

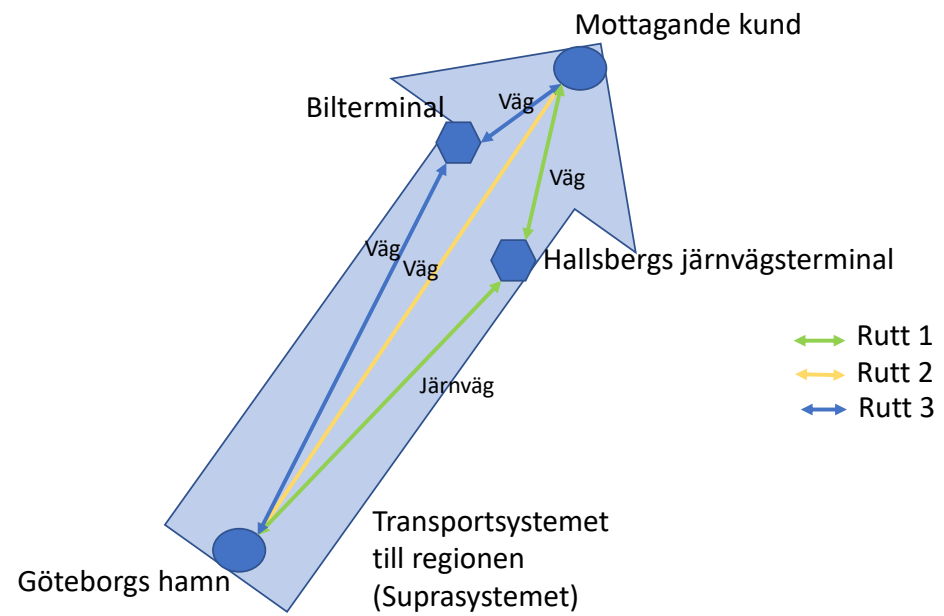
Intermodala transporter med duotrailer

Nyttan, effekter samt hot och möjligheter

Delprojekt - Systemeffekter

Frans Prenkert, Örebro Universitet





HCT och systemeffekter

- Prestanda och nytta

Magnus Swahn, NTM



Delprojekt prestanda och nytta

1. Kartlägga **driftsprestanda** för dragbil med två trailers (HCT) för implementering av denna fordonstyp i *NTMCalc*

2. Beräkna **nyttan för Elons transportlösning** (Göteborg-Örebro) med och utan HCT avseende:

- Transporteffektivitet (fyllnadsgrad)
- Trafikeffektivitet (fordonskm)
- Kostnad (index)
- Klimat (utsläpp av klimatgaser)

1. Driftsprestanda för dragbil med två trailers

NTMCalc Advanced 4.0 Environmental Performance Calculator

Transport mode

Avoid ferry routes

Route

A Hallsberg, Sverige

B Bäcklundavägen 1, 702 36 Örebro, Sverige

Average gradient for bi-directional traffic. Samples are made every 511 meters.

Create Clear More

Route distance 20.43 km

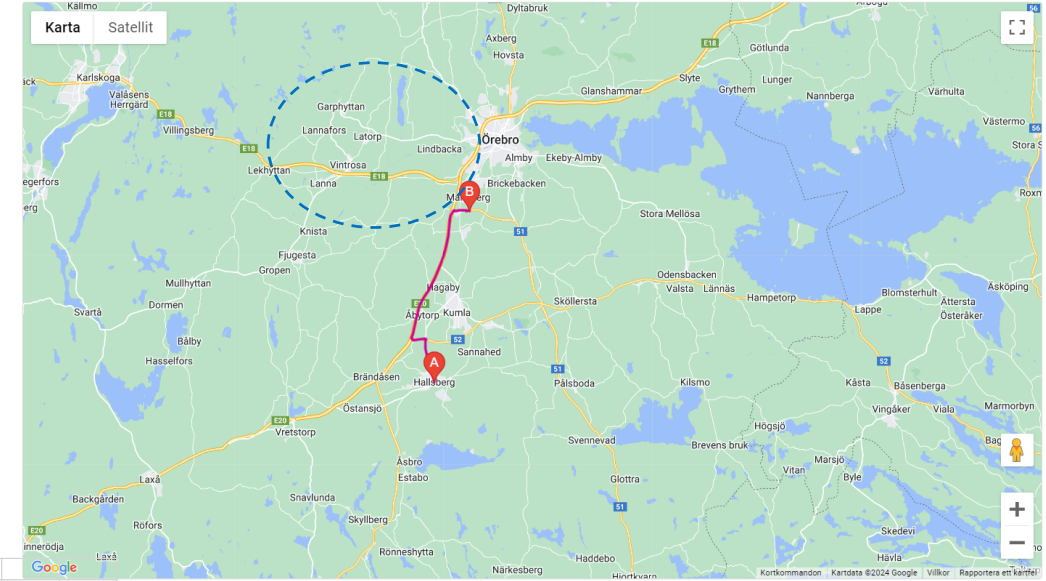
Gradient ± 0.71 %

Transport activities

Vehicle type

-- Select --

Add Load from store



NTM Nomenclature	HBEFA Nomenclature	Vehicle max measures		Max load capacity			Load Capacity Utilisation (default data)			
		tonne	m	tonne	Pallets	m ³	weight-%	pallet-%	volume-%	dim.weight-%
Light commercial vehicle - Pick-up	LCV Petrol N1-II/LCV Diesel N1-II	2,5	5	0,6	1	6	0,2	0,4	0,25	0,3
Light commercial vehicle - Van	LCV Petrol N1-III/LCV Diesel N1-III	3,5	7	1,5	4	17	0,2	0,4	0,25	0,3
Rigid Truck ≤7.5t	RT ≤ 7.5t	7,5	8	5	14		0,4	0,6	0,4	0,5
Rigid Truck 7.5 - 12t	RT > 7,5t-12t	12	11	6	20		0,4	0,6	0,4	0,5
Rigid Truck 12 - 14t	RT > 12t-14t	14	11	9	24		0,4	0,6	0,4	0,5
Rigid Truck 14 - 20t	RT > 14t-20t	20	12	12	24		0,4	0,6	0,4	0,5
Rigid Truck 20 - 26t	RT > 20t-26t	26	12	15	24		0,4	0,6	0,4	0,5
Truck with Trailer 14-20t	TT/AT >14-20t	20	12	12	20		0,4	0,6	0,4	0,5
Truck with Trailer 20-28t	TT/AT >20-28t	28	12	16	28		0,4	0,6	0,4	0,5
Truck with Trailer 28-34t	TT/AT >28-34t	34	17	22	36		0,5	0,7	0,5	0,6
Truck with Trailer 34-40t	TT/AT >34-40t	40	19	26	36	94	0,5	0,7	0,5	0,6
Truck with Trailer 40-50t	TT/AT >40-50t	50	16,5	33	33		0,5	0,7	0,5	0,6
Truck with Trailer 50-64t	TT/AT >50-64t	64	25,25	40	51	144	0,5	0,7	0,5	0,6
Truck with Double Trailer 50-64t	n/a	64	34,5	38	72	188	0,5	0,7	0,5	0,6



Hang arounds					
HCT 1 64-76t		76	25,25		
HCT 2 64-76t duo trailer		76 duo	34,5	74/76	
HCT 3 76-90t		90			
HCT 4 90-110t		110			
HCT 6					

NTMCalc steg 1

NTMCalc Advanced 4.0 Environmental Performance Calculator

Transports Report Support Close

Transport mode ?

Avoid ferry routes

Route ?

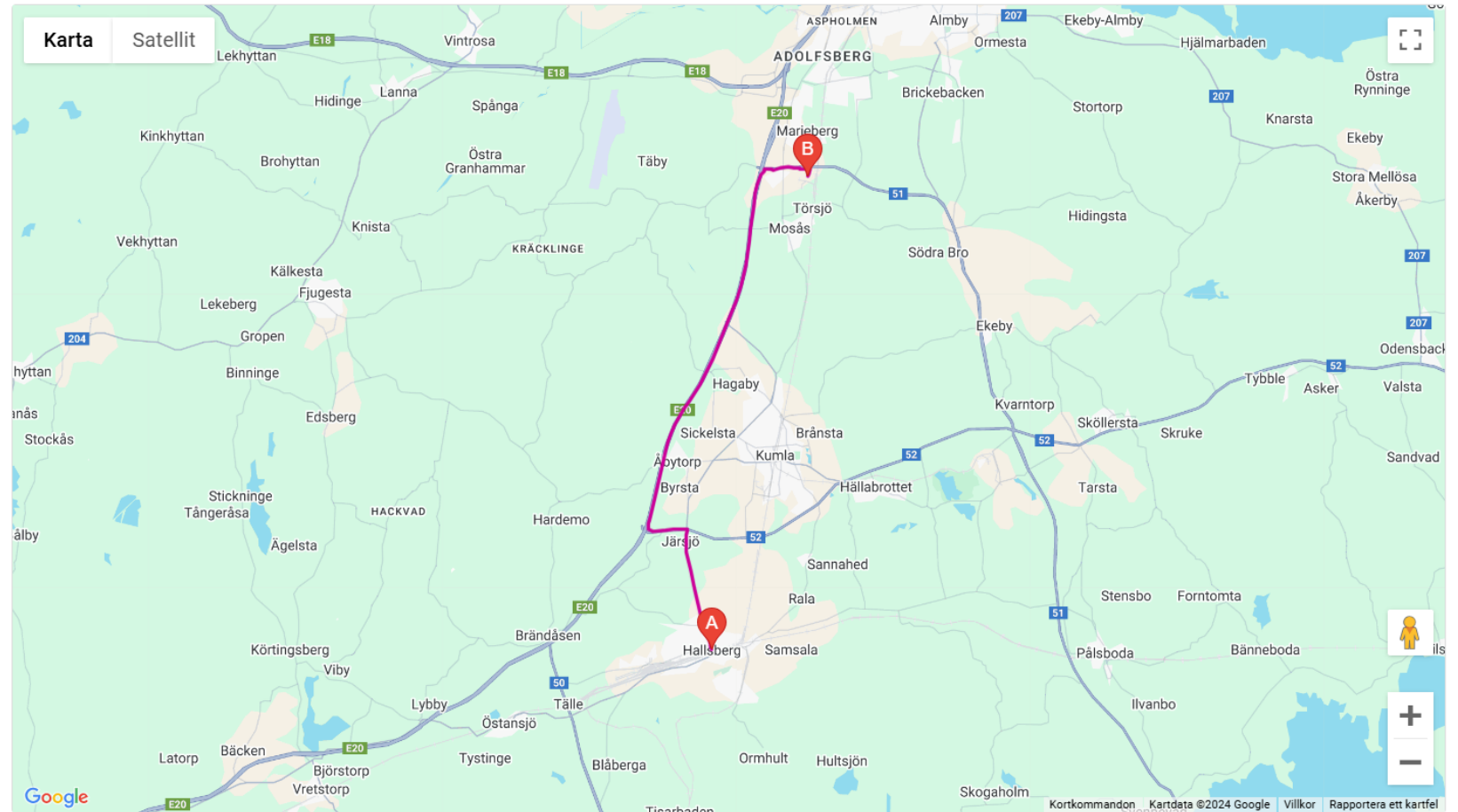
A Hallsberg, Sverige

B Bäcklundavägen, Örebro, Sverige

Create Clear More ▾

Route distance 20.59 km

Transport activities ?



NTMCalc steg 2 – justering av förutsättningar

NTMCalc Advanced 4.0 Environmental Performance

Transport mode ?

Avoid ferry routes

Route ?

A Hallsberg, Sverige

B Bäcklundavägen, Örebro, Sverige

Create Clear More ▾

Route distance 20.59 km

Transport activities ?

Vehicle type ?

Truck with trailer 50-60 t

Add Load from store

Configuration Panel:

Label

Vehicle type Truck with trailer 50-60 t

Calculation model

Shipment weight tonne

Distance km(min value > 0)

A custom value was selected or entered into the field. The field will keep this value until it gets changed or removed by the user (remove by emptying a field or selecting "- Use default option-"). This is unlike a default value which may get changed by the system if any of the parameters on which it depends get changed.

Do not show this message again

Additional parameters ?

Fuel

Road type

Euro class

Road gradient

Cargo load factor - weight %weight(min value > 0, max value ≤ 100)

Cargo carrier capacity - weight tonne(min value > 0)

Fuel consumption l/km

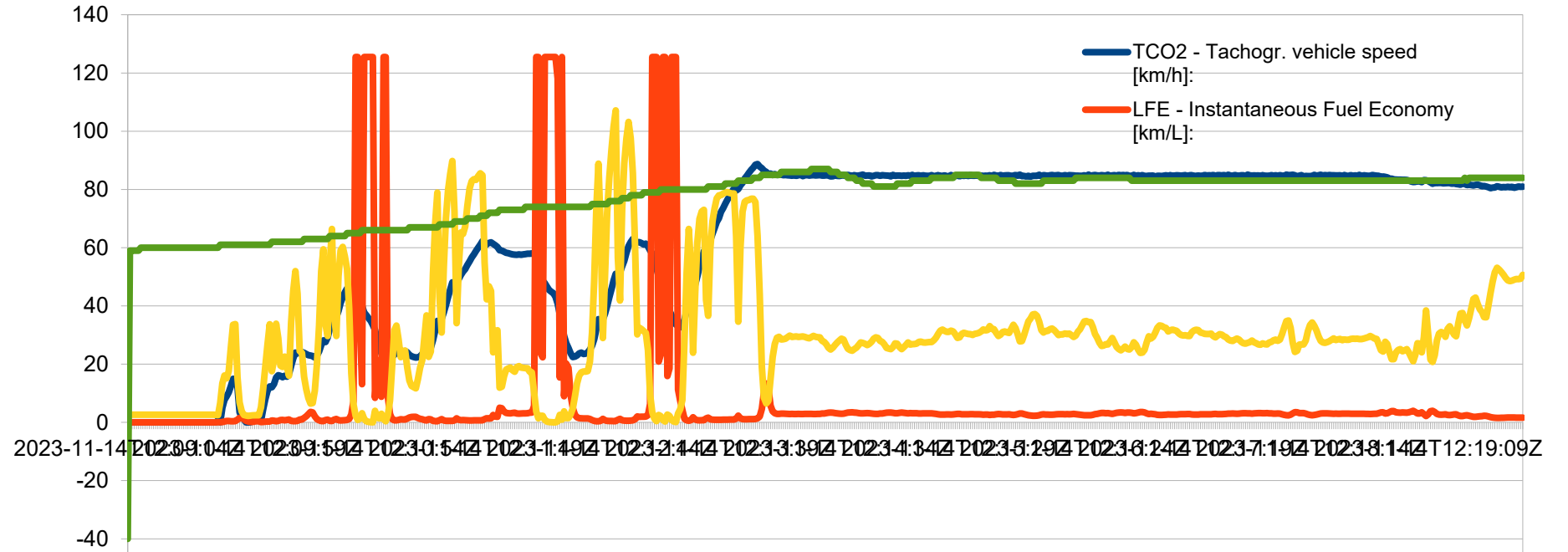
Map View:

Transports Report Support Close

Map showing route between Hallsberg and Örebro, Sweden. Key locations include Hidingsta, Stortorp, Knarsta, Ekeby, Stora Mellösa, Åkerby, Tybble, Asker, Valsta, Sandvad, Skruke, Sköllersta, Tarsta, Stensbo, Forntomta, Pålsboda, Bänneboda, Ilvanbo, and Kortkommandon. Road numbers 207 and 52 are visible.

Kortkommandon Kartdata ©2024 Google Villkor Rapportera ett kartfel

CAN- data



2023-11-14T12:19:04Z	80,89	1,54	52,45	84	105278	1		
2023-11-14T12:19:05Z	80,73	1,56	51,65	84	105278	1		
2023-11-14T12:19:06Z	80,82	1,59	50,7	84	105278	1		
2023-11-14T12:19:07Z	80,78	1,63	49,6	84	105278	1		
2023-11-14T12:19:08Z	80,93	1,66	48,8	84	105278	1		
2023-11-14T12:19:09Z	80,79	1,67	48,5	84	105278	1		
2023-11-14T12:19:10Z	80,91	1,66	48,7	84	105278	1		
2023-11-14T12:19:11Z	80,59	1,65	49	84	105278	1		
2023-11-14T12:19:12Z	80,79	1,64	49,25	84	105278	1		
2023-11-14T12:19:13Z	81	1,64	49,2	84	105278	1		
2023-11-14T12:19:14Z	80,89	1,64	49,35	84	105278	1		
2023-11-14T12:19:15Z	80,97	1,6	50,65	84	105278,5	1		
		1002,45				350	2,86414286	0,35

	TCO2 - Tachogr. vehicle speed [km/h]:	LFE - Instantaneous Fuel Economy [km/L]:	LFE - Fuel Economy [km/L]:	ET1 - Engine speed [rpm]:	LFC - Engine load [%]:	total fuel used [L]:
2023-11-14T12:09:00Z	0	0	2,65	-40	0	0,37735849

Slutsatser inför implementering i NTM*Calc*

- Bränsleförbrukning stämmer bra med NTMs data för TT/AT >50-64t
- Korrigering av volymskapacitet
- Mätning genomfört med fler driftsfall (Garphyttan)
- Implementering efter årsskiftet

2. Nyttan med Elons transportlösning Göteborg-Örebro

NTMCalc Advanced 4.0 Environmental Performance Calculator

Transports Report Support Close

Transport mode

Avoid ferry routes

Route

A Indiska Oceanen 11, 418 34 Göteborg, Sverige

B Bäcklundavägen, Örebro, Sverige

Create Clear More

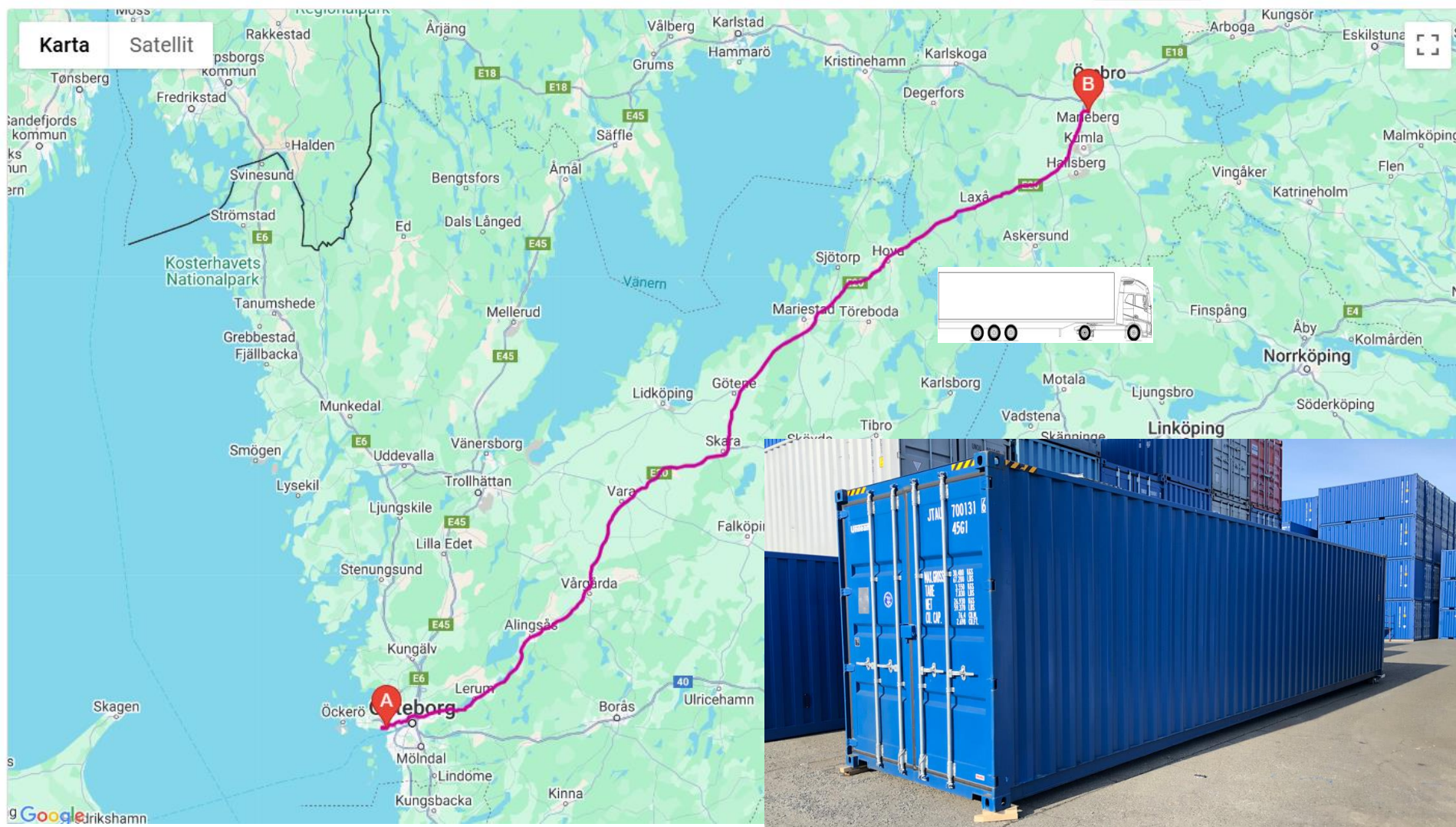
Route distance 285.98 km

Transport activities

Vehicle type

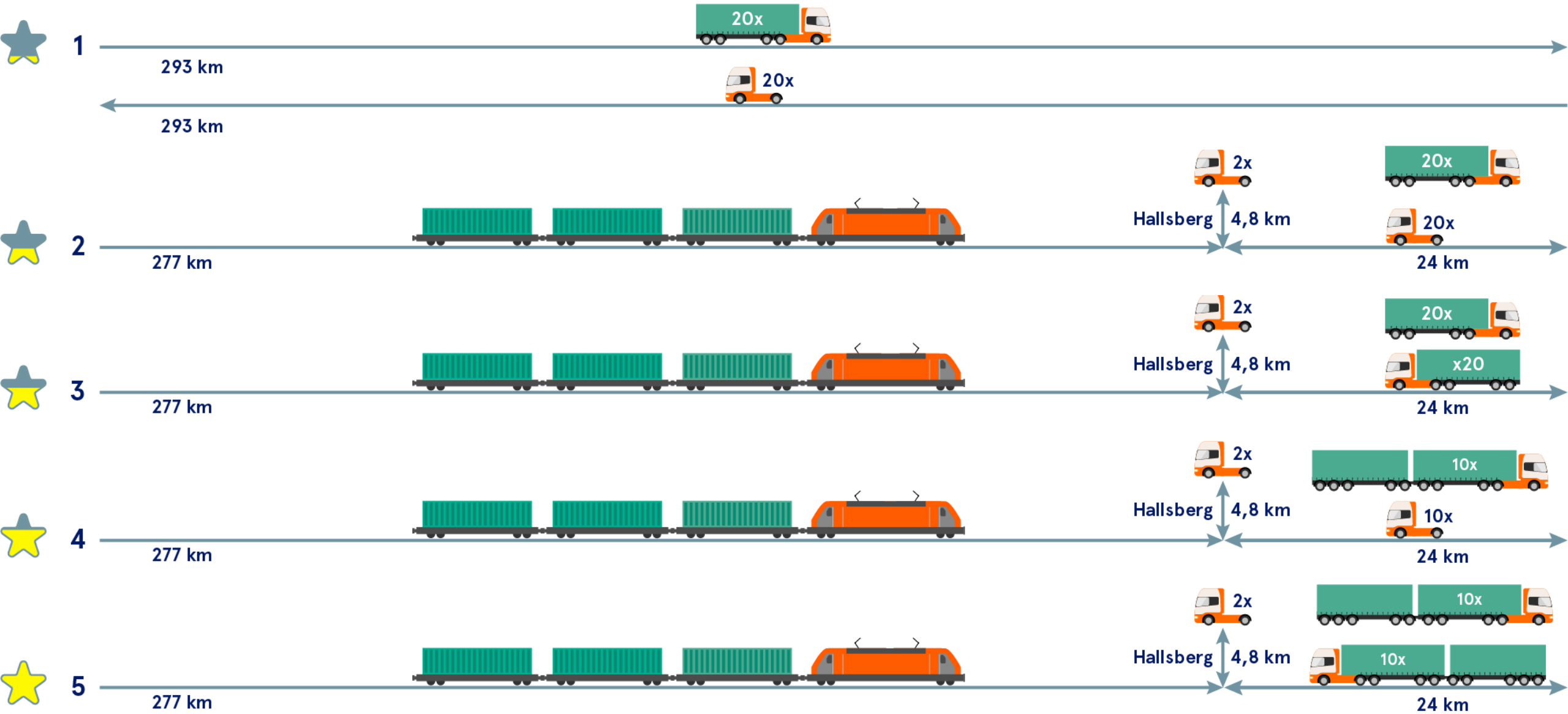
Truck with trailer 50-60 t

Add Load from store



HCT översiktlig utvärdering

-20 stycken 40 fots containers från Göteborg till Örebro, Elon



Göteborg

Elon, Örebro



1

293 km



293 km



2

277 km



Hallsberg 4,8 km



24 km



3

277 km



Hallsberg 4,8 km



24 km



4

277 km



Hallsberg 4,8 km



24 km



5

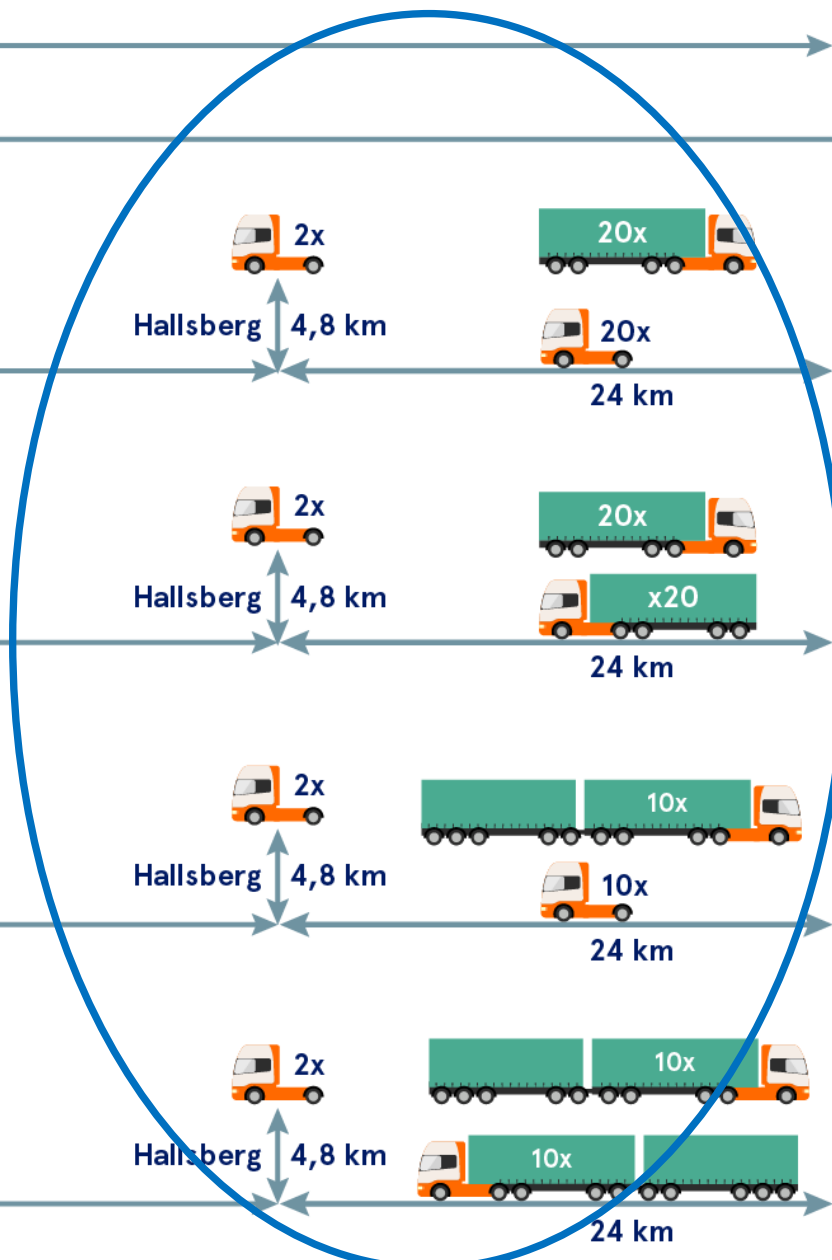
277 km



Hallsberg 4,8 km



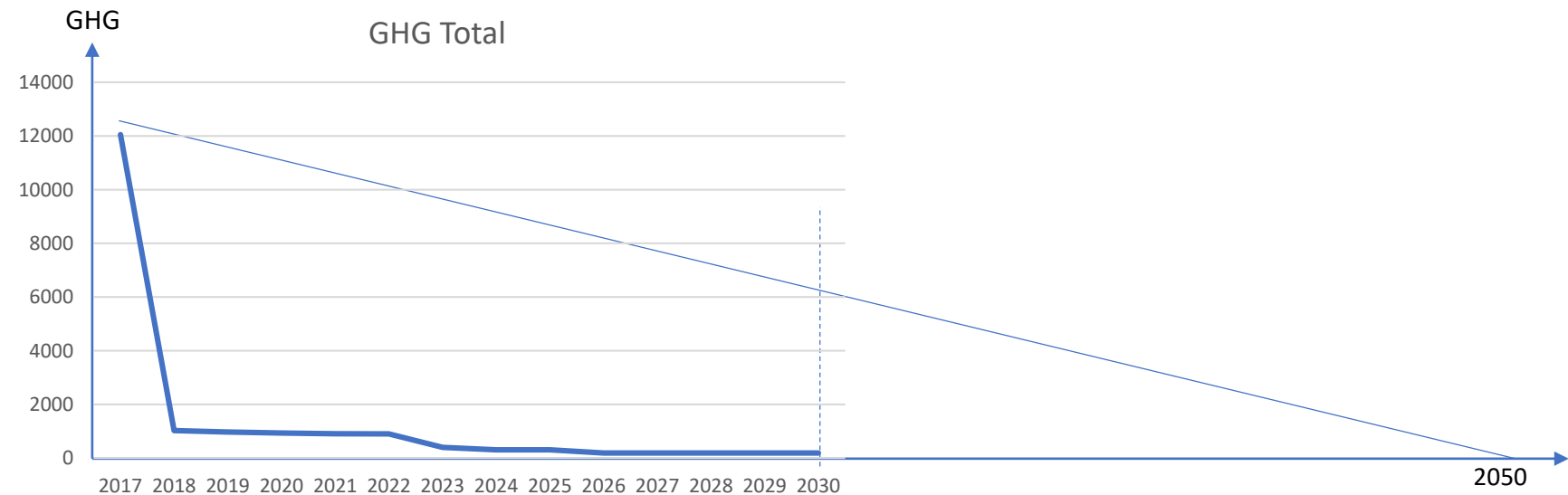
24 km



HCT översiktlig utvärdering

-20 stycken 40 fots containers mellan Hallsberg och Örebro

0,995	Positioning					Shuttle transport					Backhaul					Conveyance (forsling)					Result		
Year	Distance [km]	FC [l/km]	Trips [n]	GHG _{Total} [g/l]	GHG [kg]	Distance [km]	FC [l/km]	Trips [n]	GHG _{Total} [g/l]	GHG [kg]	Distance [km]	FC [l/km]	Trips [n]	GHG _{Total} [g/l]	GHG [kg]	Distance [km]	FC [l/km]	Trips [n]	GHG _{Total} [g/l]	GHG [kg]	GHG Total [kg]		
Baseline 1	146,5	0,3	2	2818	248	293	0,4148	20	2818	6850	293	0,3	20	2818	4954							12 052	
IM Rail	Distance [km]	FC [l/km]	Trips [n]	GHG _{Total} [g/l]	GHG [kg]	Distance [km]	FC [l/km]	2TEU [n]	GHG _{Total} [g/TEUkm]	GHG [kg]	Distance [km]	FC [l/km]	2TEU [n]	GHG _{Total} [g/TEUkm]	GHG [kg]	Distance [km]	FC [l/km]	Trips [n]	GHG _{Total} [g/l]	GHG [kg]	GHG Total	GHG savings [%]	
2018	4,8	0,3	2	2818	8	277		20	8	89	277		20	8	89	36	0,4148	20	2818	842	1 027	-91%	
2019	4,8	0,2985	2	2650	8	277		20	8	89	277		20	8	89	36	0,41273	20	2650	787	972	-92%	
2020	4,8	0,297008	2	2540	7	277		20	8	89	277		20	8	89	36	0,41066	20	2540	751	936	-92%	
2021	4,8	0,295522	2	2450	7	277		20	8	89	277		20	8	89	36	0,40861	20	2450	721	905	-92%	
2022	4,8	0,294045	2	2450	7	277		20	8	89	277		20	8	89	36	0,40657	20	2450	717	901	-93%	
2023	4,8	0,292575	2	746	2	277		20	8	89	277		20	8	89	36	0,40453	20	746	217	397	-96,7%	
2024	4,8	0,291112	2	746	2	277		20	8	89	277		20	8	89	36	0,4772	10	746	128	308	-97,4%	
Year	Distance [km]	EC [kWh/k]	Trips [n]	GHG _{Total} [g/k]	GHG [kg]	Distance [km]	FC [l/km]	2TEU [n]	GHG _{Total} [g/TEUkm]	GHG [kg]	Distance [km]	FC [l/km]	2TEU [n]	GHG _{Total} [g/TEUkm]	GHG [kg]	Distance [km]	EC [kWh/]	Trips [n]	GHG _{Total} [g/k]	GHG [kg]	GHG Total [kg]		
2026?	4,8	3	2	10	0,3	277		20	8	89	277		20	8	89	36	3	10	10	11	189,1	-98,4%	

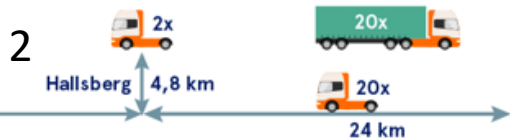


Fordonsrörelser

Tur	Nord		Syd		Trp arb	Nord		Syd		Trp arb		Nord		Syd		Trp arb		Nord		Syd		Trp arb	Nord		Syd		Trp arb	Nord		Syd		Trp arb										
	km	40ft	km	40ft		km	40ft	km	40ft			km	40ft	km	40ft			km	40ft	km	40ft		km	40ft	km	40ft		km	40ft	km	40ft		km	40ft	km	40ft	km	40ft	km	40ft		
1	4,8	0			0	4,8	1			4,8		4,8	0			0	4,8	2			9,6	4,8	0			0	4,8	2			9,6											
2	24	1	24	0	24	24	1	24	1	48		24	1	24	0	24	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96									
3	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
4	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
5	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
6	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
7	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
8	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
9	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
10	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
11	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
12	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
13	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
14	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
15	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
16	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
17	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
18	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
19	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
20	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
21	24	1	24	0	24	24	1	24	1	48		24	1	24	1	48	24	2	24	0	48	24	2	24	2	24	2	24	2	24	2	96										
22	24	0	24	1	24	24	1	24	1	48		24	0	24	1	24	24	1	24	1	48																					
23	24	0	24	1	24	24	1	24	1	48				4,8	0	0																										
24	24	0	24	1	24	24	1	24	1	48																																
25	24	0	24	1	24	24	1	24	1	48																																
26	24	0	24	1	24	24	1	24	1	48																																
27	24	0	24	1	24	24	1	24	1	48																																
28	24	0	24	1	24	24	1	24	1	48																																
29	24	0	24	1	24	24	1	24	1	48																																
30	24	0	24	1	24	24	1	24	1	48																																
31	24	0	24	1	24	24	1	24	1	48																																
32	24	0	24	1	24	24	1	24	1	48																																
33	24	0	24	1	24	24	1	24	1	48																																
34	24	0	24	1	24	24	1	24	1	48																																
35	24	0	24	1	24	24	1	24	1	48																																
36	24	0	24	1	24	24	1	24	1	48																																
37	24	0	24	1	24	24	1	24	1	48																																
38	24	0	24	1	24	24	1	24	1	48																																
39	24	0	24	1	24	24	1	24	1	48																																
40	24	0	24	1	24	24	1	24	1	48																																
41	24	0	24	1	24	24	1	24	1	48																																
42			4,8	0	0			4,8	1	4,8																																
Summa	964,8	20	964,8	20	960	964,8	41	964,8	41	1929,6		508,8	20	508,8	20	960	508,8	22	508,8	22	1017,6		484,8	20	484,8	20	960	484,8	42	484,8	42	1939,2	268,8	20	268,8	20	960	268,8	24	268,8	24	1075,2
			1929,6					1929,6		50%				1017,6							94%				969,6				969,6		50%			537,6				537,6		89%		

Nyckeltal för forsling

20 stycken 40 fots containers tor Hallsberg-Örebro



Performance Indicators		2	3	4	5	Comments
Transport efficiency	[%]	50%	>90%	50%	>90%	
Traffic efficiency	[vkm]	1930	1018	969	538	
Cost	[index]	0%	-47%	-42%	-68%	Capital, driver, fuel, service & maintenance etc
GHG _{total}	[%]	0	-41%	-39%	-47%	

Slutsatser kring Elons transportlösning

- Elektrifieringen genom tågtransport utgör den stora klimatnyttan
- Forsling med duo-trailer:
 - Ökar inte fyllnadsgrad i nuvarande lösning
 - Reducerar antal fordonskm
 - Sänker kostnader
 - Minskar utsläpp av växthusgaser
- Elektrifiering av forsling med "grön" el skulle reducera utsläppen med 30 % av växthusgaser för hela transportkedjan
- Finns det ekonomi och hur ska affärsmodellen för HCT se ut?
- Regelverk och Long-link
- Kompabilitet (kunder, gods, lastbärare (mått och legalt), infrastruktur, trafikslag)
- Transporteffektivitet och terminalutveckling

Frågor

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Frans.Prenkert@oru.se