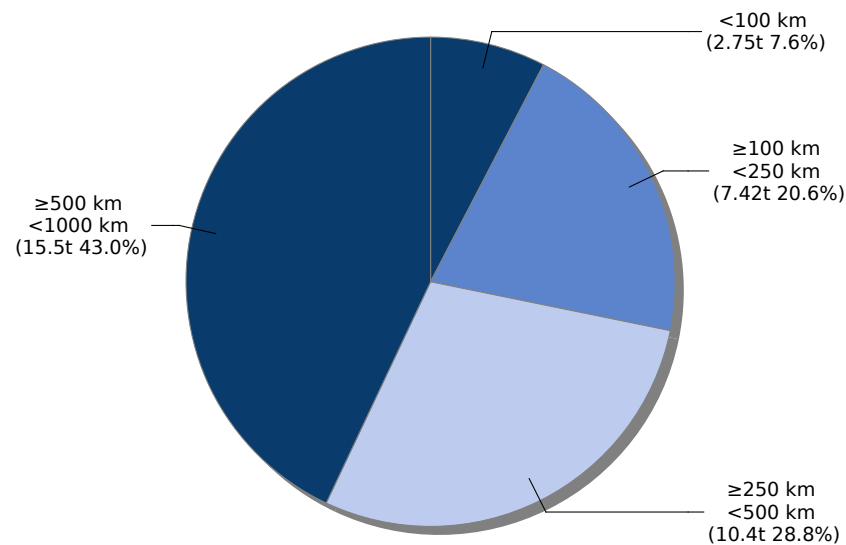
ACRIS	Total distance [km]	Days of rent	Average km per day	CO <sub>2</sub> emissions <sup>1</sup> [tons]	Share of CO <sub>2</sub> emissions <sup>1</sup> [%]
<b>TOP 10 – SORTED BY KILOMETRES</b>					
CDMR	95,028	333	285	14.3	39.8
SDMR	44,411	224	198	7.86	21.8
MDMR	33,122	104	318	4.04	11.2
PDMR	32,090	162	198	6.55	18.2
EDMR	23,764	83	286	3.26	9.0
<b>TOP 10 – SORTED BY CO<sub>2</sub> EMISSIONS</b>					
CDMR	95,028	333	285	14.3	39.8
SDMR	44,411	224	198	7.86	21.8
PDMR	32,090	162	198	6.55	18.2
MDMR	33,122	104	318	4.04	11.2
EDMR	23,764	83	286	3.26	9.0

<sup>1</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

**RENTAL DAYS PER DISTANCE CLASS:**



**CO<sub>2</sub> EMISSIONS<sup>2</sup> PER DISTANCE CLASS:**



<sup>1</sup> Average kilometre per rental day

<sup>2</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

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TRAVEL	Amount	Unit
Kilometres	522	1,000 km
Miles <sup>1</sup>	324	1,000 miles
Segments <sup>2</sup>	1,110	
City Pairs	204	
Average segment distance in km <sup>3</sup>	470	km
Average segment distance in miles <sup>3</sup>	292	miles

CO <sub>2</sub> EMISSIONS <sup>4</sup>	Amount	Unit
CO <sub>2</sub>	21.4	tons CO <sub>2</sub>
CO <sub>2</sub> per segment, average	19,266	g CO <sub>2</sub>
CO <sub>2</sub> per passenger kilometre, average	41.0	g CO <sub>2</sub> /km
CO <sub>2</sub> per passenger mile, average	65.9	g CO <sub>2</sub> /mile

<sup>1</sup> American miles

<sup>2</sup> One person, one way, from origin to destination

<sup>3</sup> Total distance of all segments divided by number of segments

<sup>4</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

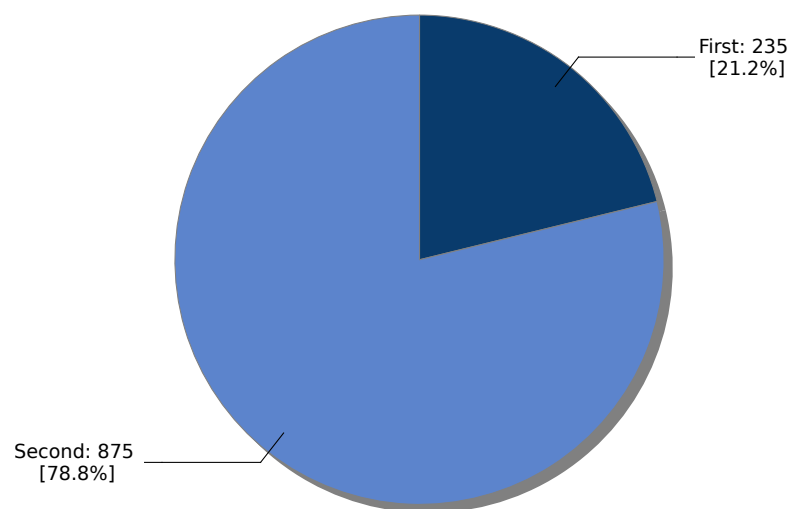
Routing	Segments	Segment length [km]	Segment length [miles]	Total distance [km]	Total distance [miles]	CO <sub>2</sub> emissions <sup>2</sup> [tons]	% of CO <sub>2</sub> emissions <sup>2</sup>
<b>TOP 10 - SORTED BY KILOMETRES</b>							
Baden-Baden - FRANKFURT(MAIN)	67	207	129	13,869	8,620	0.69	3.2
FRANKFURT(MAIN) - Basel, Badischer Bahnhof	58	397	247	23,026	14,311	0.63	2.9
FRANKFURT(MAIN) - München Hbf	58	409	254	23,722	14,743	1.28	6.0
Köln Hbf - FRANKFURT(MAIN)	55	207	129	11,385	7,076	0.59	2.8
Freiburg(Breisgau) Hbf - FRANKFURT(MAIN)	50	328	204	16,400	10,193	0.90	4.2
Banteln - FRANKFURT(MAIN)	42	311	193	13,062	8,118	0.64	3.0
Baden-Baden - Mannheim Hbf	39	110	68	4,290	2,666	0.21	1.0
Mannheim Hbf - FRANKFURT(MAIN)	34	97	60	3,298	2,050	0.16	0.7
FRANKFURT(MAIN) - BASEL	32	397	247	12,704	7,896	0.36	1.7
Hamburg Hbf - Koblenz Hbf	31	531	330	16,461	10,231	0.81	3.8

**TOP 10 - SORTED BY CO<sub>2</sub> EMISSIONS**

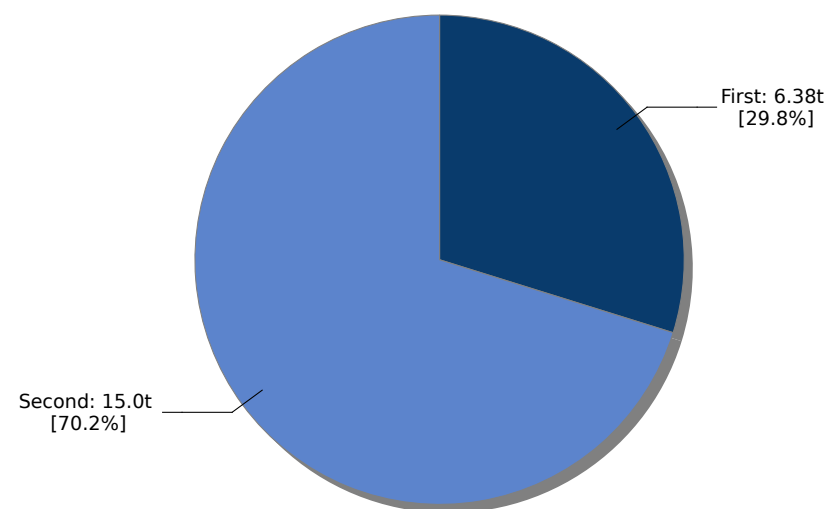
FRANKFURT(MAIN) - München Hbf	58	409	254	23,722	14,743	1.28	6.0
Freiburg(Breisgau) Hbf - FRANKFURT(MAIN)	50	328	204	16,400	10,193	0.90	4.2
Parchim - Valence TGV	17	1,434	891	24,378	15,151	0.83	3.9
Hamburg Hbf - Koblenz Hbf	31	531	330	16,461	10,231	0.81	3.8
Münchsmünster - Hull	10	1,354	842	13,540	8,415	0.71	3.3
Baden-Baden - FRANKFURT(MAIN)	67	207	129	13,869	8,620	0.69	3.2
Banteln - FRANKFURT(MAIN)	42	311	193	13,062	8,118	0.64	3.0
FRANKFURT(MAIN) - Basel, Badischer Bahnhof	58	397	247	23,026	14,311	0.63	2.9
Düsseldorf Hbf - Kermen	4	2,380	1,479	9,520	5,917	0.60	2.8
Köln Hbf - FRANKFURT(MAIN)	55	207	129	11,385	7,076	0.59	2.8

<sup>1</sup> One person, one way, from origin to destination<sup>2</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

SEGMENTS PER SEAT CLASS:



CO<sub>2</sub> EMISSIONS<sup>2</sup> PER SEAT CLASS:



<sup>1</sup> One person, one way, from origin to destination

<sup>2</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.



# HOTEL

SUMMARY .....	24
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CO <sub>2</sub> PER COUNTRY .....	26



HOTEL CLASS	Overnight stays [nights]	EMISSIONS	CO <sub>2</sub> emissions <sup>1</sup> [tons]
all hotel classes	866	from all overnight stays, all hotel classes	28.5
1 star hotel	0	per overnight stay, 1 star hotel	0
2 star hotel	60	per overnight stay, 2 star hotel	1.22
3 star hotel	318	per overnight stay, 3 star hotel	8.76
4 star hotel	294	per overnight stay, 4 star hotel	10.2
5 star hotel	194	per overnight stay, 5 star hotel	8.29
hotel class unknown	0	per overnight stay, hotel class unknown	0

<sup>1</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

# HOTEL

## CO<sub>2</sub> emissions and overnight stays per country and hotel category

Country	1 star hotel	2 star hotel	3 star hotel	4 star hotel	5 star hotel	unknown
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### OVERNIGHT STAYS PER COUNTRY AND HOTEL CATEGORY

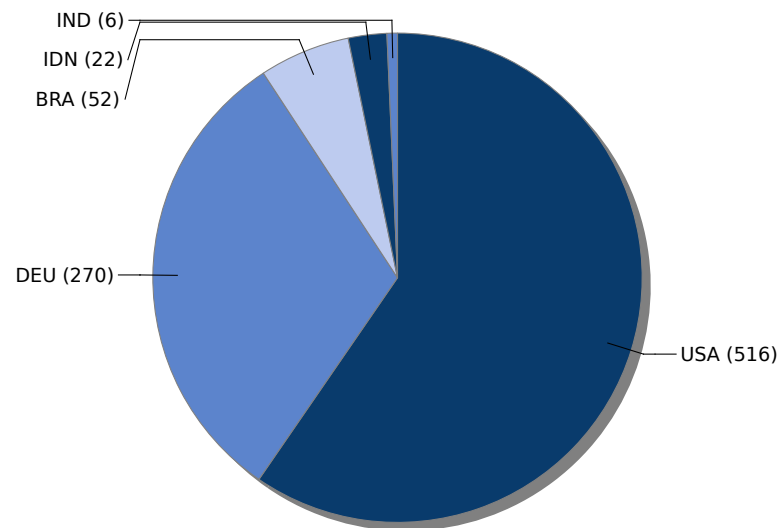
USA	0	32	191	178	115	0
DEU	0	15	100	87	68	0
BRA	0	9	17	15	11	0
IDN	0	0	8	14	0	0
IND	0	4	2	0	0	0

### CO<sub>2</sub> EMISSIONS<sup>1</sup> [TONS] PER COUNTRY AND HOTEL CATEGORY

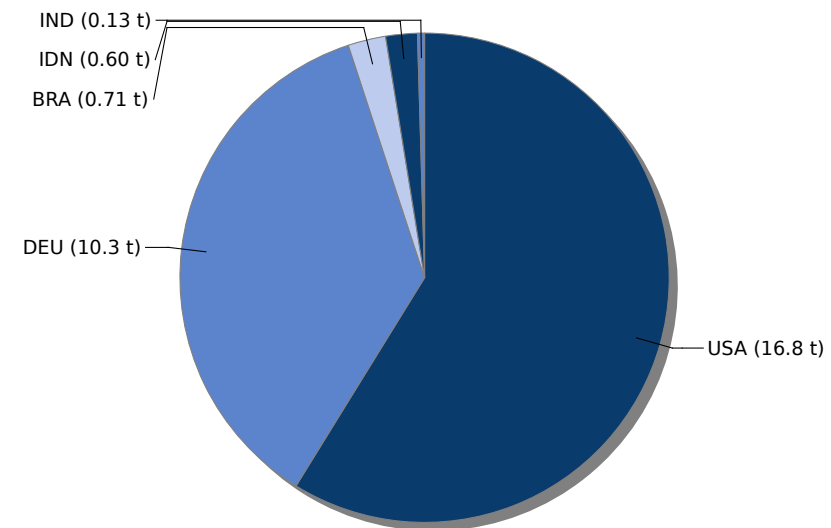
USA	0	0.60	4.71	6.26	5.19	0
DEU	0	0.46	3.66	3.32	2.87	0
BRA	0	0.08	0.18	0.22	0.23	0
IDN	0	0	0.17	0.43	0	0
IND	0	0.08	0.05	0	0	0

<sup>1</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

OVERNIGHT STAYS PER COUNTRY:



CO<sub>2</sub> EMISSIONS<sup>1</sup> PER COUNTRY:



<sup>1</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

# CARBON OFFSETTING WITH ATMOSFAIR

## DEALING WITH CO<sub>2</sub> EMISSIONS THAT CAN'T BE AVOIDED OR REDUCED

Travel activity type	CO <sub>2</sub> emissions <sup>1</sup> [tons]	Offsetting costs in EUR
FLIGHT <sup>2</sup>	660	15,178
CAR	36.1	829
RAIL	21.4	492
HOTEL	28.5	656

## ATMOSFAIR OFFSET PROJECT EXAMPLES



Biogas from cow dung (Kenya): The project supplies small biogas units to dairy farmers which produce regenerative biogas.



Efficient fuel wood stoves (Nigeria): The efficient stoves save about 80% of energy and help to reduce deforestation and indoor air pollution.

## WHY OFFSETTING?

Offsetting is an essential part of a comprehensive carbon strategy that aims at reducing your company's climate impact. It is an effective way to deal with those emissions that can't be avoided or further reduced through other measures. As a flexible instrument that is always available, offsetting minimises uncertainties within your carbon strategy and supports your organisation in reaching your self-set emission reduction targets. Furthermore, offsetting is a highly visible climate protection measure that can easily be communicated not only to your employees, customers and rating agencies but to all your stakeholders.

## ATMOSFAIR – AWARD WINNING OFFSET PROJECTS

Atmosfair is a non-profit organisation. We offer to offset the CO<sub>2</sub> emissions from your business travel activities through atmosfair projects, for example the installation of renewable energies in developing countries. atmosfair projects are UN-certified (CDM) and additionally comply with the Gold Standard. If you decide to offset with atmosfair you will receive a tax-deductible donation receipt (valid with the German tax office; other national regulation may apply).

atmosfair has been ranked No. 1 quality offset provider in international comparative studies since 2005. The assessed criteria were the quality of the offsetting projects and organisational as well as financial transparency.

<sup>1</sup> CO<sub>2</sub> emissions calculated according to VDR methodology.

<sup>2</sup> Category FLIGHT includes RFI 2.7 addition.

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# VDR STANDARD

„CO<sub>2</sub>-reporting business travel“



## WHO IS BEHIND VDR?

The German Business Travel Association VDR advocates efficient, economical and safe worldwide travel for companies. It represents the interest of German business regarding conditions for corporate travel and supports its members as a competence center for political activities.

## WHAT ARE THE BENEFITS OF USING THE VDR STANDARD?

The VDR standard for the CO<sub>2</sub> calculation of corporate travel is a standardised method to determine CO<sub>2</sub> emissions created by business travel worldwide. Although previous approaches made it possible to estimate CO<sub>2</sub> emissions from business travel, none of them took the specific characteristics of business trips into account. The VDR standard covers all relevant business travel activities (flights, hotel, rental cars, rail) and meets the requirements for worldwide application, accuracy, comparability and independence. The standard is exact enough to highlight the potential for CO<sub>2</sub> reductions. Companies that generate their CO<sub>2</sub> reports using this standard are entitled to label them with the VDR logo and seal reading „produced according to the VDR standard.“

For full methodology details, please visit:

[www.atmosfair.de/en/co2-bilanz\\_fuer\\_unternehmen](http://www.atmosfair.de/en/co2-bilanz_fuer_unternehmen)

**Disclaimer:** For maximum accuracy in calculating CO<sub>2</sub>-emissions, we update our VDR database every year. For the travel activity flight for example these updates includes elements such as the most current flight plans, new airport locations, new aircraft types and most importantly new scientific findings if available.

Due to inaccurate or incomplete customer travel data it can happen that the most precise calculation method suggested by the VDR standard can not be applied. In these cases fallback calculation methods are used which achieve the maximum precision that can be achieved with the provided data. In any case the calculations which this report is based on are compliant with the VDR standard.



Verband Deutsches  
Reisemanagement e.V.

„... in atmosfair, the VDR has gained an experienced partner for creating their standard. The quality of atmosfair's calculation methods has often been proven, including by the Federal Environmental Agency.“

**Dr. Norbert Röttgen,**

Former federal minister for the Environment,  
Nature Conservation and Nuclear Safety

# OTHER CALCULATION METHODS

**GHG:** The Greenhouse Gas (GHG) Protocol, developed by World Resources Institute (WRI) and World Business Council on Sustainable Development (WBCSD), sets the global standard for how to measure, manage, and report greenhouse gas emissions. The GHG Protocol simplifies the calculation of specific CO<sub>2</sub> per passenger in comparison to the VDR standard. Only the following factors are considered:

- Flight distance (great circle distance between the airports, multiplied by a blanket uplift factor for detours).
- Flight class: domestic, short-haul international, long-haul international.
- Booking class: A distinction is made between economy, premium economy, business and first class.

**GRI:** The Global Reporting Initiative (GRI) is an international independent organisation that helps businesses, governments and other organisations understand and communicate the impact of business operations on critical sustainability issues. GRI's approach for calculating emissions is based on the method of the GHG Protocol.

**DEFRA:** The UK Department for Environment, Food and Rural Affairs (DEFRA) has developed a tool for calculating the CO<sub>2</sub> emissions of travel activities such as flight, train journeys and car rides, among others. DEFRA's approach is based on the calculation method of the GHG Protocol but uses slightly different emission factors.

**ICAO:** The International Civil Aviation Organization (ICAO) has developed an online calculator for its website which calculates CO<sub>2</sub> emissions from air travel. The associated method uses flight profiles with ascend and descend phases, distinguishes between different types of aircrafts and also considers factors such as passenger load and co-loaded freight. Nonetheless, the ICAO calculator also has disadvantages:

- If the city pair for which the CO<sub>2</sub> is to be calculated is not in the ICAO data base, the ICAO calculator yields no result.
- The ICAO calculator considers CO<sub>2</sub> emissions only. It does not take other climate effects such as condensation trails into account.
- There are only two seat classes: economy and premium.
- The ICAO calculator assumes a full-economy seat configuration of all aircrafts.

**VFU:** The German Verein für Umweltmanagement und Nachhaltigkeit in Finanzinstituten e.V. (VFU) has developed a system of performance indicators to evaluate 'environmental performance'. Transportation is a sub-item and includes train journeys, air travel as well as road traffic. Just like the GHG Protocol and DEFRA methods the VFU tool simplifies the CO<sub>2</sub> calculation with their own emission factors.

*Disclaimer: For maximum accuracy in calculating CO<sub>2</sub> emissions we update the databases of each reporting standard every year.*



## GENERAL TERMS

MILES .....	American miles; 1 american mile = 1.609 kilometres
PKM .....	Passenger kilometre; product of number of passengers and kilometres travelled
SEGMENT .....	one person, one way, from origin to destination

## FLIGHT TERMS

AVERAGE SEGMENT DISTANCE .....	Total distance of all flights divided by number of flights
CO <sub>2</sub> VDR .....	CO <sub>2</sub> emissions according to VDR methodology
CO <sub>2</sub> GRI / GHG .....	CO <sub>2</sub> emissions according to GRI / GHG methodology
CO <sub>2</sub> DEFRA .....	CO <sub>2</sub> emissions according to DEFRA methodology
CO <sub>2</sub> ICAO .....	CO <sub>2</sub> emissions according to ICAO methodology
CO <sub>2</sub> VFU .....	CO <sub>2</sub> emissions according to VFU methodology
CO <sub>2</sub> EMISSIONS IN ALTITUDES > 9 KM .....	CO <sub>2</sub> emissions from fuel burned above 9 kilometres altitude (RFI applied, see RFI)
CO <sub>2</sub> + RFI .....	Sum of CO <sub>2</sub> and NON CO <sub>2</sub> emissions converted into CO <sub>2</sub> emissions following the RFI logic (see RFI)
CRUISE ALTITUDE .....	Cruise altitude of an airplane. Above 9,000 metres the atmosphere is far more sensitive for exhaust emissions (see RFI)
RFI .....	Radiative forcing index, metrics established by the Intergovernmental Panel on Climate Change (IPCC) to measure the impact of effects such as condensation trails or ozone formation. The RFI was established by the IPCC in 1999. It measures the total climate impact, including contrails, ozone formation, etc. compared to the pure CO <sub>2</sub> emissions. An RFI of 2 means that the warming impact of the part of a flight that is conducted above 9 km altitude is twice as big as its CO <sub>2</sub> effect alone. The range of the RFI is between 2-4 with 2.7 being the best estimate of the IPCC.

## CAR TERMS

CO <sub>2</sub> .....	CO <sub>2</sub> emissions according to VDR methodology
DAYS OF USE .....	Total number of car rental days
DISTANCE CLASS .....	Average kilometre per rental day

## RAIL TERMS

CO <sub>2</sub> .....	CO <sub>2</sub> emissions according to VDR methodology
AVERAGE SEGMENT DISTANCE .....	Total distance of all train rides divided by number of train rides

## HOTEL TERMS

CO <sub>2</sub> .....	CO <sub>2</sub> emissions according to VDR methodology
OVERNIGHT STAYS .....	Total number of overnight stays