HOK Marineconsult ApS

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Calculation of CO_2 emissions for container transport from Bremerhaven to Kalundborg by different transport routes

1st March 2024

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Introduction

On behalf of Kalundborg Harbor this report contains calculations of CO_2 emissions for a container transport from Bremerhaven to Kalundborg, Tåstrup, Slagelse, Køge, Vordingborg and Frederikssund by two different routes:

- Direct sea transport from Bremerhaven to Kalundborg via the Kieler Canal
- Sea transport from Bremerhaven to Copenhagen via the Kieler Canal, through the Great Belt and along the north coast of Sealand to Øresund

Transport to Slagelse, Tåstrup, Køge, Vordingborg and Frederikssund is carried out by truck of three different sizes, i.e. 1, 2 and 3 TEU per truck.

Ship and engine characteristics

The sea transport is carried out by a large feeder vessel of 2000 TEU having following main dimensions:

Length between pp:	207.2 m
Breadth:	27.8 m
Max. draught:	10.5 m
Draught at 70 % Dw (allowable draught in Kieler Canal = 9.5 m):	9.2 m
Max. service speed:	19.5 knots
Service speed in open sea	17 and 19 knots
Max. service speed in the Kieler Canal	8 knots

The general ship characteristics are shown on page 5 while the main engine characteristics are shown on page 6 together with the sailing distances which have been calculated by using the following web page:

https://sea-distances.org/advanced

Calculations of the emissions have been carried by the generic so-called ship design model SHIP-DESMO developed at The Technical University of Denmark (DTU). Emissions of trucks have been carried out by the so-called TEMA model developed by The Danish Ministry of Transport.

On page 7 is shown the actual sailing condition assuming an average deadweight utilization of 70 %, which is often the average loading of a container ship.

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On page 8 - 11 are shown the emissions for the container ship and the truck respectively. Calculations have been carried out for three truck types: 1) truck with only one container, 2) truck with 2 containers and finally 3) truck (module truck) loaded with 3 containers.

The specific emissions (emissions per transport unit) have been combined with the actual sailing distances and truck driving distances for the different transport scenarios for a container (one TEU) transported from Bremerhaven to Kalundborg, Slagelse, Køge, Vordingborg, Frederikssund and Tåstrup respectively, assuming 1 hour idling in Nordhavn and 10 minutes idling in Kalundborg. These CO_2 emissions are summed up on page 12 - 14, and the final results are as follows:

Ship speed = 17 knots

SHIP SPEED = 17 knots			1 TEU per truck	2 TEU per truck	3 TEU per truck
From	To	Harbor	CO_2 emissions in kg per TEU	CO_2 emissions in kg per TEU	CO_2 emissions in kg per TEU
Bremerhaven	Tåstrup	via Kalundborg	131	103	92
Bremerhaven	Slagelse	via Kalundborg	86	74	69
Bremerhaven	Kalundborg	via Kalundborg	51	51	51
Bremerhaven	Køge	via Kalundborg	146	113	100
Bremerhaven	Vordingborg	via Kalundborg	147	114	100
Bremerhaven	Frederikssund	via Kalundborg	126	100	90
Bremerhaven	Kalundborg	via Copenhagen	203	166	150
Bremerhaven	Tåstrup	via Copenhagen	123	114	110
Bremerhaven	Slagelse	via Copenhagen	202	165	150
Bremerhaven	Køge	via Copenhagen	152	132	124
Bremerhaven	Vordingborg	via Copenhagen	204	166	151
Bremerhaven	Frederikssund	via Copenhagen	161	138	129

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In order to explore the sensitivity of the ship speed on the final results/conclusion, calculations have also been carried out with a ship speed of 19 knots, which are given in following table. It is seen that the overall conclusion is still the same, i.e. only a marginal influence of the ship speed is observed on the overall result.

SHIP SPEED = 19 knots			**1 TEU per truck**	**2 TEU per truck**	**3 TEU per truck**
From	To	Harbor	CO_2 emissions in kg per TEU	CO_2 emissions in kg per TEU	CO_2 emissions in kg per TEU
Bremerhaven	Tåstrup	via Kalundborg	142	114	103
Bremerhaven	Slagelse	via Kalundborg	97	85	80
Bremerhaven	Kalundborg	via Kalundborg	62	62	62
Bremerhaven	Køge	via Kalundborg	157	124	110
Bremerhaven	Vordingborg	via Kalundborg	158	124	111
Bremerhaven	Frederikssund	via Kalundborg	137	111	100
Bremerhaven	Kalundborg	via Copenhagen	221	183	168
Bremerhaven	Tåstrup	via Copenhagen	141	131	127
Bremerhaven	Slagelse	via Copenhagen	220	183	168
Bremerhaven	Køge	via Copenhagen	169	150	142
Bremerhaven	Vordingborg	via Copenhagen	222	184	169
Bremerhaven	Frederikssund	via Copenhagen	178	156	147

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Ship data (container ship)	Units	Default values	Alternative 1	Alternative 2
Container capacity	TEU	2000	2000	2000
Panamax breadth = 32.2 m (0 = NO, 1 = yes)		1	1	1
Feeder ship - type 1 (<2900 TEU) - Panamax - type 2 (2900 - 5300 TEU) or Post Panamax - type 3 (>3500 TEU - B < 49 m) - Post Panamax - type 4 (>14000 TEU - B > 49 m)	(-)	1	1	1
Elongation in percent	%	0	0.0	0.0
Length between pp	m	175.90	175.90	175.90
Length in waterline incl. bulbous bow (= 1.01 Lpp)	m	177.66	177.66	177.66
Length over all	m	186.86	186.86	186.86
Breadth mld.	m	27.80	27.80	27.80
Depth	m	15.21	15.21	15.21
Design draught	m	9.90	9.90	9.90
Maximum draught	m	10.48	10.48	10.48
Maximum draught - design draught	m	0.57	0.57	0.57
Design deadweight/Maximum deadweight	%	91	91	91
Design deadweight	tons	23924	23924	23924
Maximum deadweight	tons	26375	26375	26375
Design deadweight/Maximum deadweight	pct.	90.7	90.7	90.7
Maximum deadweight/TEU	tons/TEU	13.19	13.19	13.19
Lightweight coefficient	t/m^3	0.121	0.121	0.121
Steel weight correction	%	0	0	0
Lightweight	tons	8981	8981	8981
Steel weight	tons	6724	6724	6724
Displacement at design draught	tons	32905	32905	32905
Displacement at maximum draught	tons	35356	35356	35356
Block coefficient (based on Lpp) at design draught	-	0.663	0.663	0.663
Block coefficient (based on Lpp) at maximum draught	-	0.673	0.673	0.673
Lpp/Displ.vol.$^{1/3}$ at design draught	-	5.53	5.53	5.53
Lpp/Displ.vol.$^{1/3}$ at maximum draught	-	5.40	5.40	5.40
Midship section coefficient at design draught	-	0.979	0.979	0.979
Midship section coefficient at maximum draught	-	0.980	0.980	0.980
Prismatic coefficient at design draught	-	0.677	0.677	0.677
Prismatic coefficient at maximum draught	-	0.687	0.687	0.687
Waterplane area coefficient based on Lpp	-	0.853	0.853	0.853
Wetted surface at design draught	m^2	6512	6512	6512
Wetted surface at maximum draught	m^2	6795	6795	6795
Service speed at design draught	knots	19.5	19.5	19.5
Service speed corretion at design draught		0.0	0.0	0.0
Froude Number at service speed	-	0.240	0.240	0.240
Scantling trial speed at 100 % deadweight at 75 % MCR	knots	19.1	19.1	19.1
Froude Number at 'reference speed'	-	0.235	0.235	0.235

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Engine characteristics

ENGINE TYPE & TECHNOLOGY				
Main engine type (slow speed = 1, medium speed = 2)	(-)	1	1	1
Main engine service rating (for non derated engine only)	pct. MCR	90	90	90
Fuel type (HFO = 1, MD/GO = 2, LNG = 3, Dual fuel = 4)	-	2	2	2
SFOC at 75 % MCR in normal ME mode (If default press 1)	g/kW/hour	1	1	1
If normal tuning press 1 - if low load tuning press 2	-	1	1	1
Sulphur content in heavy fuel (HFO)	pct.	0.1	0.1	0.1
Sulphur content in diesel oil or gas oil (DO/GO)	pct.	0.1	0.1	0.1
Derated 2 stroke main engine? (NO = 0, YES = 1)	-	1	1	1
Fuel optimised main engine? (NO = 0, YES = 1)	-	0	0	0
TIER 1, 2 or 3 engine? (1 - 3)	-	3	3	3
Specify NOx reduction technology: EGR (Exhaust Gas Recirculation) =1, SCR (Selective Catalyic Reduction) = 2 or other technology = 3	-	1	1	1
Use of scrubbers if oil is used (NO = 0, YES=1)	-	0	0	0

Sailing route lengths

SEA-DISTANCES.ORG Ports Distances Voyage Calculator Advertise Contact us

Add port Create new route

	#	Country, port	Speed, knots	Distance, miles	Days at sea	Days in port	Costs at sea	Costs in port	Arrival	Departure	Actions
From	1	Germany, Bremerhaven GMT +1.0								07 May 22 12:43	
via		Direct	10	81	0.3		0				
To	2	Germany, Brunsbuttel GMT +1.0				0		0	07 May 2022 19:55	07 May 2022 19:55	
via		Direct	10	134	0.5		0				
To	3	Germany, Kiel-Holtenau GMT +1.0				0		0	08 May 2022 00:43	08 May 2022 00:43	
via		Direct	10	234	0.9		0				
To	4	Denmark, Kalundborg GMT +1.0				0		0	08 May 2022 10:19	08 May 2022 10:19	
via		Direct	10	349	1.4		0				
To	5	Denmark, Copenhagen GMT +1.0							08 May 2022 22:19		
Total				349	1.4	0	0	0			

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Actual sailing condition

ACTUAL CONDITION				
Statisitcal payload/deadweight in full load condtion	%	67.4	67.4	67.4
(Deadweight - payload)/max. deadweight	%	32.6	32.6	32.6
Cargo utilization (percentage of maximum TEU capacity)	%	70.0	70.0	70.0
Actual number of containers	TEU	1400	1400	1400
Actual average weight per container	t/TEU	8.9	8.9	8.9
Actual deadweight	tons	21042	21042	21042
Actual payload	tons	12444	12444	12444
Actual displacement	tons	30023	30023	30023
Waterplane area coefficient based on Lpp	-	0.832	0.832	0.832
Actual draught	m	9.21	9.21	9.21
Block coefficient at design draught	-	0.65	0.65	0.65
Midship section coefficient at actual draught	-	0.977	0.977	0.977
Wetted surface at actual draught	m^2	6171	6171	6171
Service speed at actual draught	knots	19.0	17.0	8.0
Service allowance on resistance	%	0	0.0	0.0
Beaufort No.	-	4.5	4.5	4.5
Wind speed according to Beaufort No.	m/s	8.2	8.2	8.2
Significant wave height	m	1.4	1.4	1.4
Short crested wave resistance (MEPC 71/INF.29, p. 20)	kN	52	48	32
Wind and wave resistance fraction of calm water resistance	pct.	17.7	22.1	66.9
Speed dependency exponent n (Power = constant V^n)	-	3.7	3.1	2.2
Necessary propulsion power at actual deadweight	kW	13548	9307	1360
Engine rating in actual condition (Cont. Service Rating = CSR)	% MCR	77	53	8
SFOC at CSR	g/kW/hour	168.3	170.3	188.5
Oil consumption per hour (auxiliary engines at sea)	t/hour	0.14	0.14	0.14
Oil consumption per hour (auxiliary engines in harbor)	t/hour	0.17	0.17	0.17
Oil consumption per hour (main engine)	t/hour	2.28	1.58	0.26
Oil consumption per hour (main and auxiliary engines at sea)	t/hour	2.42	1.72	0.39

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Emissions and energy demand (Container ship)

		Default	Alternative 1	Alternative 2
Capacity utilization (100 % ~ design condition)	%	70	70	70
Utilized number of containers	TEU	1400	1400	1400
Deadweight	tons	21042	21042	21042
Deadwight per container	dwt/TEU	15.0	15.0	15.0
Draught	m	9.21	9.21	9.21
Ship speed	knots	19.0	17.0	8.0
Energy demand				
Energy demand per hour	GJ/hour	103	73	17
Energy demand per nautical mile	GJ/nm	5.4	4.3	2.1
Energy demand per TEU per nautical mile	MJ/TEU/nm	3.88	3.09	1.49
Oil consumption				
Oil consumption per hour	t/hour	2.42	1.72	0.39
Oil consumption demand per nautical mile	kg/nm	127	101	49
Oil consumption per TEU per nautical mile	g/TEU/nm	90.8	72.3	35.0
CO_2 emissions				
CO_2 emissions per hour	t/hour	7.7	5.5	1.3
CO_2 emissions per nautical mile	kg/nm	408	324	157
CO_2 emissions per TEU per nautical mile	g/TEU/nm	291	232	112
NOx emissions				
NOx emissions per hour	kg/hour	48	34	7
NOx emissions per nautical mile	kg/nm	2.5	2.0	0.9
NOx emissions per TEU per nautical mile	g/TEU/nm	1.79	1.41	0.61
SOx emissions				
SOx emissions per hour	kg/hour	5	4	1
SOx emissions per nautical mile	kg/nm	0.27	0.21	0.10
SOx emissions per TEU per nautical mile	g/TEU/nm	0.19	0.15	0.07
CO emissions				
CO emissions per hour	kg/hour	5.1	3.6	0.9
CO emissions per nautical mile	kg/nm	0.27	0.21	0.11
CO emissions per TEU per nautical mile	g/TEU/nm	0.19	0.15	0.08
HC emissions				
HC emissions per hour	kg/hour	7.1	5.1	1.1
HC emissions per nautical mile	kg/nm	0.37	0.30	0.14
HC emissions per TEU per nautical mile	g/TEU/nm	0.27	0.21	0.10
Particulate emissions				
Particulate emissions per hour	kg/hour	3.8	2.7	0.6
Particalate emissions per nautical mile	kg/nm	0.20	0.16	0.07
Particulate emissions per TEU per nautical mile	g/TEU/nm	0.14	0.11	0.05

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Truck data inclusive oil consumption and CO_2 emissions

1 TEU per truck

Truck engine data		EU 1996 EURO 2	EU 2001 EURO 3	EU 2006 EURO 4	EU 2011 EURO 5	EU 2015 EURO 6
Specific oil consumption (kg/kWh)		0.20	0.20	0.20	0.20	0.20
NOx emission (g/kWh)		7.0	5.0	3.5	2.0	0.4
CO emission (g/kWh)		1.20	1.20	0.10	0.10	0.10
HC emission (g/kWh)		0.30	0.25	0.015	0.015	0.004
Particulate emission (g/kWh)		0.15	0.10	0.02	0.02	0.01
Sulphur content in oil (pct.)		0.001	0.001	0.001	0.001	0.001
SO_2 emission (g/kWh)		0.004	0.004	0.004	0.004	0.004
CO_2 emission (g/kg)		3206	3206	3206	3206	3206
NOx emission (g/kg)		35.0	25.0	17.5	10.0	2.0
CO emission (g/kg)		6.0	6.0	0.5	0.5	0.5
HC emission (g/kg)		1.50	1.25	0.075	0.075	0.02
Particulate emission (g/kg)		0.75	0.50	0.10	0.10	0.05
SO_2 emission (g/kg)		0.02	0.02	0.02	0.02	0.02
NOx emission (g/MJ)		0.82	0.58	0.41	0.23	0.05
CO emission (g/MJ)		0.14	0.14	0.01	0.01	0.01
HC emission (g/MJ)		0.035	0.029	0.00175	0.00175	0.0005
Particulate emission (g/MJ)		0.018	0.012	0.002	0.002	0.001
SO_2 emission (g/MJ)		0.0005	0.0005	0.0005	0.0005	0.0005
Calorific value for diesel oil (MJ/kg)		42.8	42.8	42.8	42.8	42.8
EURO NORM (2 - 6)				4	6	6
Cargo weight per truck			t	20	20	20
Truck weight (empty)			t	10.0	10.0	10.0
Length of truck - total			m	15.0	12.0	12.0
Truck weight (loaded)			t	30.0	30.0	30.0
Cargo weight per meter			t/m	1.3	1.7	1.7
Truck weight per meter			t/m	1.8	1.8	1.8
Driving distance			km	400	400	26
Fuel consumption ratio - driving distance			(-)	1.00	1.00	1.11
Energy consumption per km			MJ/km	12.5	12.5	13.8
Energy consumption per km			MJ/km	11.3	11.3	12.5
Energy consumption per lanemeter per km			MJ/lm/km	0.83	1.04	1.15
Energy consumption per ton load per km			MJ/t/km	0.63	0.63	0.69
Oil consumption per km			g/km	292	292	323
Oil consumption per lanemeter per km			g/lm/km	19.5	24.3	26.9
Oil consumption per ton load per km			g/t/km	14.6	14.6	16.1
CO_2 emissions per km			g/km	936	936	1035
CO_2 emissions per lanemeter per km			g/lm/km	62.4	78.0	86.2
CO_2 emissions per ton load per km			g/t/km	46.8	46.8	51.7

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Truck data inclusive oil consumption and CO_2 emissions

2 TEU per truck

Truck engine data	EU 1996 EURO 2	EU 2001 EURO 3	EU 2006 EURO 4	EU 2011 EURO 5	EU 2015 EURO 6
Specific oil consumption (kg/kWh)	0.20	0.20	0.20	0.20	0.20
NOx emission (g/kWh)	7.0	5.0	3.5	2.0	0.4
CO emission (g/kWh)	1.20	1.20	0.10	0.10	0.10
HC emission (g/kWh)	0.30	0.25	0.015	0.015	0.004
Particulate emission (g/kWh)	0.15	0.10	0.02	0.02	0.01
Sulphur content in oil (pct.)	0.001	0.001	0.001	0.001	0.001
SO_2 emission (g/kWh)	0.004	0.004	0.004	0.004	0.004
CO_2 emission (g/kg)	3206	3206	3206	3206	3206
NOx emission (g/kg)	35.0	25.0	17.5	10.0	2.0
CO emission (g/kg)	6.0	6.0	0.5	0.5	0.5
HC emission (g/kg)	1.50	1.25	0.075	0.075	0.02
Particulate emission (g/kg)	0.75	0.50	0.10	0.10	0.05
SO_2 emission (g/kg)	0.02	0.02	0.02	0.02	0.02
NOx emission (g/MJ)	0.82	0.58	0.41	0.23	0.05
CO emission (g/MJ)	0.14	0.14	0.01	0.01	0.01
HC emission (g/MJ)	0.035	0.029	0.00175	0.00175	0.0005
Particulate emission (g/MJ)	0.018	0.012	0.002	0.002	0.001
SO_2 emission (g/MJ)	0.0005	0.0005	0.0005	0.0005	0.0005
Calorific value for diesel oil (MJ/kg)	42.8	42.8	42.8	42.8	42.8
EURO NORM (2 - 6)			6	6	6
Cargo weight per truck		t	38	38	38
Truck weight (empty)		t	10.0	10.0	10.0
Length of truck - total		m	16.0	16.0	16.0
Truck weight (loaded)		t	48.0	48.0	48.0
Cargo weight per meter		t/m	2.4	2.4	2.4
Truck weight per meter		t/m	2.8	2.8	2.8
Driving distance		km	400	400	27
Fuel consumption ratio - driving distance		(-)	1.00	1.00	1.10
Energy consumption per km		MJ/km	16.3	16.3	18.0
Energy consumption per km		MJ/km	15.5	15.5	17.1
Energy consumption per lanemeter per km		MJ/lm/km	1.02	1.02	1.12
Energy consumption per ton load per km		MJ/t/km	0.43	0.43	0.47
Oil consumption per km		g/km	381	381	420
Oil consumption per lanemeter per km		g/lm/km	23.8	23.8	26.3
Oil consumption per ton load per km		g/t/km	10.0	10.0	11.1
CO_2 emissions per km		g/km	1222	1222	1347
CO_2 emissions per lanemeter per km		g/lm/km	76.4	76.4	84.2
CO_2 emissions per ton load per km		g/t/km	32.2	32.2	35.5

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Truck data inclusive oil consumption and CO_2 emissions

3 TEU per truck

Truck engine data		EU 1996 EURO 2	EU 2001 EURO 3	EU 2006 EURO 4	EU 2011 EURO 5	EU 2015 EURO 6
Specific oil consumption (kg/kWh)		0.20	0.20	0.20	0.20	0.20
NOx emission (g/kWh)		7.0	5.0	3.5	2.0	0.4
CO emission (g/kWh)		1.20	1.20	0.10	0.10	0.10
HC emission (g/kWh)		0.30	0.25	0.015	0.015	0.004
Particulate emission (g/kWh)		0.15	0.10	0.02	0.02	0.01
Sulphur content in oil (pct.)		0.001	0.001	0.001	0.001	0.001
SO_2 emission (g/kWh)		0.004	0.004	0.004	0.004	0.004
CO_2 emission (g/kg)		3206	3206	3206	3206	3206
NOx emission (g/kg)		35.0	25.0	17.5	10.0	2.0
CO emission (g/kg)		6.0	6.0	0.5	0.5	0.5
HC emission (g/kg)		1.50	1.25	0.075	0.075	0.02
Particulate emission (g/kg)		0.75	0.50	0.10	0.10	0.05
SO_2 emission (g/kg)		0.02	0.02	0.02	0.02	0.02
NOx emission (g/MJ)		0.82	0.58	0.41	0.23	0.05
CO emission (g/MJ)		0.14	0.14	0.01	0.01	0.01
HC emission (g/MJ)		0.035	0.029	0.00175	0.00175	0.0005
Particulate emission (g/MJ)		0.018	0.012	0.002	0.002	0.001
SO_2 emission (g/MJ)		0.0005	0.0005	0.0005	0.0005	0.0005
Calorific value for diesel oil (MJ/kg)		42.8	42.8	42.8	42.8	42.8
EURO NORM (2 - 6)				6	6	6
Cargo weight per truck			t	54	54	54
Truck weight (empty)			t	12.0	12.0	12.0
Length of truck - total			m	24.0	24.0	24.0
Truck weight (loaded)			t	66.0	66.0	66.0
Cargo weight per meter			t/m	2.3	2.3	2.3
Truck weight per meter			t/m	3.9	3.9	3.9
Driving distance			km	400	400	27
Fuel consumption ratio - driving distance			(-)	1.00	1.00	1.10
Energy consumption per km			MJ/km	19.2	19.2	21.1
Energy consumption per km			MJ/km	19.3	19.3	21.2
Energy consumption per lanemeter per km			MJ/lm/km	0.80	0.80	0.88
Energy consumption per ton load per km			MJ/t/km	0.35	0.35	0.39
Oil consumption per km			g/km	448	448	494
Oil consumption per lanemeter per km			g/lm/km	18.7	18.7	20.6
Oil consumption per ton load per km			g/t/km	8.3	8.3	9.1
CO_2 emissions per km			g/km	1436	1436	1583
CO_2 emissions per lanemeter per km			g/lm/km	59.8	59.8	65.9
CO_2 emissions per ton load per km			g/t/km	26.6	26.6	29.3

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Sailing distances and respective CO_2 emissions at 17 knots

From	To	Sailing distance nautical miles	Speed knots	CO_2 emissions per TEU per nautical mile gram CO_2 per TEU per nm	Total emissions per TEU kg CO_2 per TEU
Bremerhafen	Brunsbüttel	81	17	232	18.8
Brunsbüttel	Kiel Holtenau	53	8	112	5.9
Kiel Holtenau	Kalundborg	100	17	232	23.2
Total		**234**			**47.9**

Kalundborg	Copenhagen	**115**	17	232	**26.6**

Sailing distances and respective CO_2 emissions at 19 knots

From	To	Sailing distance nautical miles	Speed knots	CO_2 emissions per TEU per nautical mile gram CO_2 per TEU per nm	Total emissions per TEU kg CO_2 per TEU
Bremerhaven	Brunsbüttel	81	**19**	291	23.6
Brunsbüttel	Kiel Holtenau	53	8	112	5.9
Kiel Holtenau	Kalundborg	100	**19**	291	29.1
Total		**234**			**58.6**

Kalundborg	Copenhagen	**115**	**19**	291	**33.5**

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Truck driving distances and respective CO_2 emissions assuming 1 TEU per truck

From	To	Distance km	Speed km/hour	CO_2 emissions in kg per TEU per km g CO_2/TEU/km	CO_2 emissions in kg per TEU kg CO_2/TEU
Kalundborg	Tåstrup	85	90	936	79.6
Kalundborg	Vordingborg	102	90	936	95.5
Kalundborg	Køge	101	90	936	94.5
Kalundborg	Slagelse	37	90	936	34.6
Kalundborg	Frederikssund	80	90	936	74.9
Tastrup	Nordhavn	27	54	1035	27.9
Tåstrup	Slagelse	84	90	936	78.6
Tåstrup	Køge	30	90	936	28.1
Tåstrup	Vordingborg	86	90	936	80.5
Tåstrup	Frederikssund	40	90	936	37.4

Truck driving distances and respective CO_2 emissions assuming 2 TEU´s per truck

From	To	Distance km	Speed km/hour	CO_2 emissions in kg per TEU per km g CO_2/TEU/km	CO_2 emissions in kg per TEU kg CO_2/TEU
Kalundborg	Tåstrup	85	90	611	51.9
Kalundborg	Vordingborg	102	90	611	62.3
Kalundborg	Køge	101	90	611	61.7
Kalundborg	Slagelse	37	90	611	22.6
Kalundborg	Frederikssund	80	90	611	48.9
Tastrup	Nordhavn	27	54	674	18.2
Tåstrup	Slagelse	84	90	611	51.3
Tåstrup	Køge	30	90	611	18.3
Tåstrup	Vordingborg	86	90	611	52.5
Tåstrup	Frederikssund	40	90	611	24.4

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Truck driving distances and respective CO_2 emissions assuming 3 TEU´s per truck

From	To	Distance km	Speed km/hour	CO_2 emissions in kg per TEU per km g CO_2/TEU/km	CO_2 emissions in kg per TEU kg CO_2/TEU
Kalundborg	Tåstrup	85	90	479	40.7
Kalundborg	Vordingborg	102	90	479	48.8
Kalundborg	Køge	101	90	479	48.3
Kalundborg	Slagelse	37	90	479	17.7
Kalundborg	Frederikssund	80	90	479	38.3
Tastrup	Nordhavn	27	54	528	14.2
Tåstrup	Slagelse	84	90	479	40.2
Tåstrup	Køge	30	90	479	14.4
Tåstrup	Vordingborg	86	90	479	41.2
Tåstrup	Frederikssund	40	90	479	19.1

Idling CO_2 emissions

	Idling time minutes	CO_2 emissions per mintúte g CO_2 per minute	Total CO_2 emissions kg CO_2
Idling in Nordhavn	60	350	21
Idling in Kalundborg	10	350	4