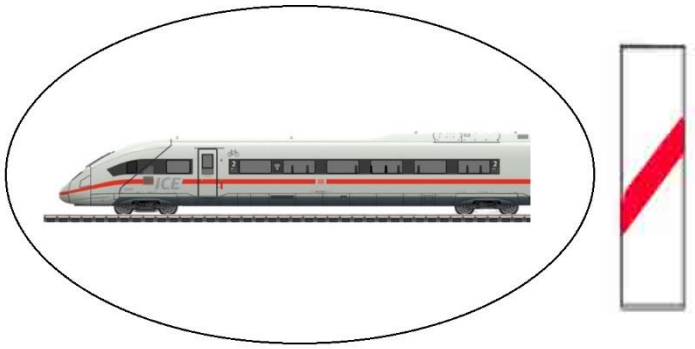
Towards an optimal (passenger) train connection with Germany

Ir. J. de Goeijen Date:2023-April Version 2.5



Content

Chapter 1. An optimal train connection with Germany

1.1 Background

I myself have traveled a lot by train. The Berlin train was one of my favorite international trains. A direct train and the journey time was not too long, just over 4 hours for me, as I usually departed from the German train station Bad Bentheim. There is a broad discussion in my home country the Netherlands about the future fast Amsterdam-Berlin train connection.

When in July 2020 the report "Switch to better international passenger transport by train" was published by the RLI with the conclusion "Improve infrastructure: Invest in one eastern corridor", I hoped to find the quantitative underpinning of this conclusion in this report. I couldn't find that. Then I suddenly had plenty of time because from that moment on we were in the middle of the corona lockdown. That's when I started this research.

1.2 Research

This report examines whether the optimal Passenger train connection with our Eastern neighbours (Germany) with one corridor or with a network connection (2 corridors) is the best solution. The contemporary necessity for substitution from "Plane" to "Train" for the connections to Germany (and beyond) will be the starting point. By seeing the railway as a corridor, it is better used as a transport network and also a structuring part of spatial planning. Rail corridor[1]

Figure 1: One corridor versus the 2 corridor solution

The one-corridor solution assumes that both the international fast connection Amsterdam-Berlin and the international fast connection Amsterdam/Rotterdam-Düsseldorf/Köln runs via Arnhem.

The 2 Corridor solution assumes that the international train connection Amsterdam-Berlin runs via Hengelo and the connection Rotterdam-Düsseldorf/Köln goes via Venlo. With this last solution, the international train traffic from Amsterdam-Düsseldorf/Köln is also handled via Eindhoven/Venlo.

Important research parameters:
- What are the shortest routes?
- What are the fastest routes?
- Which area benefit the most from the (fast) routes?
- How many travelers will travel per border crossing (Hengelo/Arnhem/Venlo).
- What do our eastern neighbours(Germany) want?

See also Appendix 9 – All Reports:

"Towards an optimal (passenger) train connection with Germany"	(1/3)
"Towards an optimal (freight) train connection with Germany"	(2/3)
"Combined Persons + Freight train connection with Germany"	(3/3)

1.3 Conclusion- Summary

1.3.1 Substitution from Airplane to Train (Chapter 2)

Hengelo is the best border crossing to handle substitution train traffic from Schiphol to Northern Germany and beyond. Substitution train traffic from Schiphol to southern Germany can be handled via the Arnhem border crossing or via Venlo. There is no reason from the substitution perspective that this important train traffic should pass through Arnhem.

All substitution train traffic from Eindhoven Airport can be routed via the border crossing Venlo. From Düsseldorf/Köln there are good train connections to both northern and southern Germany and beyond.

1.3.2 The Berlin train (Chapter 3)

In the pre-corona era, the Berlin train was a successful connection with annually increasing passenger numbers. Both from a Dutch perspective and from a German perspective, this is considered to be a very important train connection with prospects for the future.

On April 10, 2019, there was a consultation at ministerial level to significantly shorten travel times on this connection. On June 30, 2020, this led to the addition of a faster train (FV 34b) to the connection Amsterdam- Berlin. This train is 55 minutes faster between Berlin and Hengelo compared to the current travel time. As part of the Deutschlandtakt project, Germany has also opted to have the (fast) Berlin train run via Hengelo.

The Berlin train has a lot of potential for the future. Due to the investment that will be made in the coming years in the German section, both extra/high-speed track and faster trains, there is no reason to move this connection from Hengelo border to Arnhem border.

1.3.3 Length of the routes (Chapter 4)

For the Amsterdam-Berlin connection, the route to Löhne via Arnhem is 78 km longer then the route via Hengelo. If the route "02A Nieuw Hen-Apel (Via Hilversum)" is constructed in the future, this will be an even 11 km shorter route than the current route. This means that the route via Arnhem to Berlin is 89 km longer. That is 31% longer than the new route “02A” via Hengelo.

The following applies to the Rotterdam-Düsseldorf/Köln connection: If in the future it is decided to build a new fast railway track on the Venlo-Neuss route, then the Rotterdam-Dusseldorf (Via Venlo) route will be 28 km shorter than via Arnhem.

The route Rotterdam-Cologne (Via Venlo) is 55 km shorter than the route via Arnhem. On this route, the new connection Venlo-Neuss is used and from Neuss the direct connection to Köln without the detour via Düsseldorf, which provides an optimal connection.

1.3.4 Amsterdam-Berlin Travel times 2030+ (Chapter 7)

When constructing route "02A Nieuw Hen-Apel (Via Hilversum"), a travel time to Berlin of 4:43 minutes is realistic. That is 26 minutes faster than the route via Arnhem. In the latest German plans, a possible shortest travel time between Hengelo-Berlin of 3:14 h/min. referred to as this with an optimal connection at Löhne on the new track and using trains with a Vmax=300 km/h. The travel time between Amsterdam-Berlin via Hengelo would then be 4:30 h/min.

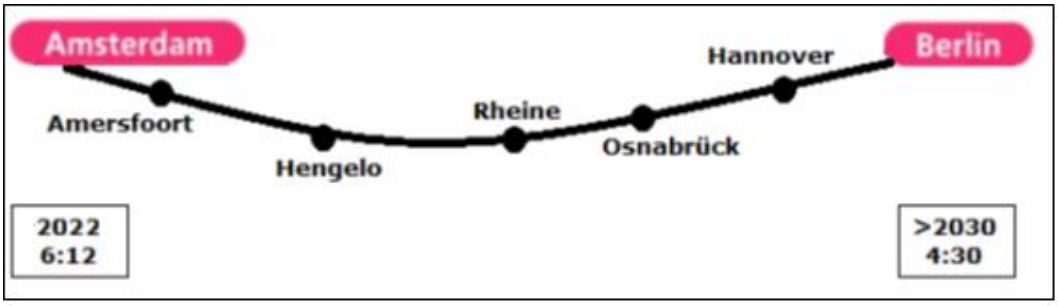


Figure 2: The ICE connection Amsterdam - Berlin

1.3.5 Rotterdam- Düsseldorf/Cologne Travel times 2030+ (Chapter 8)

The Rotterdam-Düsseldorf route via Venlo is 8 minutes faster than the route via Arnhem. The Rotterdam-Cologne route via Venlo is even 32 minutes faster than the route via Arnhem.

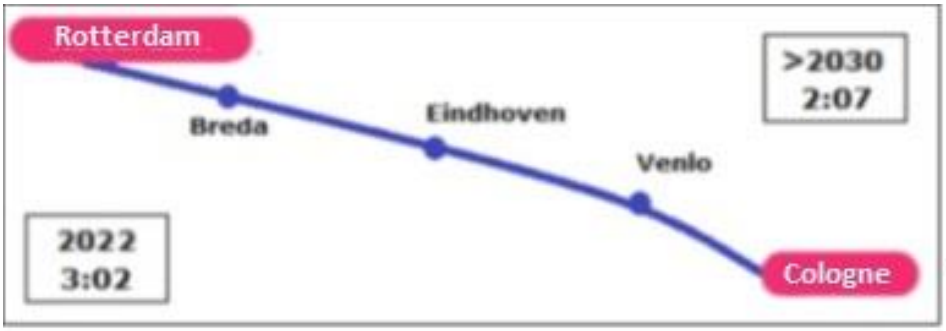


Figure 3: The ICE connection Rotterdam-Cologne

1.3.6 Who benefits in the Netherlands from the new/fast routes (Chapter 6)

For most travelers who want to travel to Berlin, Arnhem is not the obvious border crossing. A traveler from Amersfoort will continue to travel to Berlin via Hengelo, even if a fast Berlin train would run via Arnhem. This also applies to a large part of the southern Netherlands. Venlo will be the best border crossing for these travelers to travel via Düsseldorf to Berlin.

For most travelers who want to travel to Düsseldorf/Cologne, Arnhem is not the obvious border crossing. For a resident of Nijmegen it is even faster to travel to Düsseldorf via the Maaslijn and Venlo than via Arnhem.

Both overviews of Chapter 6. show that the Arnhem border crossing plays a limited role in realizing an optimal fast train connection with Germany. The Hengelo and Venlo border crossings are more suitable for this purpose because of their better location in relation to the parts of the countries to be connected.

(6.2.3 Quantitative substantiation of number of travelers/border crossing to Berlin)

Border Hengelo	Border Arnhem	Border Venlo	Border Other
11.702.559	1.200.000	3.825.943	862.170
66%	7%	22%	5%

Tabel. 1: Traveling from the Netherlands to Berlin

(6.3.4 Quantitative substantiation of number of travelers/border crossing towards Düsseldorf/Cologne)

Border Hengelo	Border Arnhem	Border Venlo	Border Other
0	3.990.066	12.335.606	1.387.000
0%	23%	70%	7%

Tabel 2: Traveling from the Netherlands to Düsseldorf/Cologne

Total = From the Netherlands to (Berlin + Düsseldorf/Cologne)

Border Hengelo	Border Arnhem	Border Venlo	Border Other
11.702.559	5.190.066	16.161.549	2.249.170
33%	15%	46%	6%

Tabel 3: Traveling from the Netherlands to Berlin + Düsseldorf/Cologne

The Arnhem border crossing is the least important border crossing for train traffic (passengers). Venlo is the most important border crossing. For travelers to Berlin, the border crossing Hengelo is the most important border crossing with a market share of 66%.

(6.4 Travelers from Germany (and beyond) to Amsterdam)

	Inhabitants	Border Hengelo	Border Arnhem	Border Venlo	Border Other
Germany	82.966.000	30.522.000	9.380.000	39.219.000	3.920.000
	100%	37%	11%	47%	5%
Germany and beyond	107.966.000	47.522.000	9.308.000	47.219.000	3.920.000
	100%	44%	9%	44%	3%

Tabel 4: Traveling from Germany (and beyond) to Amsterdam

For travelers from Germany (and beyond) the border crossings Venlo and Hengelo are the most used border crossings. The Arnhem border crossing plays a marginal role in this with only 10% of all travelers. Only travelers from (Northern part) of NRW will travel to Amsterdam via the Arnhem border crossing.

1.3.7 TEE Amsterdam-Copenhagen (Chapter 10.3.1)

The best border crossing for the train "TEE 49/50 Amsterdam – Hamburg - Copenhagen" is Hengelo. Infrastructural improvements on the Amsterdam-Osnabrück route benefit both the direct Berlin train and the direct Copenhagen train from Amsterdam.

1.3.8 PCW rapport (Hfst. 9.2)

The PCW report gives us an important conclusion: "Adapting plans to the policy of neighboring countries" For the (fast) Berlin train, the Deutschlandtakt project shows that Germany has chosen to have the Berlin train run via Hengelo. Germany has also opted to run the connection from Amsterdam to Copenhagen via Osnabrück-Hamburg.

Onno van Veldhuizen(Former mayor of Enschede)Ch. 11.2, comes to the same conclusion:
"An international train is not a Dutch train, so what Germany thinks about it is quite decisive what happens with this train.

1.3.9 RLI report - Direct trains (Chapter 9.3.2)

An advice from this report is that travelers prefer direct trains. A direct Amsterdam-Hengelo-Berlin connection is therefore preferable to a connection via Arnhem, where you have to change trains in Duisburg.

A direct connection Rotterdam-Venlo-Cologne is therefore preferable to a Rotterdam-Cologne connection where you have to change trains in Utrecht.

1.3.10 RLI report – one corridor solution (Chapter 9.3.3)

In the RLI report it is insufficiently examined why the "one corridor solution" is the best solution. This is probably the cheapest solution. With this "one corridor solution", too few travelers benefit from this one corridor, and the travel times will not be optimally short, which of course has a very negative effect on the attractiveness of a connection. The ministry I&W still use conclusions from this RLI report, while a large part of this report has been superseded by important decisions taken by Germany in the context of the Deutschlandtakt project. For example the new fast FV.34b connection Amsterdam-Berlin.

1.3.11 Rli report - Unbundling rail transport Freight-Persons(Ch 9.3.5)

For the national/highest level, the choice to have both the main freight corridor (Betuweroute) and the main international passenger transport corridor to Germany handled via the same corridor (Zevenaar-Oberhausen) is a wrong choice.

1.3.12 Upgrade Dresden-Prague (Ch. 10.6)

A new rail connection is built between this Dresden and Prague, reducing the travel time from Berlin to Prague to 2.5 hours. Together with a travel time of 3.5 hours between Hengelo-Berlin, this results in a total travel time of 6 hours between Hengelo-Prague. The Hengelo border crossing will be the best border crossing for a fast train connection from Amsterdam to Prague in a few years' time.

1.3.13 PHS (Ch. 10.7)

Substantial investments are being made on the very important connections Amsterdam-Eindhoven and Rotterdam-Eindhoven on the basis of the Dutch PHS project.
Options for reducing travel times are possible for the Eindhoven to Venlo track. The distance Venlo-Düsseldorf (straight line distance) is only 45 km and the distance Venlo-Köln (straight line distance) is only 73 km. Integration of the plans “PHS South Netherlands” and the “international train connection Rotterdam-Düsseldorf/Cologne” are a missed opportunity here.

1.3.14 De Moreelse tafel (Ch. 10.8)

The Moreelse table concluded earlier: "A fast connection underneath to Germany (Amsterdam/Rotterdam-Eindhoven-Germany) is more practical than top along (Amsterdam-Arnhem-Germany) because the metropolitan region of Rotterdam-The Hague (and large parts of N-Brabant) takes also advantage of it".

1.3.15 Night trains (Ch. 10.9)

Towards Germany, 2 main border crossings can be distinguished for these night trains.
-The North/East route for the train connections to Berlin/Prague and Hamburg/Copenhagen can be completed via the border crossing Hengelo.
-The South route for the train connections to Munich and Austria/Switzerland. With Cologne as an important intermediate station can be reached via the border crossing Venlo or Arnhem.

1.3.16 Green deal/Ambition/Long term (Chap. 10.10)

EU green part is very ambitious. The new European transport policy confirms the important role of rail in achieving the climate goals. For passenger transport, a doubling in 2030 on the European high-speed network and a tripling in 2050 has to be achieved.

These ambitions can only be achieved if the Netherlands takes the right decision now. The above-mentioned ambitions cannot be realized with the cheap “one corridor” solution. Much of the international passenger traffic to Germany cannot be optimally carried out by choosing the above solution. The Hengelo/Venlo “two corridor” solution is the best solution. Many more travelers benefit from this “two corridor” solution and travel times are reduced for a large proportion of travelers, which is necessary for the transition from Plane/Car to train to be successful.

The Arnhem border crossing is preferred for e.g. an IC Amsterdam-Arnhem-Essen-Dortmund. This connection ensures that the north of NRW will have a direct connection with Amsterdam/the Netherlands.

1.3.17 Main conclusion

The 2 corridor solution is the best solution:

Corridor Hengelo

Acceleration of the Amsterdam-Hengelo route for the Amsterdam-Berlin(ICE) and Amsterdam-Copenhagen(ICE) connections. Stop with the unrealistic options Berlin train via Arnhem and a train from Amsterdam to Copenhagen via Groningen

Corridor Venlo

Acceleration Rotterdam-Venlo and new track Venlo-Neuss for the connection Rotterdam-Düsseldorf/Cologne (ICE). Acceleration Amsterdam-Eindhoven (PHS) connects at Eindhoven to the connection to Düsseldorf/Cologne (ICE).

Figure 4: The "2 corridor" solution fits well with the German rail network

1.3.18 Logical reasoning

Logical reasoning can easily lead to the right result.

Figure 5: Logical reasoning in a bar

The EU/the Netherlands has the ambition to have international passenger transport by high-speed trains three times as extensive as it is now by 2050. In addition, all track improvements in the Netherlands within the framework of the PHS project will be realized by 2050.

Important direct fast train connections from the Netherlands in 2050 should be:
- Amsterdam-Berlin
- Amsterdam-Copenhagen
- Rotterdam- Cologne
- Amsterdam-Cologne

This report shows that the (fast) train connection Amsterdam-Berlin will run along the border crossing Hengelo. The route via Hengelo is shorter and faster than via Arnhem. Germany has also opted for the route via Hengelo. The Netherlands should therefore invested heavily in accelerating the Amsterdam-Hengelo route in order to make the Berlin train a success.

The Amsterdam-Copenhagen train connection can benefit from the existing fast infrastructure in the Netherlands and Germany. The route Osnabrück-Hamburg is already driven at a Vmax=200 km/h. Additional billions of investments for an High Speed line Groningen-Bremen are not necessary. The route via Hengelo is also faster than via Groningen. The direct train from Amsterdam-Copenhagen will also run via the Hengelo border crossing.

The train connection Rotterdam-Cologne via Eindhoven will cross the border via Venlo. The route via Venlo is much shorter than via Arnhem and also 32 minutes faster.

For the Amsterdam-Köln route, a border crossing has yet to be chosen. In the context of PHS, there will be a fast connection Amsterdam-Eindhoven in 2050 and there will be also a fast connection Eindhoven-Cologne as part of the Rotterdam-Köln route. Without additional investments, the Amsterdam-Cologne train can also run via the Eindhoven-Venlo route to Köln.

Logical reasoning. Why invest in the Arnhem-Oberhausen route as an High Speed connection if that route is not necessary to optimally connect the Netherlands with Germany?

Chapter 2. From plane to train

Figure 6: Substitution from Airplane to Train

2.1 Introduction

In this chapter we investigate which flight connections can be replaced from the Netherlands with train connections. We do this based on the number of scheduled flights "December 2021" and found on the website. flightconnections[2]

We only take in account the flights that go to Germany and beyond and where the distance is <750 km. No flights were found for the airports of Rotterdam, Groningen and Maastricht that meet the above criteria. Only flights have been found for Schiphol and Eindhoven airports that meet the above criteria.

2.2 Airports

2.2.1 Schiphol

For Schiphol to Germany and beyond, we split the flight connections into a number of flights to Northern Germany (and beyond) and Southern Germany (and beyond).

Destinations (<750 km) and number of flights Germany and beyond

Northern Germany(and beyond)		**Southern Germany(and beyond)**	
Kopenhagen (CPH)	318 fl 621 km	München (MUC)	273 fl 669 km
Berlijn (BER)	243 fl 576 km	Frankfurt (FRA)	249 fl 365 km
Praag (PRG)	172 fl 710 km	Zürich (ZRH)	247 fl 615 km
Hamburg (HAM)	138 fl 366 km	Stuttgart (STR)	148 fl 501 km
Göteborg (GOT)	121 fl 744 km	Bazel(BSL)	127 fl 569 km
Billund (BLL)	120 fl 466 km	Düsseldorf (DUS)	122 fl 182 km
Stavanger (SVG)	93 fl 735 km	Neurenberg (NUE)	86 fl 542 km
Hannover (HAJ)	91 fl 329 km	7x (Airport)	**1.252** (fl /Month)
Aalborg (AAL)	66 fl 611 km		
Bremen (BRE)	61 fl 275 km	fl= number of flights	
Kristiansand (KRS)	42 fl 672 km		
Dresden (DRS)	21 fl 627 km		
12x (Airport)	**1.486** (fl /Month)		

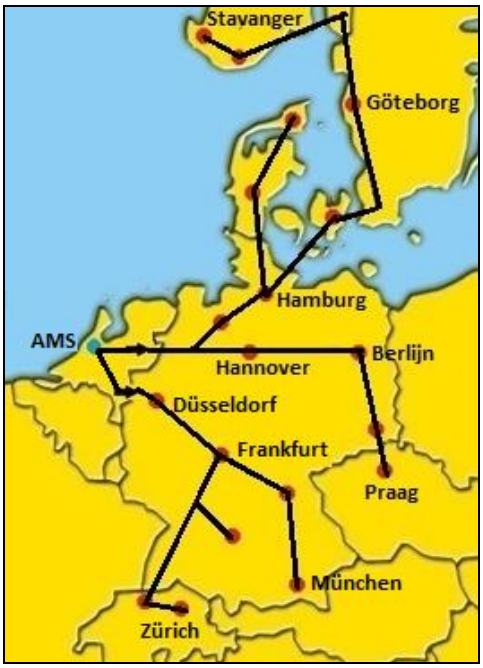


Figure 7: Flight/Train connections from Schiphol

The figure above shows all airports that are located <750 km from Schiphol and to which there are direct connections from Schiphol. The airports are divided into a collection of Northern Germany versus a collection of South Germany.

The airports/cities in Northern Germany can be reached by trains run along the border crossing Hengelo. The destinations Dresden and Prague will be the fastest route via the Hengelo border crossing. Hengelo because the travel time Berlin-Prague, now 4 ½ hours, will be reduced to 2 ½ hours within a number of years.

The airports/cities in southern Germany can be reached by trains run along the border crossing Arnhem or border crossing Venlo.

2.2.2 Eindhoven

Denmark
Kopenhagen 13 fl 664 km

Austria
Innsbruck 25 fl 631 km
Salzburg 12 fl 678 km

Poland <800 km
Poznań 9 fl 792 km
Wroclaw 19 fl 804 km

Czech Republic
Praag 18 fl 646,22 km

Poland >800 KM
Gdańsk 23 fl 939 km
Katowice 26 fl 958 km
Krakau 41 fl 1.026 km
Lublin 13 fl 1.185 km
Modlin 23 fl 1.048 km
Rzeszów 9 fl 1.170 km

Figure 8: Flight/Train connections from Eindhoven

The figure above shows all airports that are located at<750 km from Eindhoven and with direct connections from Eindhoven airport. Poznań and Warsaw airports are mentioned despite the fact that the distance from both airports to Eindhoven are >750 km. This is done because there are direct flight connections from Eindhoven with a total of 9 Polish airports. Despite the greater distance, this still offers opportunities for substitution towards Poland now and in the future.

2.3 Conclusion

What is striking is that the substitution possibilities from Schiphol for northern Germany are greater than southern Germany. 12 airports versus 7 airports and 1,486 flights per month versus 1252 flights.

In the report "Action Agenda Train and Air transport"[3] from November 2020, Northern Germany/Scandinavia is not yet on the map. This is a missed opportunity. Certainly because the travel times to Berlin/Prague and Copenhagen respectively will be significantly shortened in the coming years due to major improvements to the infrastructure, which gives better/more possibilities for substitution for the above mentioned destinations.

Hengelo is the best border crossing to handle the substitution of train traffic from Schiphol to Northern German. The substitution of train traffic from Schiphol to southern Germany can be handled either via the Arnhem border crossing or via Venlo. There is no reason from the substitution perspective that this train traffic should go through Arnhem. All substitution train traffic from Eindhoven airport can be routed via the Venlo border crossing. From Düsseldorf/Cologne, good train connections are available to both North and South Germany and beyond.

Chapter 3. The Berlin train

Figure 9: The Berlin train in action

3.1 Introduction

In this chapter, the current Berlin train is briefly discussed. The success of this train in the post-corona era is discussed and the concrete plans for this train, that Germany in particular has for the coming years in the context of the Deutschlandtakt.

3.2 Berlin train post-corona

3.2.1 International train is Successful

Third record summer in a row for NS International [4]

- Third year in a row increasing number of international rail passengers (2019: 13%, 2018: 10%, 2017: 6,4%)
- Intercity Berlin biggest riser with 19% more passengers

This summer(2019), more passengers opted for the international train. In the months June to August, NS International recorded an average growth of 13% across all destinations. The Intercity to Berlin was the biggest riser with 19% growth. It is the third record summer in a row for NS International Director Heike Luiten of NS International is very pleased with the growth: "NS has big ambitions with the international train. At distances of up to 700 km, the train should be the first choice as far as we are concerned. Towards the south, this is already working well with Thalys and the Intercity Brussels. With Eurostar, we added a train connection last year that takes you quickly and comfortably to the heart of London. And we also have big ambitions for the destination Berlin, although we still need the help of Deutsche Bahn and the Dutch and German governments. In any case, it is not up to the traveler, he wants to."

3.2.2 Intercity Berlin

Intercity Berlin is an absolute leader when it comes to passenger growth. For example, the train is very popular with passengers with Interrail – the multi-day international travel pass. Crowds in the summer months therefore bring the necessary challenges. Luiten: "We advise travelers who book with NS International these months to always reserve a seat. And especially for domestic passengers who also use the Intercity, we run an extra train between Amsterdam and Deventer from June to August. This way, there is also enough space for domestic travelers and extra space is created for travelers across the border."

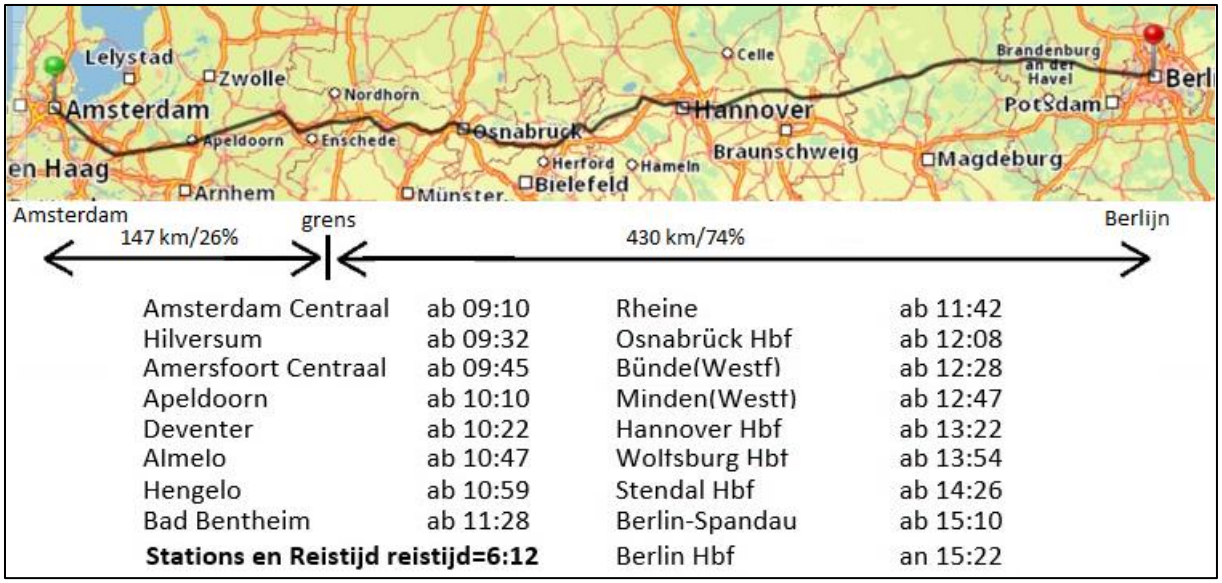


Figure 10: The route and travel time of the Berlin train

3.3 Berlin train pre-corona

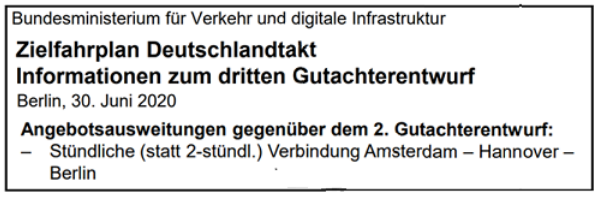
3.3.1 Consultation Germany-The Netherlands on acceleration of berlin train

Figure 11: Consultation on 10 April 2019

The Dutch State Secretary Stientje van Veldhoven and the German State Secretary for Rail Transport, Parliamentary State Secretary Enak Ferlemann, discussed today the improvement of the important Amsterdam-Berlin rail connection. The common objective is to make rail, a particularly environmentally friendly mode of transport, more attractive on this route in order to increase its market share compared to road and air transport.

3.3.2 Modifications(3rd version) Deutschlandtakt

Modifications(3rd version) Deutschlandtakt [6]


Bundesministerium für Verkehr und digitale Infrastruktur

Zielfahrplan Deutschlandtakt
Informationen zum dritten Gutachterentwurf
Berlin, 30. Juni 2020

Angebotsausweitungen gegenüber dem 2. Gutachterentwurf:
– Stündliche (statt 2-stündl.) Verbindung Amsterdam – Hannover – Berlin

Figure 12: Adding fast train Amsterdam-Berlin

The extra train that will run every 2 hours as part of the Deutschlandtakt will only stop at a few stations and will be driven with faster equipment. That is why the travel time between Hengelo (border) and Berlin will be reduced by 55 minutes. For the Germans, the Berlin-Amsterdam route is an important part of Deutschlandtakt. The fast route FV 34b (B->A via H) was even added last year.

Figure 13: The Berlin train from IC to ICE

**When the line speed on the Wolfsburg-Berlin route increases to 300 km/h and ICE 3neo is used and with an optimal connection at Löhne, for the Berlin train, to the Bielefeld-Hannover HSL extension.*

The above travel times can be found on fernbahn.de - by Marcus Grahnert[7]
Train journey to Berlin at the end of 2023 still faster thanks to new fast lease-locomotives [7B].

Stendal and other stations are skipped. With these above mentioned accelerations of the Amsterdam-Berlin route, there are still few opportunities to achieve faster travel times in Germany. If the route between Wolfsburg/Berlin and Hamm/Hannover is made suitable for 300 km/h, trains with a Vmax =300 km/h can also be running on this route, resulting in an even shorter travel time in Germany. In the Netherlands there are still possibilities to achieve a (much) shorter travel time so that the total travel time between Amsterdam and Berlin is (well) below 5 hours. The desired travel time of the NS of 4 hours from 2018 is very unrealistic and will therefore not be achieved. In the Netherlands, work is also carried out in the short term (a few years) for Acceleration of the Berlin train [8]. For the acceleration, it is necessary, among other things, that Oldenzaal station gets an extra platform, and adjustments are made to Deventer station and investments are done on the Hengelo-German border section so that the section speed can increase from 125 km per hour to 140 km per hour.

3.3.4 Substantial increase in passengers when investing in the current Berlin train

Substantial increase in passengers when investing in the current Berlin train [10]

Due to investments in the current track and extra trains from Amsterdam to Berlin, via Apeldoorn and Deventer, between 35,000 and 110,000 extra international passengers will use the current connection in 2040.

3.4 Conclusion

In the pre-corona era, the Berlin train was a successful connection with annually increasing passenger numbers. Both from a Dutch perspective and from a German perspective, this is a very important train connection with perspective towards the future. On 10 April 2019, there was a consultation at ministerial level to significantly reduce the travel times on this connection, This led to the addition of a faster train (FV 34b) to the Amsterdam-Berlin connection on 30 June 2020, from the German government. This train is 55 minutes faster between Berlin and Hengelo compared to the current travel time.

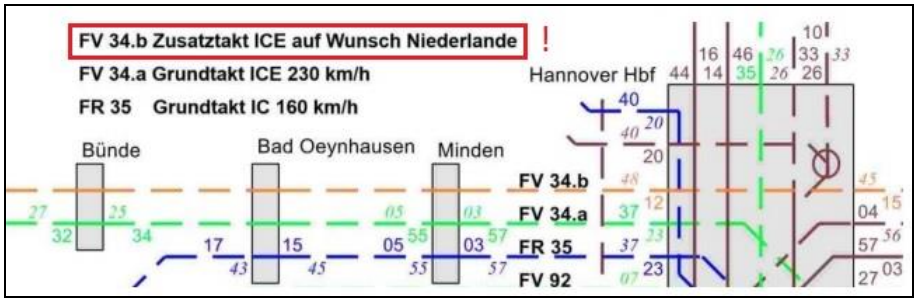


Figure 14: There will be an ICE Amsterdam-Berlin at the request of the Netherlands

The Berlin train was a successful connection until now. Due to the investment that will be made in the coming years on the German part, both extra track and faster trains, there is no reason to shift this connection over, for example, to Arnhem. Germany has also chosen to run the fast Berlin train via Hengelo.

Figure 15: The new ICE connection Amsterdam-Berlin

In Appendix 7 there is a table with the stations/times for the Berlin train, with the same departure time from Hengelo, for all variants.

Chapter 4. Length of the routes

4.1 Introduction

In this chapter, the lengths of the Amsterdam-Berlin routes are determined respectively via Hengelo and Arnhem. Because the routes for the above-mentioned routes from Löhne overlap, only the distances from Amsterdam to Löhne are determined for both routes. The lengths of the Rotterdam-Düsseldorf routes are also calculated via Arnhem and Venlo. These above mentioned data can be used to determine the later optimal trajectory choices.

4.2 Ams-Hen-Ber

Figure 16: The Amsterdam-Berlin route via Hengelo

Station	Distance				
Amsterdam Centraal	0	KM			
Hilversum	28.9	KM	Oldenzaal	167.7	KM
Amersfoort	44.9	KM	Bad Bentheim grens	174,9	KM
Apeldoorn	88.6	KM	Salzbergen	196,7	KM
Deventer	103.2	KM	Rheine	204,5	KM
Almelo	142.1	KM	Osnabruck	252,0	KM
Hengelo	156.7	KM	**Löhne**	**299,1**	**KM**

4.3 Ams- Arn-Ber

Figure 17: The Amsterdam-Berlin route via Arnhem

Station	Distance				
Amsterdam Centraal	0	KM	Duisburg	197,1	KM
Utrecht Centraal	40	KM	Mulheim	203,2	KM
Arnhem Centraal	97.5	KM	Dortmund	251,2	KM
Zevenaar grens	116,9	KM	Hamm	282,4	KM
Oberhausen	189,5	KM	**Löhne**	**377,2**	**KM**

4.4 Rot-Utr-Düsseldorf

Figure 18: The Rotterdam-Düsseldorf route via Arnhem

Route	Distance		Ede-Wageningen	97.3	KM
Rotterdam Centraal	0	KM	Arnhem Centraal	114	KM
Gouda	23.8	KM	Duisburg	213,6	KM
Utrecht Centraal	56.5	KM	**Düsseldorf**	**237,6**	**KM**

4.5 Rot-Ein-Düsseldorf

Figure 19: The Rotterdam-Düsseldorf route via Venlo

Rotterdam Centraal	0	KM	Eindhoven	104.3	KM
Breda	45.8	KM	Venlo	156.2	KM
Tilburg	67.4	KM	**Düsseldorf**	**201,2**	**KM**

4.6 Conslusion

Amsterdam - Löhne	Distance	Percentage
Via Hengelo	**299,1 km**	**100 %**
Via Arnhem	**377,2 km**	**126%**

Tabel 4: The route Amsterdam – Löhne

The route via Arnhem to Berlin is 78 km longer. The route via Arnhem is 26% longer

Rotterdam-Düsseldorf	Distance	Percentage
Via Venlo	214,6 km	**100 %**
Via Arnhem	237,6 km	**111%**

Tabel 5: The route Rotterdam-Düsseldorf

The route via Arnhem to Düsseldorf is 23 km longer. The route via Arnhem is 11% longer

Chapter 5. Travel times of the routes

5.1 Introduction

In this chapter, the travel times of the 4 routes mentioned in Chapter 4 are determined. For the parts of the routes that are located in Germany, the travel times are based on the travel times from the Deutschlandtakt. Germany has already made choices in the project Deutschlandtakt. For the travel times of the Dutch part of the routes, the current (2022) travel times are used. The Netherlands has not yet made any choices for the acceleration of our 4 routes.

5.2 Ams-Hen-Ber

Stammdaten Zug-ID	20300100244
Fahrplanjahr	Deutschlandtakt
Zuggattung	ICE (InterCityExpress)
Zugnummer	244
Höchstgeschwindigkeit	250 km/h
IC/ICE-Typ	ICE 3 Velaro D
Zuglinie	FV 34.b

Fahrplan		
Bahnhof	an	ab
Amsterdam		14:24 (Amsterdam - Hengelo 1:47 min.)
Hengelo	16:11	16:13
Rheine	16:42	16:44
Osnabrück Hbf	17:09	17:11
Hannover Hbf	18:12	18:15
Berlin-Spandau	19:31	19:33
Berlin Hbf	19:42	

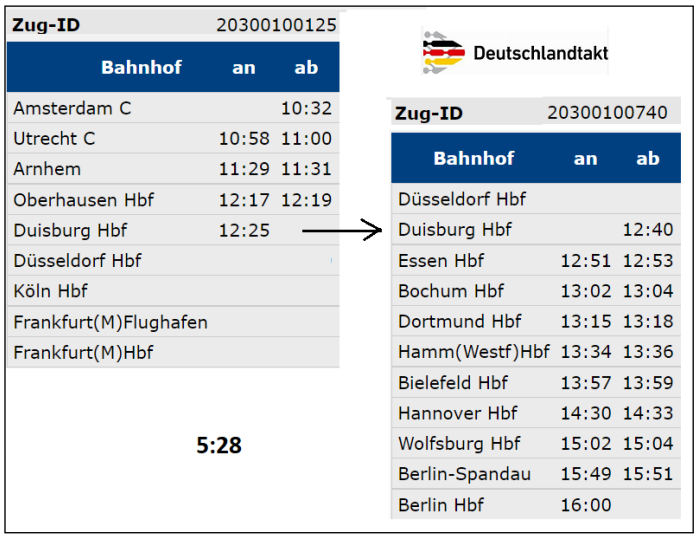
Until Hengelo(2022):	1:47 Hour/Min.
Stop Hengelo:	0:02 Hour/Min.
Hengelo-Berlijn(DT)	3:29 Hour/Min.
Total:	5:18 Hour/Min.

Figure 20: The Osnabrück-Hannover section

Determination average speed for this route (Osnabrück – Hannover)

Train Vmax=250 km/h
Straight line distance (115,11 km)
Number of stops 0
Duration: Total=1:01
On this route **V(average)=113,11 km/h**

5.3 Ams- Arn-Ber



Zug-ID	20300100125	
Bahnhof	an	ab
Amsterdam C		10:32
Utrecht C	10:58	11:00
Arnhem	11:29	11:31
Oberhausen Hbf	12:17	12:19
Duisburg Hbf	12:25	
Düsseldorf Hbf		
Köln Hbf		
Frankfurt(M)Flughafen		
Frankfurt(M)Hbf		

5:28

Deutschlandtakt

Zug-ID	20300100740	
Bahnhof	an	ab
Düsseldorf Hbf		
Duisburg Hbf		12:40
Essen Hbf	12:51	12:53
Bochum Hbf	13:02	13:04
Dortmund Hbf	13:15	13:18
Hamm(Westf)Hbf	13:34	13:36
Bielefeld Hbf	13:57	13:59
Hannover Hbf	14:30	14:33
Wolfsburg Hbf	15:02	15:04
Berlin-Spandau	15:49	15:51
Berlin Hbf	16:00	

Figure 21: Determination of transfer time at Duisburg

Until Duisburg(2022): 1:53 Hour/Min.
Train transfer Duisburg:0:15 Hour/Min.
Duisburg-Berlijn(DT): 3:20 Hour/Min.
Total: 5:28 Hour/Min.

Determination average speed for this route (Oberhausen – Hannover)
Train Vmax=300 km/h
Straight line distance (220,89 km) (This train route is 273.0 km long)
Number of stops 7(DUI-ES-BO-DORT-HAM-BIE-HAN)
Travel time: Total=2:11 (train transfer Duisburg 15 minutes)
On this route **V(average)= 102,2 km/h**
ON THIS ROUTE THERE IS A STOP EVERY 31 KM! (220,89/7)

5.4 Rotterdam-Utrecht-Düsseldorf

08:05 Rotterdam Centraal
08:13 / 08:13 Rotterdam Alexander
08:23 / 08:24 Gouda
08:42 Utrecht Centraal

Bahnhof	an	ab
Amsterdam C		08:32
Utrecht C	08:58	09:00
Arnhem	09:29	09:31
Oberhausen Hbf	10:17	10:19
Duisburg Hbf	10:25	10:27
Düsseldorf Hbf	10:38	10:40

Figure 22: Determination of transfer time at Utrecht

Travel time: 2:33 min.
Distance = 177 km
V(average)=69 km/hour.

If we add the travel time from residential address to station on both sides of this route, we have to add another 2 x 15 minutes. The actual V(average) will be 58 km/h (see below). That's very low.
Time: 2:33 min. 153 min. + 2x15 = 183min. Distance = 177 km -> V(average)=58 km/h.

5.5 Rotterdam-Eindhoven-Düsseldorf

Figure 23: Determination of the transfer time at Eindhoven

Travel time: 2:43 min.

5.6 Conclusion

Ams - Berlijn	today(2022)	Stop/Transfer	Deutschlandtakt(2030)	Total
Via Hengelo	1:47 (to Hengelo)	2 min.	3:29 (from Hengelo to Berlin)	5:18
Via Arnhem	1:53 (to Duisburg)	15 min	3:20 (from Duisburg to Berlin)	5:28

Tabel 6: The route Amsterdam-Berlin

Why is the travel time via Arnhem to Berlin longer then via Hengelo:

- Arnhem route much longer (78 km)
- Arnhem route has more stops in Germany. Especially on the Oberhausen-Hannover section because there are 7 stops there. The V(average)= 113 km/h on the Osnabrück-Hannover section is higher than V(average)=102 km/h on the Oberhausen-Hannover section.
- The train via Hengelo to Berlin also benefits from some infrastructural improvements as part of the Deutschlandtakt project.

Based on the above travel times, the route via Hengelo is faster than via Arnhem.

Rot - Dus	today(2022)	Stop/transfer	Deutschlandtakt(2030)	Total
Via Venlo	1:01 (to Eind)	7 min.	1:35 (from Eind to Dus)	2:43
Via Arnhem	0:37 (to Utrecht)	16 min	1:40 (from Utr to Dus)	2:33

Tabel 7: The route Rotterdam-Düsseldorf

Based on the above travel times, the route via Arnhem to Düsseldorf is faster than via Venlo.
The travel times are far too high via both routes. In the Netherlands, considerable investments will have to be made to achieve acceptable travel times so that many travelers will use this connection.
In "Appendix 6 High-speed trains in China" I briefly discuss the Chinese High Speed network. In particular, the important connection "Shanghai-Nanjing" is compared with the Dutch/European situation.

V-average	km/h
Rotterdam- Köln (2022 Arnhem)	67
Rotterdam- Köln (>2030 Eindhoven)	96
Shanghai-Nanking (2022)	274

Tabel 8: Comparing the averages speeds

Conclusion : The Rotterdam-Cologne (2022 Arnhem) connection by train has a V-average of only 67 km/h. The important Shanghai-Nanking train connection in China has a V-average of 274 km/h. Within the Netherlands/Europe, major steps still need to be taken to reduce the travel time in particular the Rotterdam-Cologne connection.

Chapter 6. Who benefits from an improvement of a route

6.1 Introduction

In the discussion of what the best routes are, we have discussed the length and travel time of the routes in the previous chapters. What is usually missing is: "which travelers can benefit from an acceleration of a certain route"? I will examen this in this section.

For example, if the Arnhem-Oberhausen route is accelerated in the context of the Berlin train, the city Arnhem and its surroundings will of course benefit from this. The travelers from e.g. Amersfoort and Apeldoorn do not benefit from the above mentioned acceleration.

This chapter visualizes which areas/places benefit from an improved train connection for both the Netherlands-Berlin connection and the Netherlands-Düsseldorf/Cologne connection.

6.2 The route to Berlin/Hamburg

6.2.1 The current situation

6.2.1.1 Hans Buijtelaar

Hans Buijtelaar – International starters [12]

The radio program Pointer deals with the Berlin train. It has to be faster to be a good alternative to cars and planes. The number of passengers also counts. Amersfoort has, after Amsterdam and Berlin, the most starters per day.

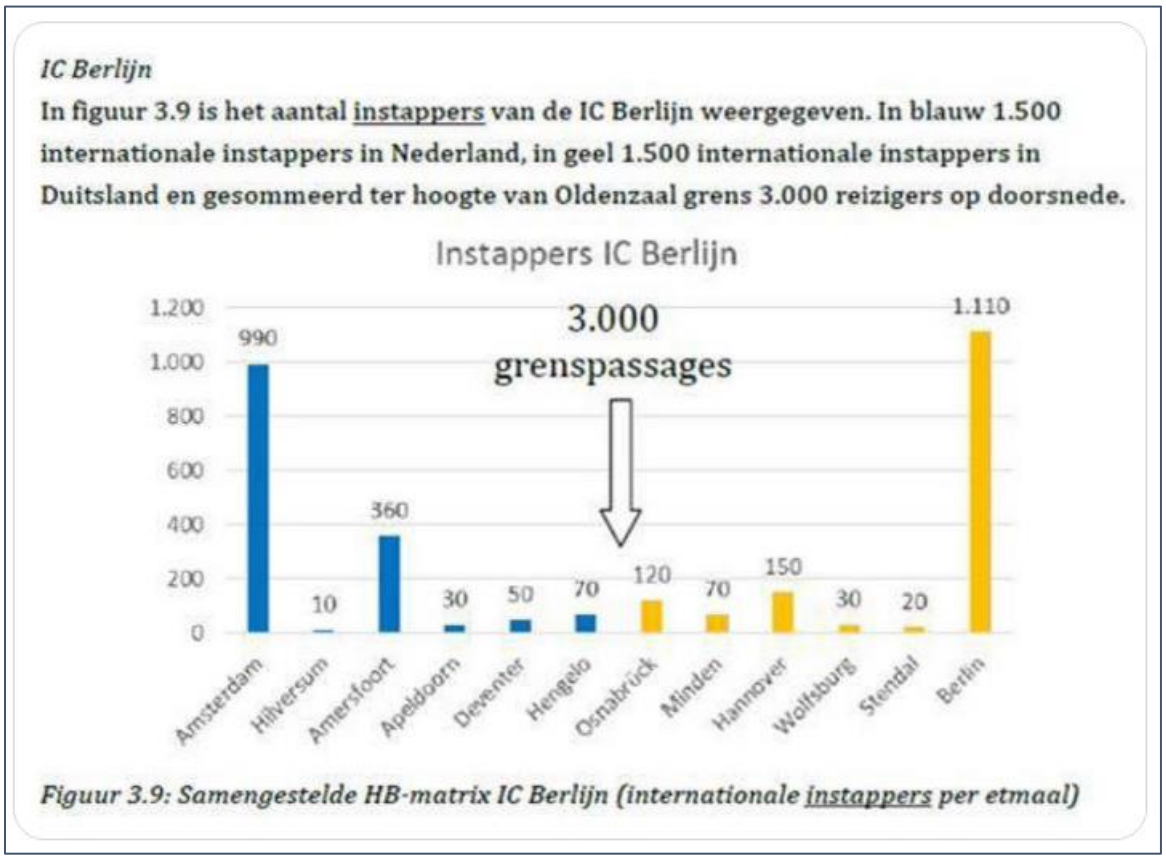


Figure 24: International starters per day

6.2.1.2 CAS

Door CAS[13]

door **Cas**
wo 05 jan 2022, 16:15

Forum: OV in het buitenland
Onderwerp: Intercity Berlijn
Reacties: 486
Weergaves: 51034

the 'best' route (each additional transfer counts for 15 minutes on top of the journey time), all transfers possible, scheduled for 10 February 2022 08:00.

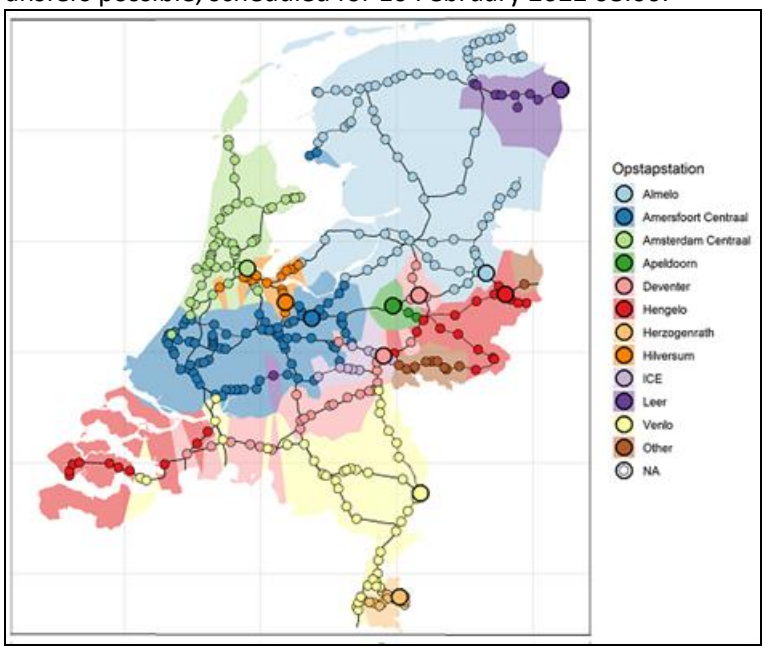


Figure 25: Boarding stations Berlin train

After the reports here about the importance of the various IC Berlin stops, I was curious about which stops are important for the whole country. A Christmas holiday project later there is this, a card 'how-to-send-hafas-you-to-Berlin':

What I get out of this:
- Amersfoort is important for the southern Randstad, Utrecht and parts of Brabant. Those regions therefore probably suffer a lot from a diversion via Zwolle.
- Twente is important for large parts of the east and north. Most of the supply to Almelo is via Zwolle, so Hengelo could easily take over.
- Hilversum and Apeldoorn have no use outside their immediate surroundings.
- Domestic frequency matters a lot. Deventer has a lot of potential for Brabant/Gelderland,

6.2.2 Future situation (>2030) Berlin

Figure 26: By train from the Netherlands to Berlin

Now we are going to describe the situation after implementing all the improvements of the cross-border connections with Germany. There is a fast infrastructure between Amsterdam/Utrecht to Hengelo, from Amsterdam to Arnhem and beyond and a fast infrastructure from Rotterdam to Eindhoven/Venlo and Cologne. We also include all new local cross-border connections in this overview.

This report concluded that the fastest connection between Amsterdam and Berlin is via Hengelo. Travelers from Amsterdam/Utrecht region will travel to Berlin via Hengelo.

In the figure above you can see from the color of the City which route/border crossing is followed when traveling to Berlin by train. Most travelers from the Netherlands will travel via the Hengelo border crossing. That's all black colored cities. The southern Netherlands will mainly travel via Venlo and from cities close to the German border, travelers will often travel via a local border crossing. A very limited group of travelers will use the Arnhem border crossing when traveling to Berlin. In the next section, we determine the number of potential travelers for all the border crossings just mentioned.

6.2.3 Quantitative substantiation of the number of travelers/border crossing towards Berlin

Figure 26B: Map of the Netherlands

In this section we determine for each province which border crossing will be traveled over on the route to Berlin. The choices made to arrive at the table below are set out in Appendix 4.

Province	Inhabitants	Border Hengelo	Border Arnhem	Border Venlo	Other Overig
Zuid-Holland	3.753.944	3.753.944	0	0	0
Noord-Holland	2.909.827	2.909.827	0	0	0
Noord-Brabant	2.592.874	0	100.000	2.492.874	0
Gelderland	2.110.472	1.110.472	1.000.000	0	0
Utrecht	1.369.873	1.269.873	100.000	0	0
Overijssel	1.171.910	1.171.910	0	0	0
Limburg	1.118.302	0	0	946.302	172.000
Friesland	654.019	654.019	0	0	0
Groningen	590.170	0	0	0	590.170
Drenthe	497.743	397.743	0	0	100.000
Flevoland	434.771	434.771	0	0	0
Zeeland	386.767	0	0	386.767	0
Totaal	**17.590.672**	**11.702.559**	**1.200.000**	**3.825.943**	**862.170**
Perc.	**100%**	**66%**	**7%**	**22%**	**5%**

Tabel 9: Number of travelers for each province via each border crossing towards Berlin

The table above shows that 66% of Dutch travelers will travel to Berlin via the Hengelo border crossing. Border crossing Venlo comes in 2nd place with a potential of 22% travelers.

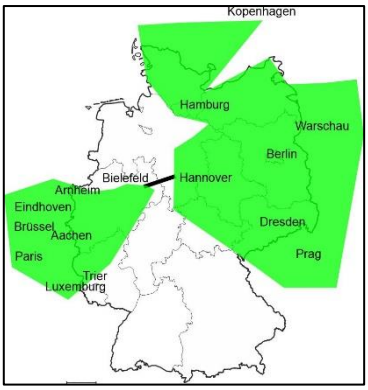


Figure 27: Acceleration Bielefeld-Hannover

Acceleration Bieleveld-Hannover[12B]

The figure on the left shows which areas benefit from the acceleration of this route. This is in line with Figure 26 of this document. Arnhem and the south of the Netherlands will benefit. Most travelers from the green area (left) will NOT cross the border via Arnhem. Most travelers, e.g. from Eindhoven, will travel via Venlo via Düsseldorf to Berlin..

6.3 The route to Düsseldorf – Cologne and beyond

Figure 28: By train from the Netherlands to Düsseldorf

6.3.1 Future situation (>2030)

In this section we are going to describe the situation after implementation of all the improvements of the cross-border connections with Germany. So both a fast infrastructure between Amsterdam/Utrecht to Hengelo, from Amsterdam to Arnhem and beyond and a fast infrastructure from Rotterdam to Eindhoven/Venlo and beyond. As an extra, we take into account that a fast infrastructure between Amsterdam-Eindhoven will also be realized in 2030. Some local cross-border connections are also included in this overview. Of course, not to forget that the lely-line has also been realized.

This report shows that the fastest connection between Rotterdam-Düsseldorf/Cologne is via Venlo and that the fastest connection between Amsterdam-Cologne is via Venlo.

In the figure above you can see from the color of the city which route/border crossing is followed when travelling by train to Düsseldorf/Cologne. Most travelers from the Netherlands will travel via the Venlo border crossing. That's all blue colored cities. Many travelers from cities near the German border will travel through a local border crossing. These cities are all green colored. A very limited group of travelers will use the Arnhem border crossing when travelling to Düsseldorf/Cologne.

6.3.2 Nijmegen

The city of Nijmegen has been given the color BLUE in the figure above. This means that if you want to travel from Nijmegen to Düsseldorf-Cologne and beyond, the fastest connection is via the Venlo border crossing.

Distance			
Nijmegen-Arnhem	19 km	**Nijmegen**- Venlo	60 km
Arnhem-Duisburg	100 km		
Duisburg-**Düsseldorf**	24 km	Venlo-**Düsseldorf**	45 km
Total	143 km		105 km

The distance of the route via Arnhem is 38 km longer. That's 36% more.

Travel time in 2022: (Bahn.de)
Nijmegen – Düsseldorf (Via Arnhem)
15:13 – 16:46, 1h 33min , 1 transfer
Distance 93 km
V(average)= 60 km/h
Deputy Patrick van der Broeck expects that due to the electrification of the Maas line, an express train can run between Nijmegen and Maastricht. That express train stops at fewer stations and half an hour of time saved[14].

ProRail: Maaslijn will be electrified by the end of 2024[15].

Nijmegen Venlo in 40 minutes by an express train.
Venlo Düsseldorf in 21 min by an express train.
Total= 40 + 5(transfer) + 21= 1: 06 h/min.

6.3.3 Enschede

The city Enschede is GREEN in the figure above. This means that if you want to travel from Enschede to Düsseldorf-Cologne and beyond, the fastest connection is via the Enschede-Gronau border crossing(Other).

Distance			
Enschede-Arnhem	82 km	**Enschede**- Munster	65 km
Arnhem-Duisburg	100 km		
Duisburg-**Düsseldorf**	24 km	Munster-**Düsseldorf**	125 km
Totaal	206 km		190 km

The distance via Arnhem is 16 km longer. That's 8% more.

In 2022, the travel time is: (Bahn.de)
Enschede– Düsseldorf (Via Arnhem)
10:04 – 12:46 , 2h 42min, 3 Transfers
Distance= 111 km
V(average)= 41 km/h

Fast, comfortable and sustainable travel with EuregioRail[16].

On the German side, the frequency of trains is also increased and the travel time is shortened, both towards Münster and Dortmund. This also requires the extension of the tracks. From 2028, passengers will benefit from this.

Figure 29: The new railway lines from the east of the Netherlands to Germany

6.3.4 Quantitative substantiation of number of traveler's/border crossing towards Düsseldorf/Cologne

In this section we determine for each province which border crossing will be crossed on the route to Düsseldorf/Cologne.

Province	Inhabitants	Border Hengelo	Border Arnhem	Border Venlo	Border Other
Zuid-Holland	3.753.944	0	253.000	3.553.944	0
Noord-Holland	2.909.827	0	0	2.909.827	0
Noord-Brabant	2.592.874	0	0	2.592.874	0
Gelderland	2.110.472	0	1.710.472	400.000	0
Utrecht	1.369.873	0	269.000	1.169.873	0
Overijssel	1.171.910	0	571.910	0	600.000
Limburg	1.118.302	0	0	518.302	600.000
Friesland	654.019	0	150.000	504.019	0
Groningen	590.170	0	500.170	0	90.000
Drenthe	497.743	0	400.743	0	97.000
Flevoland	434.771	0	134.771	300.000	0
Zeeland	386.767	0	0	386.767	0
Total	**17.590.672**	**0**	**3.990.066**	**12.335.606**	**1.387.000**
Perc.	**100%**	**0%**	**23%**	**70%**	**7%**

Tabel 10: Number of travellers for each province via each border crossing towards Düsseldorf/Köln

The table above shows that 70% of Dutch travelers will travel across the Venlo border crossing to Düsseldorf/Cologne. Border crossing Arnhem comes in 2nd place with potential 23% travelers.

6.4 Travelers from Germany (and further) to Amsterdam

6.4.1 Introduction

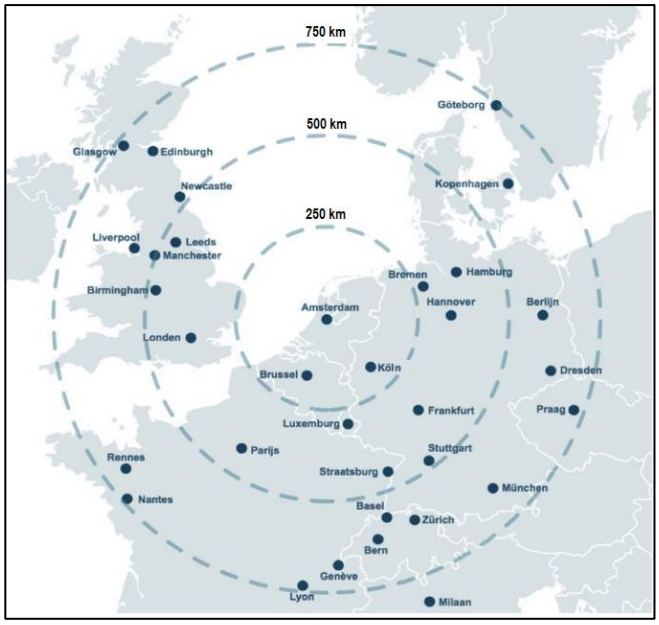


Figure 30: Potential passengers for the train to Amsterdam

In the previous paragraphs, it was investigated at which border crossing travelers from Amsterdam/Rotterdam travel when travelling towards Berlin or Düsseldorf/Cologne. In this section, we're going to explore the same starting from the other side. Or if travelers travel from Germany and further to Amsterdam which border crossing do these travelers take.

We will take the 750 km distance from Amsterdam as a border. This 750 km border is often taken as a starting point for the possibility of substitution from Plane to Train.

Figure 31: Germany/Länder Germany/Kreise

Germany is divided into 16 federal states (Bundesländer). As can be seen in figure 31(Left).Within these Länder there are regional administrative units called Kreis. In figure. 31(Right) we see the Kreis subdivision of the Bundesländ NRW.

We will investigate per Bundesländ which border crossing is being travelled between Germany and Amsterdam. If there is a Bundesländ from which you can travel over several border crossings, the same exercise is done at Kreis level for this Bundesländ.

The numbers on which the cities are colored on the Map and the Table below are filled are listed in Appendix 5.

Figure 32: The Border Crossings to Germany

Germany-Amsterdam	Inhabitants	Border Hengelo	Border Arnhem	Border Venlo	Border Other
Nrw	17.925.000	875.000	9.380.000	4.865.000	2.880.000
Bayern	13.177.000	0	0	13.177.000	0
Baden-Wurtenberg	11.125.000	0	0	11.125.000	0
Niedersachsen	8.027.000	6.987.000	0	0	1.040.000
Hessen	6.025.000	1.221.000	0	4.804.000	0
Reinland-Paltz	4.106.000	0	0	4.106.000	0
Sachsen	4.043.000	4.043.000	0	0	0
Berlin	3.677.000	3.677.000	0	0	0
Schleswig-Holstein	2.922.000	2.922.000	0	0	0
Brandenburg	2.538.000	2.538.000	0	0	0
Sachsen-Anhalt	2.169.000	2.169.000	0	0	0
Thuringen	2.109.000	1.949.000	0	160.000	0
Hamburg	1.854.000	1.854.000	0	0	0
Mecklenburg-V-Pom	1.611.000	1.611.000	0	0	0
Saarland	982.000	0	0	982.000	0
Bremen	676.000	676.000	0	0	0
Total	**82.966.000**	**30.522.000**	**9.380.000**	**39.219.000**	**3.920.000**
	100%	**37%**	**11%**	**47%**	**5%**
Denemarken	6.000.000	6.000.000	0	0	0
Polen (part)	6.000.000	6.000.000	0	0	0
Oostenrijk (part)	2.000.000	0	0	2.000.000	0
Zwitserland (part)	4.000.000	0	0	4.000.000	0
Sweden (part)	1.000.000	1.000.000	0	0	0
Tsjechië (partl)	6.000.000	4.000.000	0	2.000.000	0
Total	**107.966.000**	**47.522.000**	**9.308.000**	**47.219.000**	**3.920.000**
	100%	**44%**	**9%**	**44%**	**3%**

Tabel 11: Number of passengers for each Bundesland to Amsterdam

The table above shows that many travelers will travel from Germany and further to Amsterdam over the Hengelo border crossing and the Venlo border crossing. Few travelers will travel across the Arnhem border crossing. Only passengers from NRW will travel to Amsterdam at the Arnhem border crossing. 50% of all potential travelers from NRW also travel through other border crossings to Amsterdam.

6.5 Travelers from Germany (and further) to Rotterdam

For travelers who want to travel from Germany (and further) to Rotterdam, the border crossing in question will differ little from traveling to Amsterdam. Some cases, where another border crossing will be used, will be discussed below.

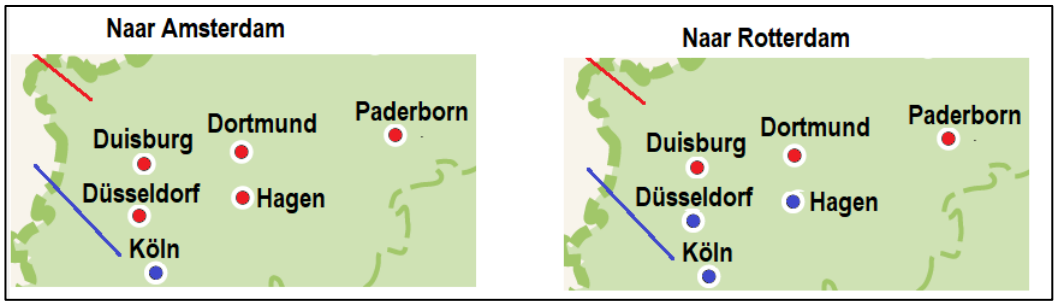


Figure 33: Travel to Amsterdam compared to Rotterdam from Düsseldorf/Hagen.

As can be seen in the figure above, travelers from the vicinity of Düsseldorf and Hagen will travel across the Venlo border crossing to Rotterdam. So fewer travelers compared to destination Amsterdam for the Arnhem border crossing and more travelers for the Venlo border crossing.

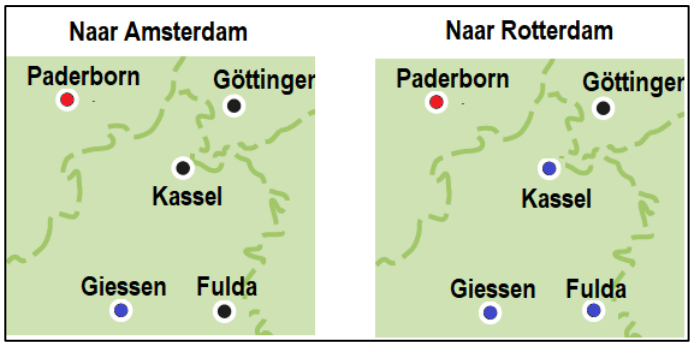


Figure 34: Travel to Amsterdam compared to Rotterdam from Fulda/Kassel.

As can be seen in the figure above, travelers from the surroundings of Fulda and Kassel will travel across the Venlo border crossing to Rotterdam. So fewer travelers compared to destination Amsterdam for the Hengelo border crossing and more travelers for the Venlo border crossing.

For the destination Rotterdam, the border crossing Venlo is even more dominant for travelers from Germany (and beyond) than for the destination Amsterdam.

6.6 Conclusion

For both the connection from the Netherlands to Berlin and the connection to Düsseldorf/Cologne, the Arnhem border crossing does not play a major/dominant role in a level playing field. What is striking is that even for the city of Nijmegen, a trip to Düsseldorf/Cologne is the fastest via Venlo and not via Arnhem.

Total= From the Netherlands to (Berlin + Düsseldorf/Köln)

		Grens Hengelo	Grens Arnhem	Grens Venlo	Grens Overig
Nederland	Totaal	11.702.559	5.190.066	16.161.549	2.249.170
Perc.	100%	33%	15%	46%	6%

Tabel 12: Number of travelers from the Netherlands to Berlin + Düsseldorf/Köln

From Germany (and beyond) to Amsterdam

	Inwoners	Grens Hengelo	Grens Arnhem	Grens Venlo	Grens Overig
Duitsland	107.966.000	47.522.000	9.308.000	47.219.000	3.920.000
en verder	100%	44%	9%	44%	3%

Tabel 13: Number of travelers from Germany (and further) to Amsterdam

The vast majority of travelers from Germany (and further) to Amsterdam will not use the Arnhem border crossing. Both the Hengelo border crossing and the Venlo border crossing, each with a 44% market share, are much more important border crossings than the Arnhem border crossing.

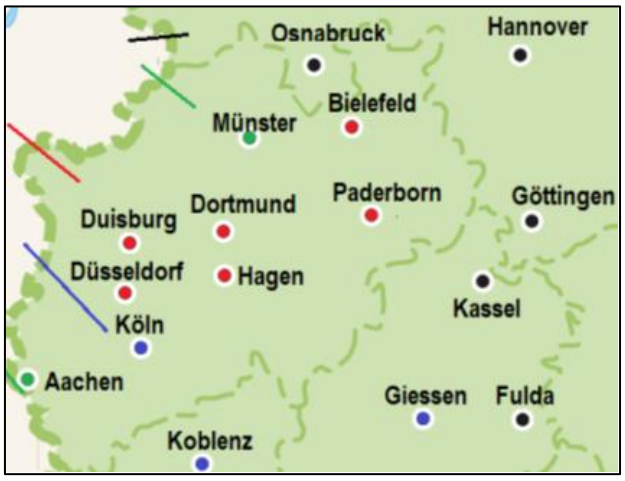


Figure 35: Travelers from Germany to Amsterdam

As can be seen in the figure above, only travelers from the North of the state of NRW will use the Arnhem border crossing when traveling to Amsterdam. For the areas around Aachen and Münster, these travelers will travel to Amsterdam via local border crossings. The fastest way to travel to Amsterdam from Köln, and further south, is via the Venlo border crossing.

Hfst 7. Improvement/Acceleration route Amsterdam – Hengelo

7.0 Introduction

With the plans within the Deutschlandtakt (2030+) project, Germany has taken significant steps to, among other things, accelerate the travel time between Berlin and the Dutch border. Now it is up to the Netherlands to shape the acceleration on the Dutch border route. In this chapter, 6 alternative routes are compared for the Amsterdam-Hengelo route. The goal is to get a broad acceleration on the above-mentioned trajectory with the least/realistic investment.

7.1 Route 01 - New line Hengelo-Utrecht

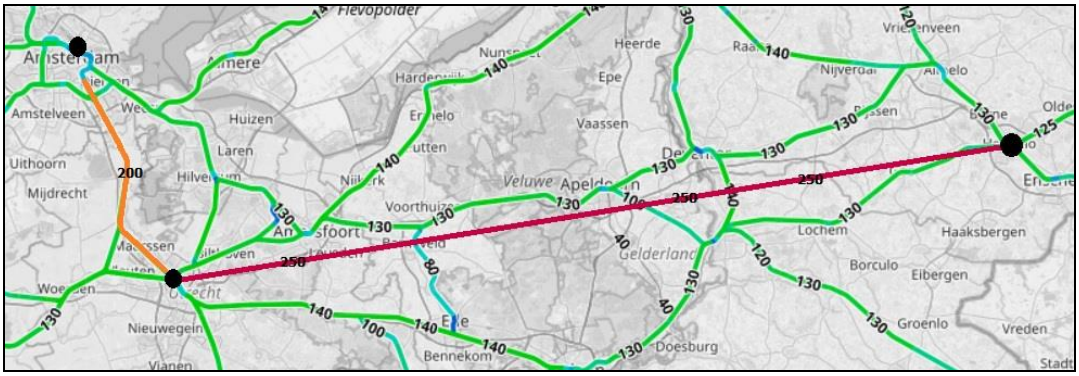


Figure 36: The new Hengelo-Utrecht railway line

7.1.1 Introduction

The fastest connection from Amsterdam to Hengelo could be realized by building a new direct line Amsterdam-Hengelo. From Utrecht there are good connections to Amsterdam, Rotterdam, The Hague and Eindhoven, which justifies the construction of the new Utrecht-Hengelo railway line.

The new Hengelo-Utrecht route will be built for trains with a Vmax=250 km/h. On the Utrecht-Amsterdam route, the Vmax=200 km/h.

The distance (straight line) between Utrecht-Hengelo is 115 km. This is a good length for an HSL route without a stopover.

7.1.2 Length

Amsterdam – Utrecht	40 km
Utrecht-Hengelo	115 km
Totaal	155 km

This route is 1.7 km shorter than the current route (156.7 km)

7.1.3 Travel time

Calculation of travel time over this new route with a length of 115 km and a Vmax = 250 km / h.

Compare with the ICE Hannover – Wurzburg Vmax=250 km/h
Traject Fulda – Wurzburg
Distance= 86 km
Travel time= 34 min.

Our route is 115 km there must be with the above example so 115-86 = 29 km extra driven be with maximum speed. 29 km driving with Vmax(250)= 29/250 x 60= 7,0 min.

For Distance= 115 km, the total journey time becomes 34 + 7.0 min = 41.0 min.

If we look at NS.nl website then the fastest travel time Hengelo-Utrecht is 1:29 = 89 min.
The faster journey time of the new line 89-41 = 48 min.

0:20 (Amsterdam-Utrecht)
0:02 (Stop Utrecht)
0:41 (Utrecht-Hengelo) (Amsterdam-Hengelo 1:03)
0:02 (Stop Hengelo)
3:29 (Hengelo naar Berlijn)
4:34 Total (Amsterdam-Berlijn hbf)

7.1.4 Conclusion

This is a fast route. Due to a large (115 km) new high speed rail. This solution has also a high price tag.

7.2 Route-02 New line Hengelo-Apeldoorn

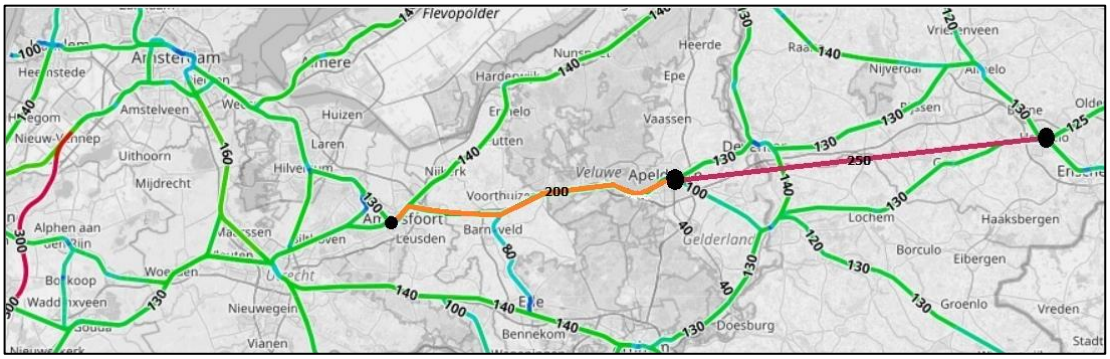


Figure 37: The new Hengelo-Apeldoorn railway line

7.2.1 Introduction

In order to accelerate the Hengelo-Randstad route, the Hengelo-Deventer route must be avoided because the capacity of this route is already at its maximum number of trains. Between Hengelo-Wierden there are already 10 trains per hour/direction. By building a new railway line between Hengelo-Apeldoorn, the busy Hengelo-Deventer section can be avoided and considerable time savings can be achieved.

Upgrading the Apeldoorn-Amersfoort route to a V(max)=200 km/h is relatively easy/cheap. On the subsequent route Amersfoort-Amsterdam (via Hilversum) it is difficult to increase the V(max) to 200 km/h. That is why it was decided to investigate 2 routes from Amersfoort to Amsterdam:

- Route-2A Amersfoort-Amsterdam (Via Hilversum)
- Route-2B Amersfoort-Amsterdam (Via Utrecht)

7.2.2 Route 2A

Figure 38: The variant Amersfoort – Amsterdam along Hilversum

7.2.2.1 Introduction

The Amsterdam-Amersfoort route is a short route (45 km). This route runs through an urban area and there are already many trains running on this route. Driving with a Vmax=200 km/h must be feasible on this route.

7.2.2.2 Length

Amsterdam – Apeldoorn	88,6 km
Apeldoorn-Hengelo	56,5 km
Total	145,1 km

This route is 11 km shorter than the current route (156.7 km)

7.2.2.3 Travel time

Distance: Hengelo-Apeldoorn 57 km with Vmax=250 km/h

Compare with the ICE Hannover – Wurzburg Vmax=250 km/h
Part Fulda – Wurzburg
Distance= 86 km
Travel time= 34 min.

Our route is 57 km, so in the above example there is 86-57 = 29 km less km distance at maximum speed. 29 km driving with Vmax(250)= 29/250 x 60= 7,0 min.
For the Distance = 57 km, the total travel time becomes 34 -7.0 min = 27.0 min.

Distance: Apeldoorn-Amersfoort 44 km with Vmax=200 km/h
NS.nl(2022) travel time 24 min.
57 km 21 min. (200 km/hour) (*See Ch. 12.6 HSL East infrastructure - Speed 200 km/h*)
44 km =57-13 km
13/200 x60 = 4 min
Apeldoorn->Amersfoort 17 min

Hengelo -> Amersfoort 44 min. (Without stop in Apeldoorn)

Distance: Amersfoort- Amsterdam 45 km with Vmax=200 km/h
NS.nl(2022) travel time 33 min.
(This is 9 minutes more than the Apeldoorn-Amersfoort route which is only 1 km shorter.)

Amersfoort→Amsterdam 26 min (Choice made 26=17 + 9)

0:26 (Amsterdam-Amersfoort)
0:02 (Stop Amersfoort)
0:44(Amersfoort-Hengelo) (Amsterdam-Hengelo 1:12 min)
0:02 (Stop Hengelo)
3:29 (Hengelo naar Berlijn) **(-15)->3:14**
4:43 Totaal -**15 ->(4:28)**
Ch. 3.3.1 (page 19) with the shortest possible travel time between Berlin and Hengelo of 3:14 minutes.

7.2.2.4 Conclusion

This is a fast route. This is the shortest trajectory of all 6. The Weesp-Amsterdam part and the passage from Hilversum station are a relatively slow part. With extra investments we can save a few minutes of extra time.

7.2.3 Route 2B

Figure 39: The variant Amersfoort – Amsterdam along Utrecht

7.2.3.1 Introduction

The Amersfoort-Utrecht route is a short route of 21 km. Driving with a Vmax of 200 km/h is easy to achieve. From Utrecht you can drive on the fast connection (Vmax = 200) to Amsterdam.

7.2.3.2 Length

Amsterdam-Utrecht	40,0 km
Utrecht-Amersfoort	21,4 km
Amersfoort – Apeldoorn	43,7 km
Apeldoorn-Hengelo	56,5 km
Totaal	160,6 km

7.2.3.3 Travel time

0:20 (Amsterdam-Utrecht)
0:02 (Stop Utrecht)
0:12 (Utrecht-Amersfoort)
0:02 (Stop Amersfoort)
0:44 (Amersfoort-Hengelo) (Amsterdam-Hengelo 1:20 min)
0:02 (Stop Hengelo)
3:29 (Hengelo naar Berlijn)
4:51 Total

7.2.3.4 Conclusion (Route 2B)

This route does not result in a shorter travel time.

7.2.4 Conclusion(Route 2)

This Route-2B is 15 km longer than the Route-2A and the journey time is 8 minutes longer than the Route-2A. The Route-2A is the best route. Passengers from Rotterdam/The Hague can change to the Berlin train in Amersfoort.

7.3 Route-03 New railway line Hengelo-Rijssen

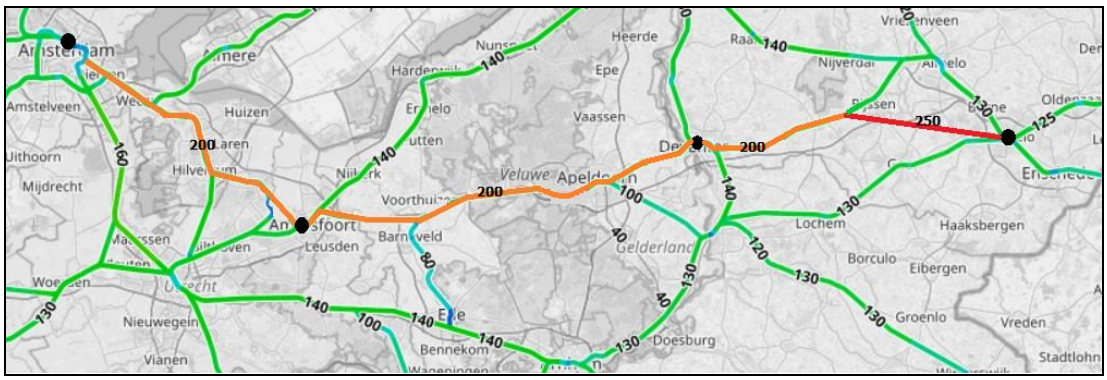


Figure 40: The new Hengelo-Rijssen railway line

7.3.1 Introduction

To avoid the busy Hengelo-Wierden section, a new Rijssen-Hengelo connection is built.

7.3.2 Length

Amsterdam – Rijssen	129,8 km
Rijssen – Hengelo	19,4 km
Totaal	149,2 km

This route is 7.5 km shorter than the current route(156.7 km)

7.3.3 Travel time

0:26 (Amsterdam-Amersfoort)
0:02 (Stop Amersfoort)
0:17 (Amersfoort-Apeldoorn)
0:02 (Stop Apeldoorn)
0:08 (Apeldoorn-Deventer)
0:02 (Stop Deventer)
0:02 (Extra, enter and exit Deventer)
0:13 (Deventer-Rijssen)
0:10 (Rijssen-Hengelo)
1:22 Total

0:02 (Stop Hengelo)
3:29 (Hengelo naar Berlijn)
4:53 Total

7.3.4 Conclusion

This is a not very fast route. Between Rijssen and Deventer, our Berlin train also competes with the frequent freight trains on this route.

7.4 Route-04 Existing route via Hengelo

Figure 41: Existing route from Hengelo to Amsterdam

7.4.1 Introduction

The existing Hengelo-Amsterdam route could be upgraded to a Vmax=200 km/h. This will not solve the bottleneck between Hengelo-Wierden. In terms of ambition level, this solution/route also scores very pure.

7.4.2 Length

Amsterdam – Hengelo 156,7 km

7.4.3 Travel time

0:26 (Amsterdam-Amersfoort)
0:02 (Stop Amersfoort)
0:17 (Amersfoort-Apeldoorn)
0:02 (Stop Apeldoorn)
0:08 (Apeldoorn-Deventer)
0:02 (Stop Deventer)
0:02 (Extra entry and exit time Deventer)
0:26 (Deventer-Hengelo)
1:25 Totaal

0:02 (Stop Hengelo)
3:29 (Hengelo tor Berlijn)
4:56 Total

7.4.4 Conclusion

Not a fast route. Also route with few ambitions. This route is already almost at its maximum capacity.

7.5 Route-05 Adjustments route Enschede-Zwolle

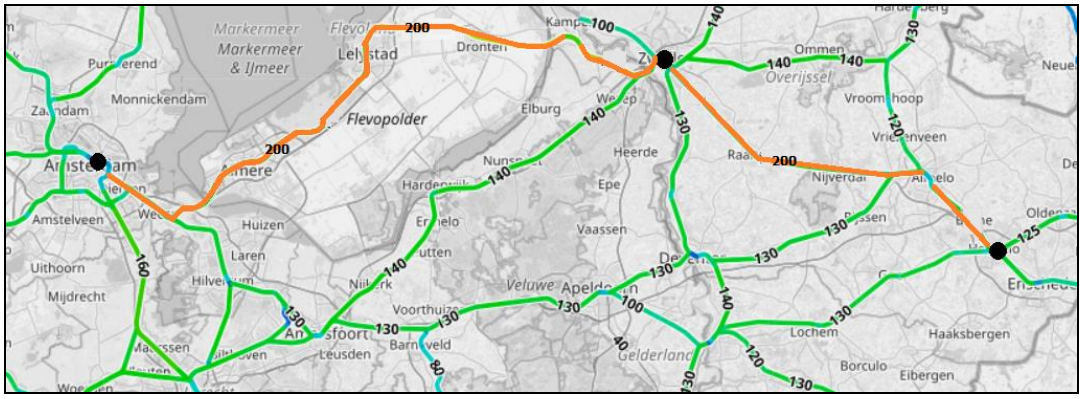


Figure 42: The Amsterdam-Hengelo route along Zwolle

7.5.1 Introduction

In the chapter, the Route Amsterdam-Hengelo is discussed that runs via Zwolle.
On 30-09-2020, the province of Overijssel presented a plan to improve the Zwolle-Enschede-Munster train connection. By also running the Berlin train via this route, the travel time in the Netherlands of this train can be shortened.

7.5.2 History

7.5.2.1 Zwolle wants to be connected to train connection to Berlin (2016)

The city of Zwolle wants to investigate whether the international train can also stop in [Zwolle[9].]

Figure 43: Berlin train along Zwolle

Figure 43: Zwolle wants a Berlin connection

The route of the international train between Amsterdam and Berlin has to be rerouted, so that the train can also stop at Zwolle station. The municipality of Zwolle is advocating this. This could mean that the international train no longer stops at Deventer station, as is still the case today.

7.5.2.2 Improvement of train connection Amsterdam-Berlin(2018)(Rijssen-Hengelo)

Quick Scan Improvement train connection Amsterdam-Berlin[10]

AT OSBORNE Royal HaskoningDHV

- Nieuwe lijn Rijssen - Hengelo

Het huidige tracé maakt tussen Rijssen en Hengelo een omweg door de kernen van Wierden en Almelo. Snelheidsverhoging is dan ook op het huidige tracé kostbaar en belastend voor de omgeving. Derhalve is gekozen om hier uit te gaan van aanleg van een vrij liggend tracé, zo veel mogelijk gebundeld met de A1. De (zeer indicatieve) kosten voor deze maatregel bedraagt ca. € 0.5 - 0.9 miljard.

Figure 44: Research into upgrade route between Rijssen and Hengelo

As can be seen in the figure above, RoyalHaskoningDHV indicates that it is not realistic to increase speed on the above mentioned route.

7.5.3 The plan

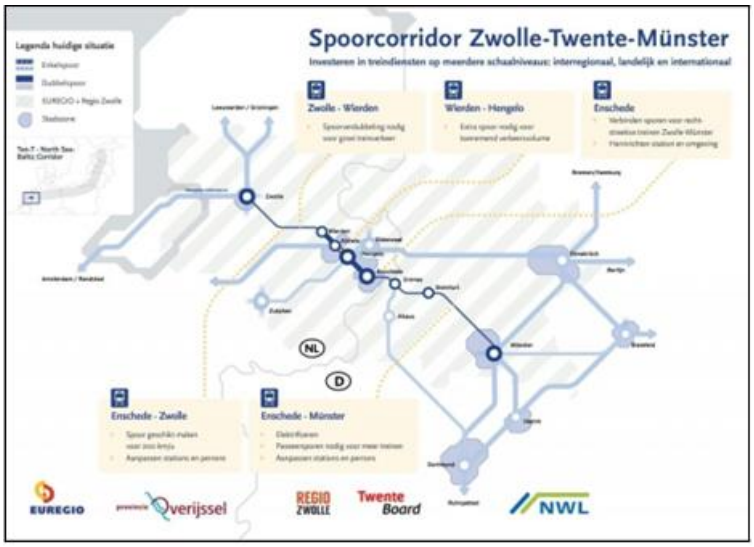


Figure 45: The Zwolle – Münster rail corridor

Faster train connection[17] between Randstad and Zwolle-Enschede-Münster costs 3.5 billion
To have a fully-fledged intercity connection between Zwolle and Münster within ten years, 3.5 billion euros is needed. This line can significantly reduce both the travel time between Zwolle and Enschede and that between Amsterdam and Berlin.

The travel time between Zwolle and Enschede can be reduced from 50 to 35 minutes. For residents of the Twente region, the journey to Amsterdam is shortened by half an hour to an hour and a half.

Maatregelen gekozen pakket	Reistijdwinst [min]	Kosten [mio€]
Zwolle-Heino-Raalte	-3	1.600 €
Raalte-Nijverdal (geen aanpassing tunnel)	-2	95 €
Nijverdal-Wierden	-1	35 €
Wierden-Almelo	-0,5	215 €
Almelo-Hengelo	-2	380 €
Hengelo-Enschede	-2	210 €
Subtotaal	-10,5	2.535 €
Aanvullende maatregelen tbv inpassing dienstregeling		
Hanzelijn 3kV (Lelystad-Zwolle)	-1	20 €
Enschede, vrije kruising en verplaatsen opstelterrein	0	180 €
Subtotaal	-1	200 €
Totaal	**-11,5**	**2.735 €**

Figure 46: Overview time savings versus costs

As can be seen in the figure above, huge investments are needed on this route in order to achieve small time savings.

7.5.3.1 Principles

- R2: 200 km/u: Integraal de baanvaksnelheid verhogen naar 200km/u tussen ZI-Es.
  Hierbij wordt er nog geen rekening gehouden met de mogelijk impact voor de kosten en de (on)mogelijkheden vanuit de infra en beschikbare ruimte tot aanpassen spoorbaan.

Figure 47: The province itself also has doubts about the feasibility

The province itself already indicates that it sees major doubts/uncertainties about the feasibility of this project.

7.5.3.2 Tunnel box Almelo and Nijverdal

Figure 48: Speed limit at the entrance and exit of the Almelo tunnel box

Limit speed to the speed indicated by the number. This speed must be reached at the next signal 'No. 281 Entrance Speed Sign'. Applies only to drivers of trains intended for the carriage of goods and trains designated by the railway undertaking concerned.

In the tunnel box of Almelo, the freight trains are allowed to run a maximum of 60 km/h. The maximum speed at which you can drive through Almelo station is 70 km/h.

7.5.3.3 Reactie

Little enthusiasm among State Secretary[11] for faster train Zwolle-Enschede-Munster.

Weinig enthousiasme bij staatssecretaris voor snellere trein Zwolle-Enschede-Munster

ENSCHEDE - In politiek Den Haag is er weinig enthousiasme voor een snellere treinverbinding van Zwolle naar het Duitse Münster via Enschede. Volgens staatssecretaris Steven van Weyenberg van Infrastructuur en Waterstaat is het 'ingewikkeld'.

Figure 49: Little enthusiasm among State Secretary

7.5.4 Length of this route

Amsterdam Centraal	0	km
Zwolle	103.4	km
Hengelo	162.4	km

Length	
straight line distance	129,7 km
Via Zutphen	151.8 km
Via Amersfoort	156,7 km

7.5.5 Travel time of this route

Amsterdam-Hengelo	1:36
Stop Hengelo	0:02
Hengelo-Berlijn	3:29
Totaal:	5:07 h/min.

The travel time between Amsterdam and Enschede can potentially be reduced by around 30 minutes compared to today.
2:04
- 30 min
1:34 min
94 min.

V(average) Enschede-Amsterdam = 137/94 * 60= 87 km/uur

7.5.6 Conclusion

The province of Overijssel (Zwolle) would like the Berlin train to run past Zwolle. They indicated this in 2016. The province of Overijssel now comes with a very unrealistic plan to drive 200 km/h between Zwolle and Enschede. The province itself indicates that it has not looked at whether the plan is feasible.

Royal Haskoning is talking to the client (Province of Overijssel) this time. In their previous quick scan (December 2018), the conclusion was that expanding the current Wierden-Almelo route is far too expensive and reduce very little journey time.
The province of Overijssel has a solution, but what problems do we solve with this?

I see the following problems/wishes for Twente/Overijssel:
– Berlin train much faster
– Twente wants a faster connection to the Randstad
– Faster connection Zwolle-Munster
– Problem rail capacity between Hengelo and Wierden

(The problem of the large number of freight trains through Twente will not be discussed in this document. In 2030, 12,000 freight trains per year will run through Twente/Hengelo.
As part of the problem of the large quantities of freight trains, more and more residents of Twente cities are already complaining because these freight trains cause a lot of nuisance.
Wierden[18] must make more efforts for residents near the railway track.
The construction of north branch of the Betuwe line[19] could be a solution to the above problem.)

The question is whether you can meet all wishes with 1 solution (this solution).

The solution of the province of Overijssel does not score very well for the above wishes.
– Berlin train: Small time savings and only for passengers to/from Amsterdam.
– Faster to the Randstad: Only the travelers to Amsterdam benefit from this.
– Faster connection Zwolle-Munster
– Problem rail capacity between Hengelo and Wierden

There is already a capacity problem on the Hengelo-Wierden route. Today trains running at 10 trains per hour per direction. Due to the doubling of the track between Zwolle-Wierden, 2 express trains per hour will run on this route between Zwolle and Enschede instead of 1 train per hour. The Berlin train will soon also run every hour instead of 1x every 2 hours. There are serious plans for a direct train Amsterdam-Hengelo-Hamburg (-Copenhagen). This expensive plan by the province of Overijssel does not contribute to a solution to the capacity problem on the Hengelo-Wierden route.

Another major problem of this plan/route is that it is not future-proof for future high-speed international connections. It's a snapshot. The route is designed for now with a Vmax of 200 km/h. At the moment, equipment has already been purchased for the Berlin train with a Vmax = 230 km / h. The fast Berlin train(FV 34.b) will use trains with a Vmax of 250 km/h. If the HSL line Löhne -Hannover and Wolfsburg-Berlin are suitable for trains with a Vmax of 300 km/h, trains with a Vmax of 300 km/h will most likely also run on the Amsterdam-Berlin route.

Briefly speaking. This is a not a good plan.

7.5.7 Plan Enschede – Gronau (April 2022)

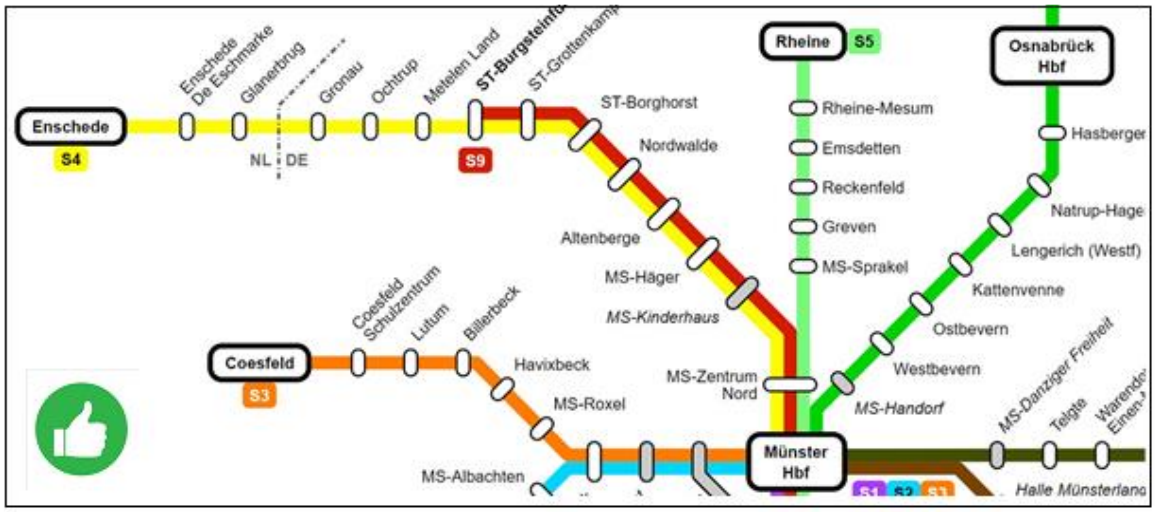


Figure 50: Upgrading of the Enschede-Münster connection

Quick improvements possible for cross-border rail[20] between Zwolle, Twente and Germany. The new German coalition agreement and recent research results give an important boost to the plans for the Zwolle-Twente-Münster and Hengelo-Dortmund rail connections. With an investment of around €100 million in total, direct cross-border train connections can be established in a first step. Electrification of the route could even be completed as early as 2030.

The research shows that this is possible. The realization costs of 100 million euros require an investment of 70 million euros on the Dutch side and 30 million euros on the German side. With these improvements, the number of cross-border rail passengers will increase by around 48%. The amount includes the following measures:
- Electrification of the Gronau-Enschede section (following the electrification Münster-Gronau)
- Linking the existing Zwolle-Enschede express train with the Enschede-Münster local train
- Introduction of an additional Dortmund-Coesfeld local train
- Upgrade of local train Dortmund-Enschede to an express train Dortmund-Hengelo

Figure 51: The bump blocks at Enschede station

And of course what should not be forgotten to remove the bump blocks in Enschede. This is a much better plan. In the reasonably short term, a relatively small investment (100 million Euro) can add a large added value to the Twente-Munster connection and beyond.

Date: 15 November 2022: The Dutch government is investing 30 million euros in the electrification[23] of the railway line that better connects the high-tech regions of Twente and Münsterland.

7.6 Route-06 Existing route via Arnhem

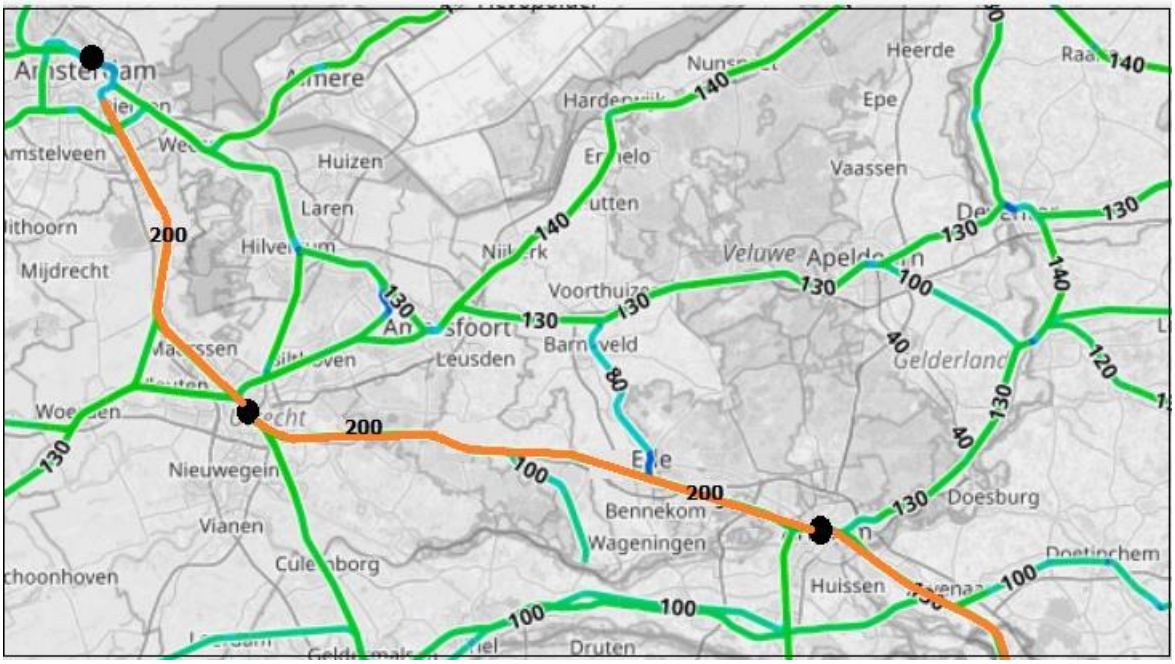


Figure 52: The Arnhem - Amsterdam route

7.6.1 Introduction

The Berlin train could run via Arnhem. In the Netherlands, the trains could run at a Vmax of 200 km/h. Because there are no plans/time slot in the plans of the Deutschlandtakt, with this solution trains has to be switched at Duisburg station.

7.6.2 Length

Löhne(Via Arnhem) 377,2 KM

7.6.3 Travel time

0:20 Amsterdam-Utrecht
0:02 Stop Utrecht
0:25 Utrecht-Arnhem
0:02 Stop Arnhem
0:45 Arnhem-Duisburg
1:34 Hour/min.

0:15 Transfer Duisburg
3:20 Duisburg-Berlijn (+10)
5:09 Hour/min. + 10 -> (5:19)
The tight requirement of 31 minutes between Bielefeld and Hanover is off the table. See also 10.4.1.
It will probably be a journey time of 41 minutes[24] between the above mentioned cities.

7.6.4 Conclusion

Without major investments, only little travel time can be saved on this route.

7.7 Conclusion on all routes

ROUTE	km Ams-Hen	km Ams-Loh	Time Ams-Hen	Time Ams-Ber
01 New Hen-Utr	155	298	1:03	4:34
02A New Hen-Apel(Via H)	145	288	1:12	4:43
02B New Hen-Apel(Via U)	161	302	1:20	4:51
03 New Hen-Rijs	149	292	1:22	4:53
04 Route via Hengelo	157	299	1:25	4:56
05 Via Zwolle	162	305	1:36	5:07
06 Route via Arnhem		377		5:09

Table 14: The different routes Hengelo-Amsterdam compared

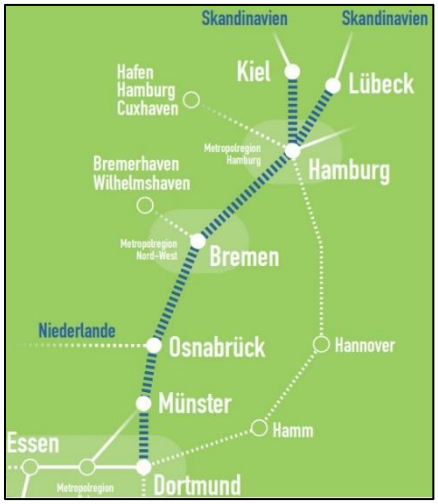
Choosing Route-2A as the "best" because:
This is the shortest route with a reasonably short travel time. The Route-01 is 9 minutes faster, but for this route an additional 50 km of expensive (High Speed) track has to be built.

Route-04 is 13 minutes slower than Route-2A. This route also does not solve the capacity problems on the railway tracks between Hengelo-Wierden and Hengelo-Deventer.

The Route-2A via Hengelo	288 km	The Route-06 via Arnhem	377 km
Via Arnhem longer	89 km	At 288 km that is	31 % more

Figure 52B: Mermaid

Choosing Route-2A means the following travel time for the direct "TEE 49/50 Amsterdam-Copenhagen". (See below)



Figuur 52C: Nord-West-Schienenmagistrale

Amsterdam-Kopenhagen
1:12 Amsterdam-Hengelo
0:02 Stop Hengelo
0:56 Hengelo-Osnabrück
0:02 Stop Osnabrück
4:43 Osnabrück-Kopenhagen (travel time like EuroCity 34)
6:45 hour/min.

With the realization of the project "Nord-West-Schienenmagistrale", the travel time from Amsterdam-Copenhagen via Hengelo can be further reduced to 6:30 hour/min.

Nord-West-Schienenmagistrale[25]: upgrading (partial) routes up to 200/230 km/h and the construction of additional passing tracks (June 2022).

Fast Train connection in >2030 on the new route/track Hengelo-Apeldoorn:
- 1x/h Enschede-Schiphol
- 1x/h Enschede-The Hague
- 1x/h Amsterdam-Berlin
- 1x/h Amsterdam-Hamburg (every 2 hours on to Copenhagen)

Hfst 8. Improvement route Rotterdam-Düsseldorf/Cologne

8.1 Route-10 Acceleration of existing route via Arnhem

Figure 53: : Route Rotterdam-Düsseldorf/ Köln along Arnhem

8.1.1 Inleiding

The acceleration on this route will consist of increasing the Vmax to 200 km/h on most of this route. In the current plans, only new/extra track will be built between Utrecht and Arnhem. In Germany, the Duisburg-Köln route is already operating at 200 km/h.

8.1.2 Lengte route

Rotterdam Centraal	0	km	Duisburg	213,6	km
Utrecht Centraal	56,5	km	Düsseldorf	237,6	km
Arnhem Centraal	114,0	km	**Köln**	**278,6**	**km**

8.1.3 Travel time

0:30 Rotterdam-Utrecht
0:10 Transfer Utrecht
0:21 Utrecht-Arnhem
0:02 Stop Arnhem
0:45 Arnhem-Duisburg
0:02 Stop Duisburg
0:15 Duisburg- Düsseldorf 2:05 To Düsseldorf
0:02 Stop Düsseldorf
0:32 Düsseldorf- Köln
2:39 (has been 3:00 uur)

8.1.4 Conclusion

Little travel time can be saved on this route.

8.2 Route-11 Acceleration route via Venlo

8.2.1 Introduction

A lot of time can be saved on the Rotterdam-Venlo route by using the Rotterdam-Breda High Speed connection and by increasing the train speed to 200 km/h on the Breda-Venlo route.

Figure 54: The Rotterdam-Venlo sub-route

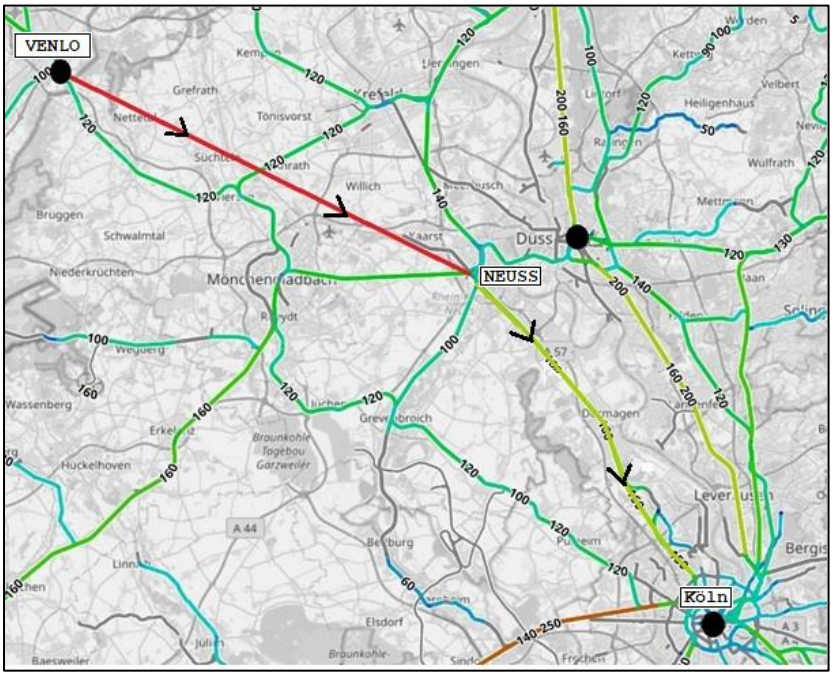


Figure 55: The Venlo-Köln sub-route

By building a new Venlo-Neuss railway line, the travel time on this route can be substantially reduced. The freight trains can run on the already existing connection via mönchengladbach.

From Venlo we will investigate both the route to Düsseldorf and to Köln.
The journey time between Venlo-Düsseldorf (NS.nl) in 2022 is 1:04 hours/min. The distance Venlo-Düsseldorf (straight line distance) is 45 km. The average driving speed is 42 km/h on this route.
The journey time between Venlo- Köln(NS.nl) in 2022 is 1:30 hours/min. The distance Venlo-Köln (straight line distance) is 73 km. The average driving speed is 49 km/h on this route.

8.2.2 Length

Rotterdam – Breda	46 km		
Breda- Eindhoven	59 km		
Eindhoven-Venlo	53 km		
Venlo - Neuss	41 km		
Neuss - Düsseldorf	11 km	Neuss - Köln	34 km
	210 km		233 km

8.2.3 Travel time

0:23 Rotterdam – Breda
0:02 Stop Breda
0:27 Breda- Eindhoven
0:02 Stop Eindhoven
0:29 Eindhoven-Venlo
0:02 Stop Venlo
0:20 Venlo – Neuss
0:02 Stop Neuss

0:10 Neuss – Düsseldorf	0:20 Neuss – Köln
1:57 Hour/Min	2:07 Hour/Min

8.2.4 Conclusion

The route from Rotterdam via Venlo gives the shortest travel times to Düsseldorf and Köln respectively. What is striking is that the travel time to Düsseldorf is 8 minutes shorter and the travel time to Köln is even 32 minutes shorter when driving directly from Neuss to Köln.

Via this new route these trains could run:

- 1x p/hour Rotterdam-Cologne
- 1x p/hour Amsterdam-Cologne
- 1x p/hour Rotterdam-Düsseldorf
- 1x p/hour Antwerp-Düsseldorf

By running an extra IC Amsterdam-Arnhem-Duisburg-Essen-Dortmund, the northern part of NRW also gets a good/direct connection to Amsterdam.

8.3. Conclusion fastest connection Rotterdam-Düsseldorf/Cologne

ROUTE	km Rot-Dus	km Rot- Col	Time Rot-Dus	Time Rot- Col
10 Rotterdam- Col (Via A)	238 km	288 km	2:05 h/min.	2:39 h/min.
11 Rotterdam- Col (Via V)	210 km	233 km	1:57 h/min.	2:07 h/min.
Difference	28 km	55 km	0:08 h/min.	0:32 h/min.

Table 15: The different routes Rotterdam-Köln compared

As can be seen in the table above, the construction of a new infrastructure between Venlo-Neuss accelerates 32 minutes travel time, compared to the route via Arnhem. Many more travelers also benefit from the upgrade of this route than via the Arnhem route.

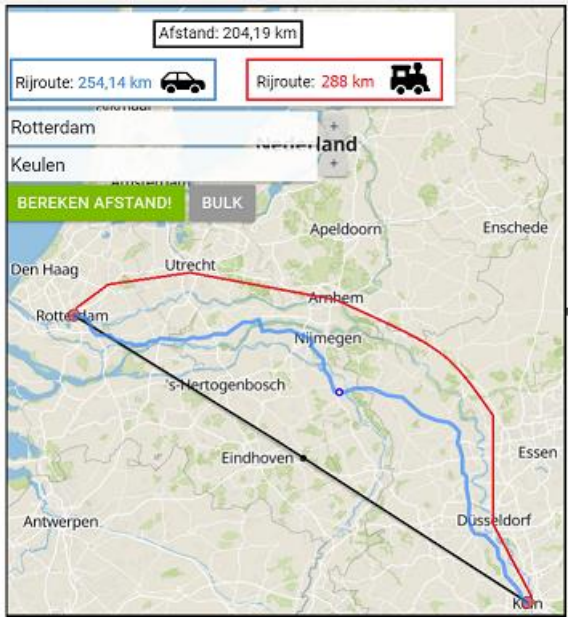


Figure 56: The Rotterdam-Cologne connection

With 288 km, the Rotterdam-Cologne train route via Arnhem is 84 km longer than the 204 km as straight line distance. That's 41% more. (Compare the Red with the Black route/distance)

ROUTE	km Ams-Dus	km Ams- Col	Tijd Ams-Dus	Tijd Ams- Col
Amsterdam- Cologne (Via A)	222 km	263 km	1:48	2:22
Amsterdam- Cologne (Via V)	233 km	247 km	1:59	2:09
DIFFERENCE	-11 km	16 km	-0:11 h/min.	0:13 h/min.

Table 16: The different routes Amsterdam-Köln compared

As can be seen in the table above, the route via Venlo saves 13 minutes for the Amsterdam-Cologne in travel time.

Hfst 9. Other reports

9.1 Introduction

This chapter briefly discusses some of the reports that have been made in recent years on the theme of "International train traffic". Conclusions from these reports are used to make choices about the optimal train connections with Germany.

9.2 Report PCW(2020-May)

QuickScan innovative international rail transport[21]

Figure 56B: Adjusting plans to Germany policy

9.2.1 Connection Amsterdam-Berlin

The fast Berlin train (FV 34 b) according to the German plans runsvia Hengelo. See also 'Ch. 3. The Berlin train". Germany has no plans for a direct train Berlin-Amsterdam via Arnhem.

9.2.2 Connection Amsterdam-Copenhagen

Lelylijn is not important[22]

Figure 57: German State Secretary Enak Ferlemann

Germans find fast Lely line Groningen-Bremen "not interesting"; all fast trains via Osnabrück and Hengelo

The German State Secretary for Mobility, Enak Ferlemann, does not consider Groningen-Bremen-Oldenburg suitable as a fast international rail connection from the Netherlands to northern Germany and Scandinavia. He told That to Omroep Fryslân in the FryslânDOK program Spoarsykje. According to Ferlemann, the fastest rail connection between the Netherlands and Hamburg or Bremen is via Hengelo and Osnabrück. Even from Oldenburg, according to him, travelers can best travel over Bremen and Osnabrück to the Netherlands.
"Train traffic is not only about the shortest route, but also about how fast a train can travel a certain distance," says Ferlemann. "All trains from Scandinavia will run over Hannover and Osnabrück in the future. A fast train from Scandinavia over Hamburg and Groningen is not obvious."

9.2.2.1 Connection Bremen-Osnabrück

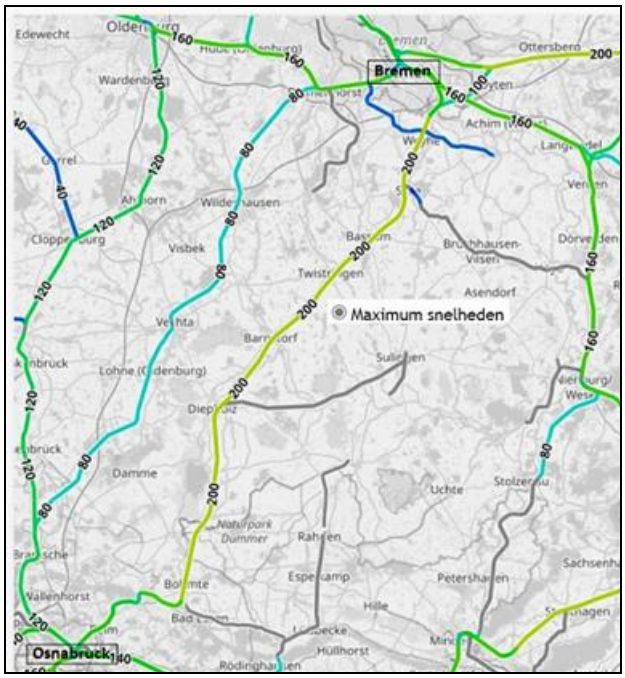


Figure 58: The Osnabrück-Bremen section

Osnabrück Bremen
Vmax=200 km/hour
Distance 103 km
Travel time 51 min.
V(average)= 121,2 km/hour

9.2.2.2 Connection Bremen-Groningen

Wunderline[23]

Figure 59: The Groningen-Bremen section

Groningen Bremen
Vmax=130 km/hour straight line distance 150 km
2:13 min. 133 min V(average)=67,7 km/hour

9.2.2.3 Conclusion

The osnabrück-bremen connection is covered with a V(average)=121 km/h.
The groningen-bremen connection to be built will be covered with a V(average)=68 km/h.

The connection via Groningen to Bremen also potentially has (too) few passengers. The connection via Hengelo attracts more travelers because large cities such as Amersfoort, Apeldoorn / Deventer and Twente have much more traveler potential than Groningen. Germany (also) opts for this fast connection via Hengelo-Osnabrück-Bremen-Hamburg to Copenhagen.

9.3 Report RLI(2020-June)

Move the switch to better international rail passenger transport[24]

9.3.1 Introduction

On 30-June-2020, Germany made an important decisionby including an extra fast Amsterdam-Berlin train in their plans. See also "Ch. 3. The Berlin train".

This report (RLI) was published in July-2020. This report (RLI) is no longer up to date as of publication. Nevertheless, the ministry remains committed to the "one corridor solution" recommended in this report. I had hoped that this report would support the "one corridor solution" in a quantitative way. Unfortunately, that is not the case.

9.3.2 Direct trains

Belang van rechtstreekse verbindingen

Hoewel het al sinds 1994 mogelijk is om per spoor van Nederland naar Londen te reizen, is de belangstelling voor reizen via de treintunnel onder het Kanaal pas toegenomen nadat recent de verbinding tussen de Randstad en Londen rechtstreeks is gemaakt. De totale reistijd van-deur-tot-deur ongeveer gelijk gebleven, maar het grote voordeel van de directe verbinding is dat de reiziger gedurende zijn reis niet hoeft over te stappen.

Ook de treinreis van Amsterdam naar Berlijn is een voorbeeld dat laat zien hoezeer de reiziger hecht aan een directe verbinding. Met een (cross-platform en comfortabel te maken) overstap in Hannover op de ICE kan de reiziger namelijk twintig minuten eerder op Berlijn Hbf zijn dan met de rechtstreekse Berlijnlijn. Toch prefereren veel reizigers de directe verbinding.

Figure 60: Direct connections are preferred

A direct connection between Amsterdam and Berlin via Hengelo is preferable because a direct connection via Arnhem is not in the German plans and is therefore not realistic. Via Arnhem, a transfer has to be made in Duisburg.

A direct connection Rotterdam-Düsseldorf/Cologne via Venlo is preferred because it is a direct train. Via Arnhem, a transfer must be made in Utrecht.

9.3.3 One Corridor solution

"*This does not alter the fact that substantial travel time gains can be made in the realization of one eastern corridor towards Germany for both Berlin and Ruhr area/Frankfurt, for example by increasing the speed on the corridor to 160 to 200 km/h.*"

If we were to create one eastern corridor, would there be time savings to be made?
With the one corridor versus the two corridors solution, benefits could be gained in terms of costs. A major disadvantage of this cheap one corridor solution is of course that much less traveler benefits from this upgrade.

With a two-corridor solution, the speed on both corridors could also be increased. What the council ignores is that, for example, the Amsterdam-Berlin route via Arnhem is 78 km longer.
There is no quantitative substantiation here that justifies their(RLI) conclusion.

9.3.4. Capacity and Third Track

NS cancels plan ic cologne:no capacity

NS cancels plan ic cologne no capacity [25]

"*Third track no solution. Koster points out that the space on the track is very limited. According to him, the third track in Germany does not solve that either. "The third track at Zevenaar only solves the current capacity bottlenecks and offers no room for future growth," he explains.*"

According to the NS, there is already a lack of capacity.

9.3.5 Unbundling of regional, national and international rail transport

"*The unbundling of regional, national and international rail transport can help to improve the improve the international train accessibility of the Netherlands.*"

Arnhem Centraal	ab 09:45	Wesel Feldmark	ab 10:34
Zevenaar	ab 09:54	Wesel	ab 10:43
Emmerich-Elten	ab 10:00	Friedrichsfeld	ab 10:46
Emmerich	ab 10:09	Voerde(Niederrhein)	ab 10:50
Praest	ab 10:13	Dinslaken	ab 10:54
Millingen(b Rees)	ab 10:17	Oberhausen-Holten	ab 10:58
Empel-Rees	ab 10:20	Oberhausen-Sterkrade	ab 11:02
Haldern(Rheinl)	ab 10:23	Oberhausen Hbf	an 11:07
Mehrhoog	ab 10:28		

The table above shows all stations on the Arnhem-Oberhausen route where the regional train stops. That's a total of 16 stops. On the Arnhem-Oberhausen route, the different types of train compete for the insufficient capacity on this corridor. The RLI has forgotten to mention that projections indicate that for 2030 the number of freight trains on this route will be 33,500 trains per year. This single corridor solution will not be able to meet the growing demand for international rail traffic. Especially considering the ambitions that the e.g. The Netherlands has the next 25 years.
Switch to the "two corridor" solution.

Figure 61: An ICE train on the Betuwe route

A choice was made to build the most important freight route to Germany (the Betuwe route) from Rotterdam via Zevenaar to Oberhausen in Germany. The choice that RLI is now making "Invest in one eastern corridor (the Arnhem corridor)" means that in the Zevenaar-Oberhausen section freight transport and international rail transport compete with each other on the limited rail capacity on the aforementioned route.

For the national/highest level, the choice to have both the main freight corridor (Betuweroute) and the most important international passenger transport corridor to Germany handled via the same corridor (Zevenaar-Oberhausen) is a wrong choice. In the remaining part of this paragraph, I will briefly discuss the problems that cause the above choice.

Upgrade line Emmerich–Oberhausen[25b]

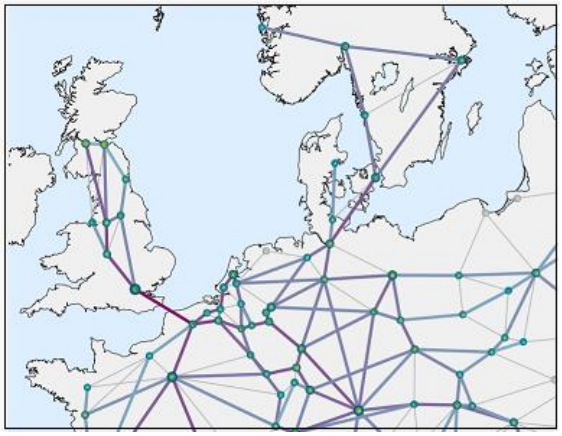
80 km is the distance from Zevenaar (from where the Betuwe route and the ICE to Oberhausen will run on the same route) to Oberhausen. At 3 km from this route, near Oberhausen, 4 tracks are available. Over 77 km, only 3 tracks are available. This is too little to guarantee a good timetable. Especially if an ICE train has slowing down, which is often the reality. In practice, regional traffic and freight traffic per direction will take up 1 track. For ICE passenger traffic, 1 track remains available for both directions over a length of 77 km.

Figure 61B: At Zevenaar a Cargo train and ICE meet

Why so much attention for the connection via Arnhem. The Netherlands has 17.5 million inhabitants. Arnhem has 164,000 inhabitants which is less than 1% of the Dutch population!

9.4 Central design HSL network

[Significantly more high-speed trains only feasible with central design of the HSL network [25]]



"A mathematical model has been used to map out the chances of the train with a new European HSL network." Based on the number of air passengers, I made a model for high-speed trains, explains Engineer Grolle. His model looks for the shortest travel times on a potential HSL network and then creates a network of high-speed trains based on transport demand. It is striking that the model does not propose a high-speed line from Amsterdam via Groningen to Hamburg, but a fast railway line via Bad Bentheim.

Figure 62: The HSL network for Northern Europe

For Amsterdam – Hamburg, an HSL via Groningen is faster, but if you look at all other travel relationships, the model comes to the conclusion that a fast railway line via Hengelo and Osnabrück is more profitable. In the end, more travelers will benefit from this.

Ministry of Infrastructure and Water Management

This network approach (two corridors) is a much better solution than the "one corridor" approach of the RLI and the Ministry of Infrastructure and Water Management.

9.5 Research ProRail

Figure 63: Prorail research into the best route

ProRail concludes in its research that the Hengelo border crossing is the designated border crossing to improve train traffic towards northern Germany and Scandinavia.

The Arnhem border crossing, on the other hand, is suitable for a direct train from Amsterdam to Essen – Dortmund.

Chapter 10. Other rail projects/rail initiatives

10.1 Introduction

This chapter discusses a number of initiatives/projects that have an impact on the improvement/acceleration of train connections between the Netherlands and Germany and beyond. Germany as a central country in Europe is fully committed to improving the railways in the coming decades.

10.2 Deutschlandtakt

Deutschlandtakt

[Project Deutschland takt[27]]

First the timetable, then the rail infrastructure.

With the Deutschlandtakt project, the rail infrastructure will be improved on the basis of the timetable in order to achieve a good rail network in Germany. This network can then be used for both passenger transport and goods transport. The goal: More often, faster and everywhere. As a result, the Deutschlandtakt project becomes the central point from which the railway network can be further developed.

Train passengers benefit:
More often: Trains will run more often. On the important connections, a train will run every 1/2 hour. Waiting for the next train won't take as long as it does today.
Faster: The travel times will be shortened by better connections and improvement in the rail network by, among other things, increasing the speed of the train in many places.

Due to the Deutschlandtakt project, the number of train drivers must double in 2030 compared to 2020. It is expected that the expansion of the rail infrastructure will cost 48.5 billion Euros.

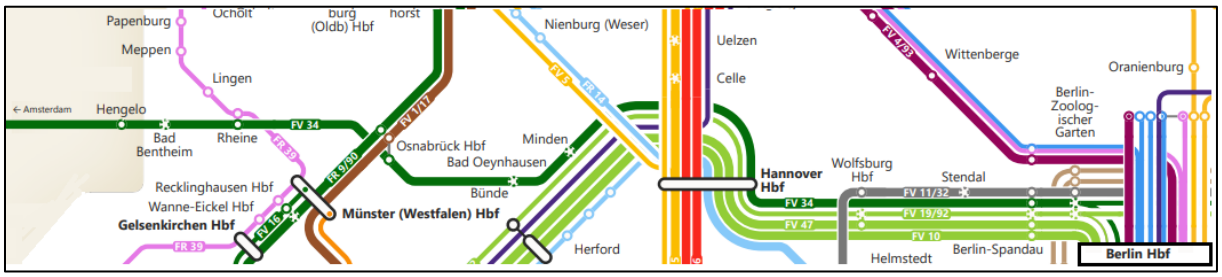


Figure 64: Deutschlandtakt with the Amsterdam-Berlin FV34 connection

10.3 Tee 2.0-Europatakt-Eurolink

10.3.1 Tee 2.0

Federal Ministry of Transport and Digital Infrastructure

TEE 2.0

The German proposal for the TEE2.0[28] concept consists of the following parts:

- A TEE 2.0 connects at least 3 countries with each other or with 2 countries the route is min. 600 km.
- A TEE 2.0 train runs at least 160 km/h on a large part of the route or runs at an average speed of at least 100 km/h over the entire route.
- A TEE 2.0 train offers extra comfort such as free internet, good catering compared to the standard trains

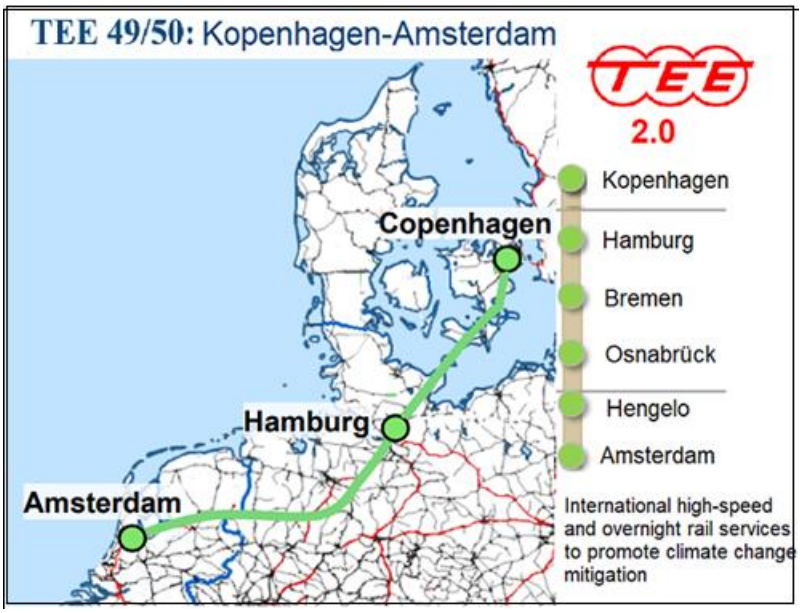


Figure 65: The TEE connection Amsterdam - Copenhagen

Border Hengelo:
TEE 49/50 Amsterdam – Hamburg - Copenhagen
TEE 53/54 Amsterdam – Hannover – Berlin – Warsaw

Border Arnhem/Venlo
TEE 3/4 Amsterdam – Cologne – Basel – Rome
TEE 51/52 Amsterdam – Cologne – Munich – Vienna

10.3.2 Europatakt

Europatakt

[Europatakt - An European Integrated Timetable[29]]

From TEE 2.0 and Deutschlandtakt to Europatakt

- The concept TEE 2.0 is a strategy for strengthening entrepreneurial international passenger rail services with high-speed and overnight rail services.
- It will interlink the individual optimized clock-face timetables of the European countries to build up a coordinated network of international connections to reduce international journey times.
- An increasing number of European states are establishing clock-face timetables as the Deutschlandtakt in order to ensure attractive offerings with higher-frequencies for the travelling public as well as to optimize the capacity of the infrastructure for all users.
- If the timetables are coordinated between neighboring states, the next step is to have direct trains with a longer itinerary connecting several nodes and hubs in three or more states.
- This approach might be extended to build up a network of international connections ("Europatakt") by the provision of appropriate framework conditions.

10.3.3 Eurolink

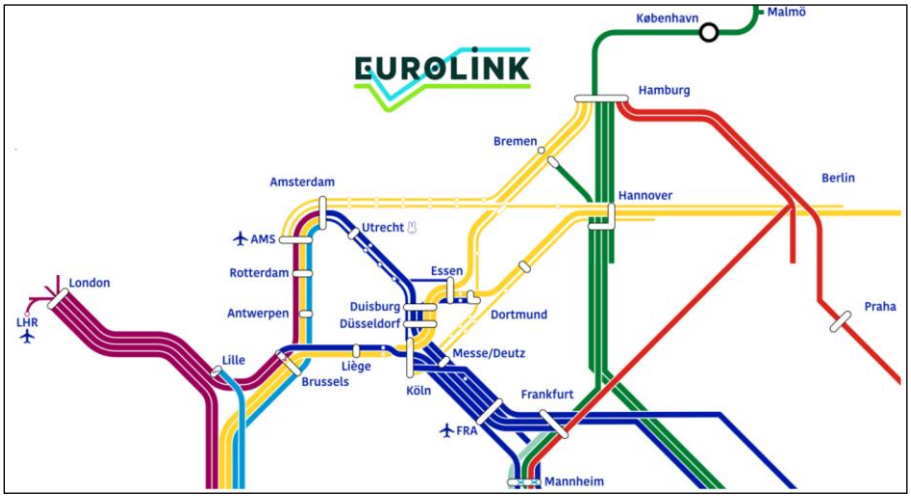


Figure 66: Timetable designed on a European scale

Towards a better international timetable in Europe. In the future, international trains (timetables) will be the starting point for setting up a new timetable. This creates more space for international trains and shortens travel times. At the moment, there are still connection problems when a train crosses a national border. As a result, the train will become a better alternative to the plane in the future.

10.4 Acceleration Hamm-Hannover and Wolfsburg-Berlin

New construction railway line Bielefeld-Hannover[31]

A new Bielefeld–Hannover railway line and acceleration of the Hamm-Bielefeld railway line are part of the 2030+ timetable as part of the Deutschlandtakt project. This project is part of a total concept of many individual measures to significantly reduce travel time between Dortmund and Berlin. The goal is to remove this bottleneck and at the same time reduce travel time.

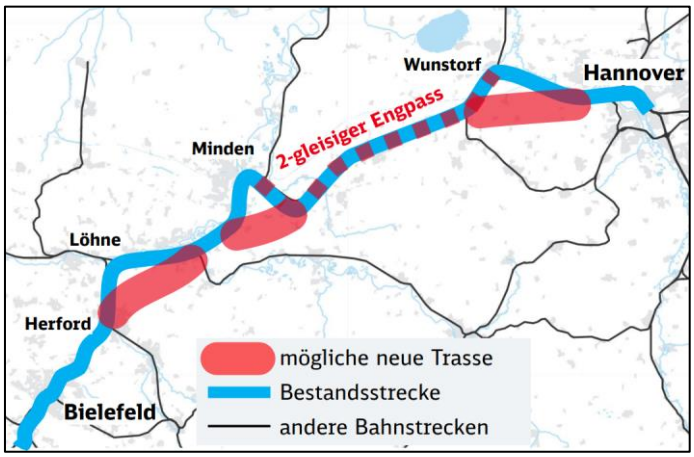


Figure 67: Improvements on the Bielefeld-Hannover section

Figure 68: Travel time gain between Dortmund and Berlin of 35 minutes

As can be seen in the figure above, the acceleration of the travel time between Dortmund and Berlin consists of several parts. At Löhne, between Bielefeld and Hannover, the Amsterdam-Berlin train follows the same route as the ICE from Düsseldorf to Berlin. All infrastructural measures carried out from Löhne to Berlin will also benefit the acceleration of the Amsterdam-Berlin train/connection.

The 2030+ timetable provides for a reduction of travel time on the Hannover – Osnabrück route by 5 minutes compared to today. With a connection to a new line Seelze – Bielefeld near Löhne, the travel time is reduced by a maximum of 20 minutes compared to the travel time according to Deutschlandtakt. Berlin-Amsterdam[31b]

Der Fahrzeitvergleich Berlin – Osnabrück – Berlin

	Fahrplan 2022	Fahrplan 2025	Zielfahrplan 2030+, ICE	Zielfahrplan 2030+, IC	Zielfahrplan mit Bypass, ICE	Zielfahrplan mit Bypass, IC
Hengelo	ab 10:59	ab 10:49*	ab 10:13	ab 11:13	ab 10:13	ab 11:13
Bad Bentheim	ab 11:28	ab 11:11		ab 12:33		ab 12:33
Rheine	ab 11:42	ab 11:25	ab 10:44	ab 11:47	ab 10:44	ab 11:47
Osnabrück Hbf	ab 12:08	ab 11:53	ab 11:11	ab 12:14	ab 11:11	ab 12:14
Bünde(Westf)	ab 12:28	ab 12:17		ab 12:34		ab 12:34
Minden(Westf)	ab 12:47			ab 12:57		
Hannover Hbf	ab 13:22	ab 13:04	ab 12:15	ab 13:26	ab 11:58*	ab 13:07*
Wolfsburg Hbf	ab 13:54					ab 13:37*
Stendal Hbf	ab 14:26					
Berlin-Spandau	an 15:04	an 14:31	an 13:31	an 14:45	an 13:15*	an 14:28*
Berlin Zoo				an 14:57		an 14:40*
Berlin Hbf	an 15:22	an 14:51	an 13:43	an 15:02	an 13:27*	an 14:47*
Berlin Ostbahnhof	an 15:34	an 15:03		an 15:14		an 14:57*
Berlin Südkreuz			an 13:57		an 13:41*	
* errechnete Fahrzeiten						
Fahrzeiten						
Osnabrück - Berlin Hbf	3:14 h	2:58 h	2:32 h	2:48 h	2:16 h	2:334 h
Hengelo - Berlin Hbf	4:23 h	4:02 h	3:30 h	3:48 h	3:14 h	3:34 h

Table 17: Travel times on the Hengelo-Berlin route

Explanation of the above travel time table. The 2022 timetable is the basic timetable without maintenance-related restrictions.

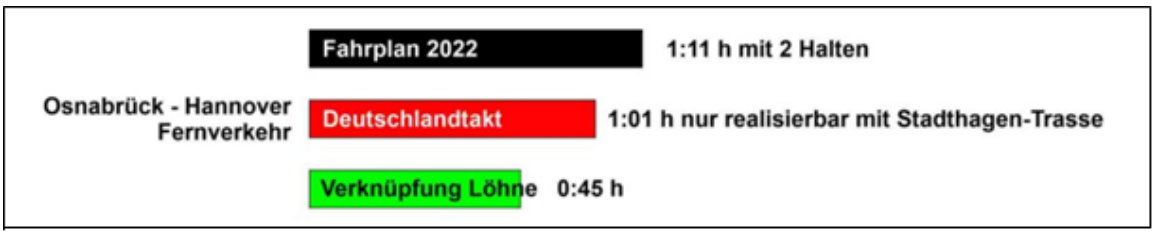


Figure 69: Possible accelerations on the Osnabrück-Hannover section

The 2025 timetable is faster than today because from the end of 2024 the 230 km/h fast Talgo trains will be used. The bypass timetable assumes that the new railway line can easily be reached from Löhne. This variant can be easily integrated into the rest of the 2030+ target schedule: This faster ICE (300 km/h) drives for the train Bielefeld – Berlin, the slower IC behind it and can thus serve Wolfsburg.
The fastest journey time between Hengelo-Berlin Hbf will be 3:14 hours/min at optimal bypass. This would mean that the travel time Amsterdam-Berlin would be 4 1/2 hours.

Is a travel time Amsterdam-Berlin of 4 hours possible?
No. Between Hanover and Berlin, the acceleration possibilities are almost exhausted.
From Amsterdam to Hannover, 489 kilometers should be covered in 2 hours and 30 minutes at an average speed of 200 km/h. Even the new Cologne - Frankfurt railway line does not reach this high average speed, although a large part of this route is driven at 330 km/h.

Verkehrsministerium streicht starre 31 Minuten-Vorgabe für Bahnlinie Bielefeld-Hannover

Figure 70: The 31-minute limit is no longer being held.

News of date: 1-May-2022

The strict requirement of 31 minuten[48] for the ICE travel time between Bielefeld and Hannover is off the table. Bundestag member Frank Schäffler has long insisted that other alternative routes cannot be implemented due to an overly tight commitment to declare the 31-minute travel time as necessary.

Only variants 2 and 5 of the "Schüssler-Plan" are eligible for the travel time of 31 minutes, while at 41 minutes the other three variants are also acceptable. This would ensure the connection of the fast railway line to Osnabrück-Nederland in Löhne/Bad Oeynhausen, which is important for the acceleration of the Amsterdam-Berlin line.

The above mentioned development means that the Amsterdam-Berlin train will also benefit optimally from the improvement of the Bielefeld-Hannover line.

10.4.2 Final report on the Deutschlandtak target scheme

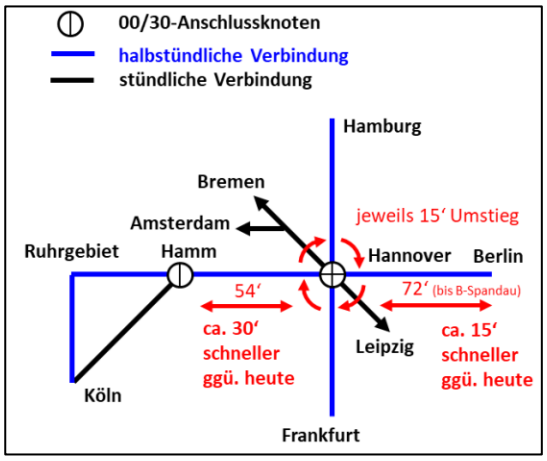


Figure 71: Fast connection NRW/Amsterdam-Berlin

Date: 20.09.2022 The increase in route speed in the route from Löhne/Minden to Berlin results in more attractive travel times from NRW and Lower Saxony to the capital. The travel time Cologne Hbf – Berlin Hbf will be reduced by 44 minutes compared to 2021 and will be 3:35 hours

The travel time between the Netherlands (Border Hengelo) – Berlin is reduced by 55 minutes compared to 2021.De following graph shows schematically which relationships benefit from the accelerations between NRW and Berlin:

The travel time (Border Arnhem) Cologne Hbf – Berlin Hbf is reduced by **44 minuten**.
The travel time the Netherlands (Border Hengelo) – Berlin is reduced by **55 minutes**!

10.5 Fehnmarnbelt tunnel

Fehmarnbelt-tunnel[32]

Figure 72: The new Hamburg-Copenhagen link

The construction of the 18 km long Fehmarnbelt tunnel between Germany and Denmark will finally start on 1 January 2021. The Fehmarnbelt tunnel is the longest submerged tunnel in the world and will consist of a four-lane highway and two train tracks. The intention is that from 2029 the trains will run via the new Fehmarnbelt tunnel..

Once that tunnel is ready, the travel time between Hamburg and Copenhagen will be reduced by two hours. Today the journey time is still 4 hours and 40 minutes.

1. New destinations in (Northern) Germany

In addition to accelerating to Germany, we are looking at new destinations within Germany. North-west Germany, including Hamburg as soon as the infrastructure fails, is high on our wish list.

2. Destinations in Northern Europe

If the Fermanbelt tunnel between Germany and Denmark is realized, we would like to work with DB on how we can bring further destinations in northern Europe (e.g. Copenhagen) within the reach of the Dutch traveler.

Figure 73: Dutch NS also wants direct trains to Hamburg and Copenhagen

10.6 Connection Dresden -Prague

New construction [Dresden-Praque[33]]

The new railway line will be shorter than the current slower route through the Elbe valley and suitable for speeds of up to 230 km/h. For example, the travel time between Prague and Dresden is reduced to just one hour compared to 2 hours and fifteen minutes now. The journey time Prague-Berlin, now four and a half hours, will be reduced to two and a half hours in the future.

Figure 74: Tunnels are an important part of this new route

Figure 75: The Dresden – Prague section is an important European route

Figure 76: In 2022 the travel time is 10 hours on the Hengelo - Prague route

A new rail connection is being built between these two metropolises – from Berlin to Prague the travel time is 2.5 hours. Together with a travel time of 3.5 hours between Hengelo and Berlin, this results in a total travel time of 6 hours between Hengelo-Prague. That's a 4 hour faster travel time than today.

10.7 High Frequency Rail Transport Programme

With the High Frequency Rail Transport Programme, we make it possible to run a train every ten minutes on the busiest routes. Our dream of the future is also getting closer: fewer planes and more high-speed trains. In this way we increase accessibility between cities and the regions. And between the Netherlands and the rest of Europe.

[High-frequency rail transport programme[34]]

Figure 77: Overview PHS

10.8 Future vision track 2050 (Moreelse Tafel)

[Eindhoven as an international hub[35]]

What Utrecht Central Station is for domestic train traffic, Eindhoven station can become for the Triangle Amsterdam-Brussels-Cologne: a hub of fast rail connections. This is what the Moreelse Tafel states in its vision for the future 2050.

The Moreelse Tafel (named after the Utrecht Moreelsepark where the main buildings of NS and ProRail are located) is a group of experts who, under the banner of the Railforum knowledge network, think about the future of rail transport. The initiators are Bas Govers (Goudappel office), Maurits Schaafsma (Schiphol Airport) and Pepijn van Wijmen (APPM office). Other members include Emile Jutten (NS), Menno Olman (BoerCroon office) and Donné Slangen (Ministry of Infrastructure and the Environment). They speak freely, not on behalf of their organizations.

The powerful economic region of Eindhoven is centrally located between the core regions Randstad, Vlaamse Ruit (Antwerp, Leuven, Brussels, Ghent) and Rhein-Ruhr (Dortmund, Essen, Düsseldorf, Cologne, Bonn), notes the Moreelse Tafel. But the rail connections to Germany leave much to be desired: no direct Intercity trains, so frequent transfers, many stops and long travel times. The car and the coach on the highway are easier and faster.

OV MAGAZINE

Volgens de Moreelse Tafel liggen er kansen voor de rail vanuit de metropoolregio's Amsterdam en Rotterdam-Den Haag via Eindhoven naar Rhein-Ruhr. Vanuit Rhein-Ruhr bestaan er weer prima verbindingen met Hamburg, Berlijn en Frankfurt in respectievelijk het noorden, oosten en zuiden van Duitsland. Een snelle verbinding onderlangs naar Duitsland (Amsterdam/Rotterdam–Eindhoven–Duitsland) is praktischer dan bovenlangs (Amsterdam–Arnhem–Duitsland) omdat ook de metropoolregio Rotterdam-Den Haag daarvan profiteert.

Figure 77B: Moreelse table - A fast connection underneath

Future Vision 2050 is available here[36]
In order not to interfere with the High-Frequency Rail Transport (PHS) Programme of IenM, ProRail and NS, a 'dot on the horizon' has been chosen in 2050. PHS, which provides for more Intercity trains on four major domestic axes, runs until 2035.

Eindhoven and Düsseldorf want an High Speed Line[37]
The mayors of Eindhoven and Düsseldorf are making a joint appeal to the Dutch and German governments to take concrete steps for a direct Intercity between the two cities. Final destination: a high-speed line hsl-zuidoost. The mayors Van Gijzel (Eindhoven) and Geisel (Düsseldorf) make their appeal in the run-up to the ministerial summit of the two countries that will be held next spring. The connection should run from The Hague/Rotterdam via Eindhoven to Düsseldorf, where it connects to the ICE grid.

Figure 78: Highs speed connection Den Haag - Düsseldorf

"Only Canada and the US have a busier trade between them than Germany and the Netherlands," said a spokesman for the municipality of Eindhoven. "And we are the second economic engine in this country." The rail connection as it currently stands – with a transfer in Venlo to the regional train that runs once an hour – is therefore insufficient, according to the municipalities.

There has been talk for years about a direct intercity between Eindhoven and Düsseldorf. The final destination for the two cities is an HSL(High Speed Line) between the southern Randstad and the Ruhr area. This also includes new infrastructure. Eindhoven wants such a connection to be included in the MIRT.

[Tracks to Eindhoven[38]]
Opportunities for improving international train connections from the Eindhoven region.

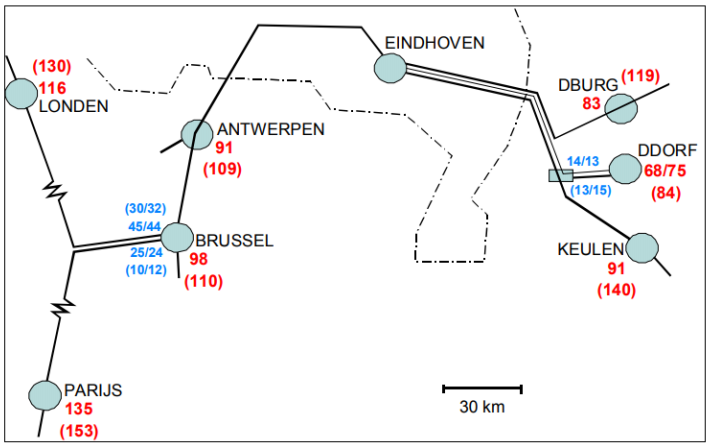


Figure 79: transfer time in minutes (to Eindhoven/from Eindhoven); the big figures the average travel speed in km/h between Eindhoven and the relevant place

As can be seen in the figure above, the Eindhoven-Cologne connection has great potential. When upgrading this route, an average travel speed of 140 km/h can be achieved.

10.9 Night trains

10.9.1 Introduction

At night, fast, comfortable night trains can cover 1000 to 2000 km. With 40 of these routes, more than 100 important destinations can therefore be reached. For this European night network, the following map [Euro Night Sprinter – Netzvision 2030+[39]] has been developed.

Figure 80: Proposal night trains 2030++

In order to be able to realize this (high-speed) night network, agreements must be made within the EU and the countries concerned about the following 5 components:
- Infrastructure needs to be improved
- Purchase of comfortable and fast trains
- These trains must be easy to book
- The user fee to be paid for the railways must be low
- The train must be given equal opportunities compared to the plane.

10.9.2 Conclusion

When you travel to Germany and beyond, 2 main connections can be distinguished for these night trains:
-The North/East route for the train connections to Berlin/Prague and Hamburg/Copenhagen can be completed via the Hengelo border crossing.
- The South route for the train connections to Munich and Austria/Switzerland. With Cologne as an important intermediate station, and Venlo or Arnhem as the border crossing..

10.10 EU green deal

Figure 81: EU green deal

The European Green Deal[46] is the von der Leyen Commission's programme to combat climate change. With this Green Deal, Europe must reduce CO2 emissions by 55 percent by 2030 compared to 1990 and by 2050 Europe should become the first climate-neutral continent.

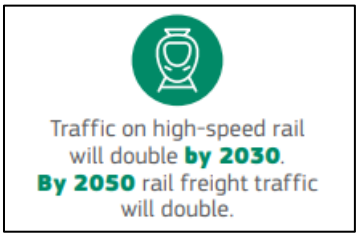


Figure 82: Green deal - transport

By 2030, the existing international rail network for high-speed trains must be twice as large as it is now and three times in 2050, the committee states in a series of proposals that should lead to efficient and green mobility.

On major TEN-T passenger lines, trains must be able to run at least 160 km/h by 2040, so that the entire EU has competitive high-speed lines.

(Three-quarters of the transport of goods by road must be moved to rail and waterways.)

Skimping on infrastructure would be an error of judgement
With the aim of doubling the modal share of rail by 2030, the issue of rail infrastructure has become more important than ever in many European countries. There are still many who believe that a beautiful modern train can improve train service without spending the necessary money on infrastructure. Invest in infrastructure[46B]

10.11 Rail Baltica

Rail Baltica[50] is a rail infrastructure project to connect the Baltic States and Finland to the European rail network via Poland with an entirely new standard gauge electric high-speed rail line.

Figure 83: Logo Rail Baltica

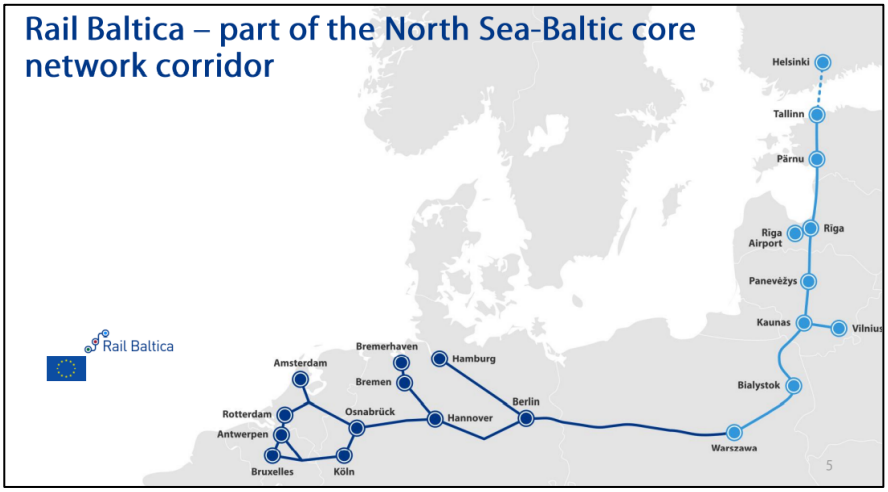


Figure 84: North-Sea Baltic corridor

Rail Baltica is a groundbreaking rail infrastructure project that will connect the three Baltic states, Finland and Poland, bringing the countries closer together and closer to Europe. It will remove the logistical bottleneck that currently exists in North-East Europe, creating the missing link in Europe's transit networks and finally allowing the Baltic states to be fully integrated with other European countries. We are already working this new trajectory. Completion to Talinn is expected in 2030.

ExpectedRail Baltica train services:

- **Rail Baltica** will provide a fast rail link between the Baltic capitals every two hours.
- **Rail Baltica** high-speed trains from Tallinn to **Warsaw** and **from Tallinn to Vilnius** run an estimated four times a day.
- A maximum of ten trains per day run on the **Vilnius-Kaunas-Warsaw** route.
- Two night trains on the Tallinn-Riga-Kaunas-Warsaw-Berlin and **Vilnius-Kaunas-Warsaw-Berlin** route.

To be able to travel to Helsinki by train, a 92-kilometre tunnel between Helsinki-Tallinn is needed[51].

Chapter 11 Twente and the Berlin train

11.1 Connection Twente- Randstad/Groningen

Date: 26 February 2019

UT: Invest in a better train connection with Randstad(conurbation of Western Netherlands) rather than in the Lower Saxony line[51]

Figure 91: Victor van der Chijs - UT

More priority must be given to a better train connection with the Randstad and Germany from Enschede. The University of Twente advocates this; according to the university, this is more important than, for example, a new train connection with Groningen, the so-called Lower Saxony line..

University cities

As one of the arguments for the construction, the importance of connecting the two university cities - Groningen and Enschede - is mentioned. But Victor van der Chijs, chairman of the board of the UT, prefers to see better connections with university cities Munster and cities such as Amsterdam, The Hague and Rotterdam. "Especially if you take a train to the Randstad, the travel time is long. Sometimes you also have to switch. What is also nice to think, that the trains nowadays take longer than in 1949[51B]. "The construction of the new railway line - there are still a few kilometers of new track to be built in Drenthe - will probably cost around 250 million euros. Van der Chijs thinks that this money could be spent better.

Germany

There is little connection back and forth with Groningen; the cooperation partners of the UT are located in the Randstad and in Germany. "We work a lot with German university cities, but also with German companies. We have a Max Planck Institute here, a Frauhofer Institute on the ground, all people going back and forth to Germany." But a better connection with Amsterdam is also important, because of the collaboration with the VU. In September, a new program will start, which will eventually result in hundreds of students going back and forth to Amsterdam every two weeks. I the new railway line will be built? There is a petition, which has now received four thousand signatures. The signature of Victor van der Chijs will not be included.

11.2 The (Former) Mayor of Enschede

Date: 30 July 2019

'turbo train' to Berlin runs via Twente[52]

Figure 92: :Onno van Veldhuizen

The Mayor of Enschede knows for sure: 'turbo train' to Berlin runs via Twente

VIDEO ENSCHEDE/HENGELO - The future, ultra-fast train between Amsterdam and Berlin will run via Twente. That is the firm conviction of the Enschede mayor Onno van Veldhuizen. According to him, the lobby has done its job. "I dare to say that we have chased Arnhem off the track."

With the whole accessibility, which of course a lot of people say, "yes Enschede may be a bit closer to a lot of things" especially for people who do not live in Enschede who find it even further away. There we have had a very good lobby via the Amsterdam Berlin line where for me Berlin is not so crucial at all. Much more crucial is that you get from Twente to Amsterdam faster. There was really a serious threat that that whole plan would be developed via Arnhem. Thanks to a good lobby on the German Bundesbahn and also a good understanding of what they want, it is now clear that Arnhem is out of the race.

Is that certain? I am fairly sure of that, also because, I really mean that, we do that better than all the others, the combined German-Dutch lobbies we are good at as far as Europe and that also makes the difference it is also quite logical. An international train is not a Dutch train, so what Germany thinks of it is rather decisive what happens in the Netherlands.

11.2.2 Reaction Achterhoek on OAO note GNOE

Note GNOE[55] (GNOE=Freight corridor North-East Europe)

Discussions with and perspective from Germany: Good coordination between the Netherlands and Germany is essential to bring this dossier to a successful conclusion. So far, no contact has been made with Germany and the perspective from Germany has not been brought into this discussion. The Achterhoek organized that contact. When we asked DB Netz, we found that their vision for the future Takt für Deutschland is based on focusing freight on the third track currently under construction between Oberhausen and Emmerich in connection with the Betuwe line **and precisely to reduce cross-border freight transport in Bad Bentheim in order to speed up the IC Berlin there.**

11.3 The ICE through Twente

Date: May 26, 2000

The first NS trainset runs from June to November 2000 on the occasion of the Expo 2000 as an extra train between Amsterdam and Hannover.

Figure 93: ICE in Almelo

ICE-3 writes railway history
Leidsch Dagblad | 2000 | 26 May 2000 | page 5
At the German border station Bad Bentheim, railway history was written yesterday. For the first time since the steam locomotive disappeared from daily service, another international passenger train from the Netherlands ran straight to the German rail network without changing locomotives. The new German-Dutch high-speed train ICE-3 performed the long-awaited border crossing without fail.

Those who are willing to get up very early can take the new ice-3 high-speed train to Hanover from 1 June (2000) until 31 October, the ICE will drive from Amsterdam directly to the EXPO 2000 in this German city. With people from the tourism industry, the railway industry and journalists, the advanced train made its first official journey across the border yesterday. Because there are different voltages on the Dutch and German overhead lines, until now in Bad Bentheim, Emmerich and Venlo the Dutch locomotive had to make way for a German (or vice versa) locomotive, a time-consuming maneuver. Yesterday, the change from one voltage to another voltage in Bad Bentheim was only a matter of a few buttons in the ICE-3.

Bahnhof	an	ab	Hinweis
Amsterdam CS		06:37	
Amersfoort	07:09	07:13	
Deventer	07:52	07:53	
Hengelo	08:24	08:25	
Bad Bentheim	08:41	08:46	Betriebshalt
Osnabrück Hbf	09:22	09:24	
Hannover-Linden	10:39	10:53	Betriebshalt
Hannover Messe/Laatzen	10:59		

Figure 94: ICE Amsterdam - Hannover

Nevertheless, the 'test drive' went to Hannover not entirely without incidents. After the train had been running at 200 km/h for a while, the train came to a stop for a switch with a malfunction. This resulted in a delay of more than half an hour. Only need to speed those interested in the EXPO 200 do not have to make the choice for the ICE-3 anyway.
The high-speed train, which can reach 330 km/h on a specially suitable track, takes only six minutes less than the regular train over the Amsterdam-Hannover distance (4 hours a 22 minutes instead of 4 hours and 28 minutes).
This is because this train is integrated into the timetable between the regular trains. For the enthusiasts, a ride with the ICE-3 can nevertheless be an experience, for which they have the inconvenience of the early departure time from Amsterdam (6.37 am).

11.4 Fast train to Berlin via Twente (VVD- Lex Schukking)

Date: 21 September 2022

Oldenzaals Member of Parliament [Lex Schukking does not give up[54]]

Fast train to Berlin? Oldenzaals Member of Parliament Lex Schukking does not give up: 'Even though I never drive it myself'

OLDENZAAL/HENGELO - I seem to be a voice in the wilderness. It does not prevent VVD member of parliament and Oldenzaler Lex Schukking from a new lobby for a high-speed connection Amsterdam-Berlin, via Twente. "Someone has to start with it."

Figure 95: Lex Schukking at Hengelo station

An hour faster in Amsterdam and In Berlin. From Twente Central Station. Schukking: "By that I mean Hengelo." Only four intermediate stations between Amsterdam and Berlin would call at the high-speed train. "Twente Centraal and Amersfoort in the Netherlands and Osnabrück and Hannover in Germany." According to Schukking, it is important that the region stands behind this idea.

The discussions about Schiphol airport can serve as ammunition. "The number of flights at Schiphol is drastically reduced. Alternative transport is needed. With a new train, we can respond to this." Europe connects major cities through trans-European transport networks. "Make no mistake, there is money available for projects like this."

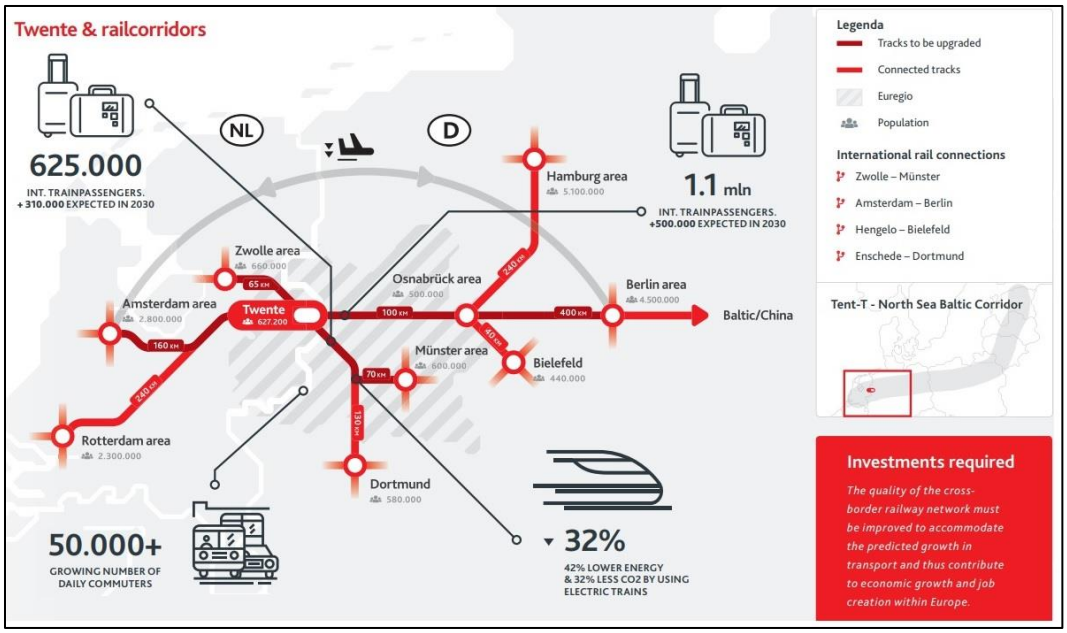


Figure 96: International railway connections in Twente

Corridor Amsterdam-Berlin (TEN-T). The IC Amsterdam-Berlin is a vital link for passenger transport between the Netherlands and Germany. *[International railway connections, more opportunities for Europe[54B]]*

Chapter 12 Accountability

12.1 Flights from the Netherlands

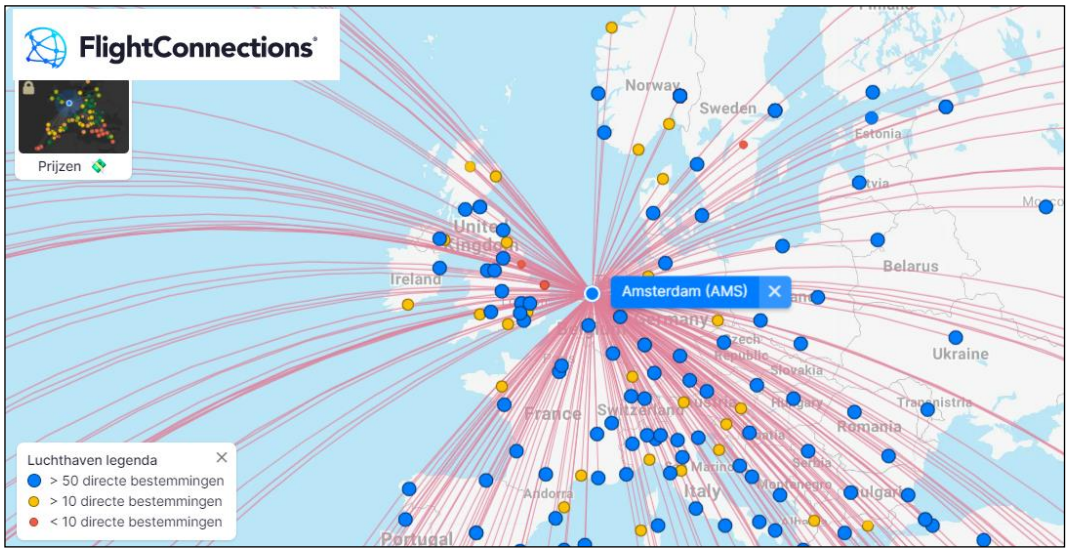


Figure 97: Flight connections from Schiphol

All information about the Flight Connections that are mentioned in this report I have obtained from the site above. [Flights from Amsterdam[40]]

12.2 Distances in the Netherlands

[Distance-tool[41]]

Figure 98: Distance tool the Netherlands

With the above tool I have determined the distances of the different Dutch routes.

12.3 Distances in Germany

[Distances in Germany[42]]

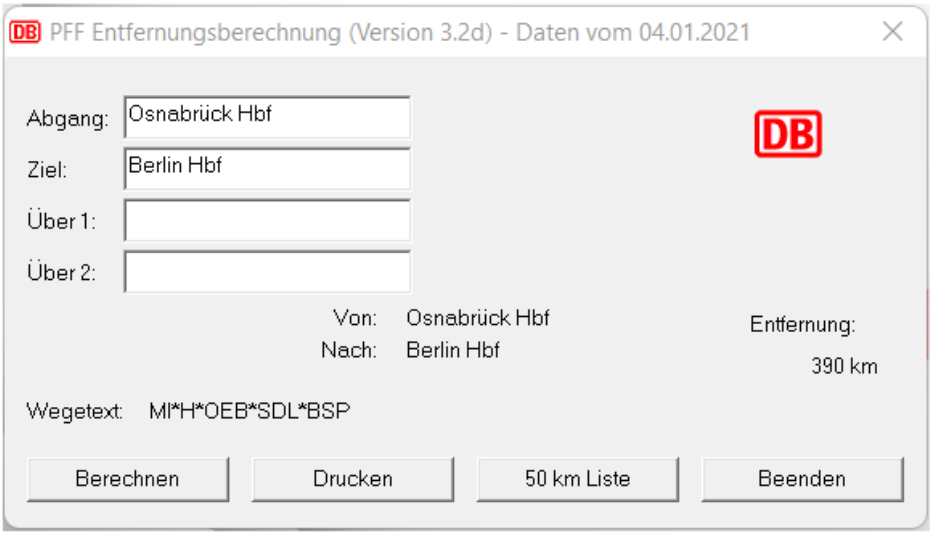


Figure 99: Distance tool Germany

With the above application I have determined the distances of the different German routes.

12.4 Railway Atlas Germany

[Eisenbahnatlas Deutschland[43]]

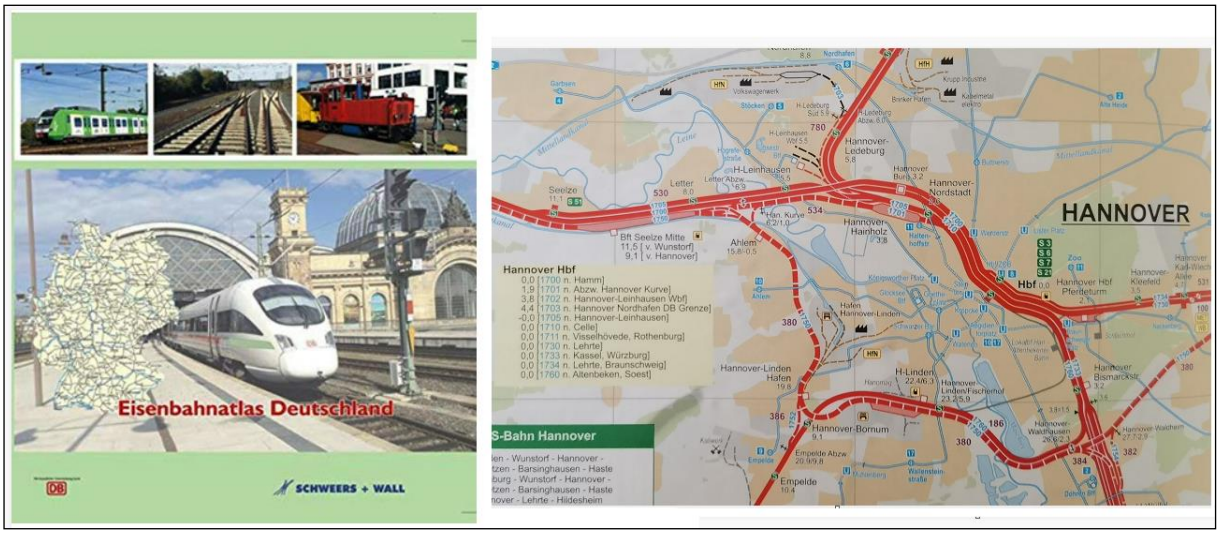


Figure 100: Track atlas Germany

I have extracted a lot of detailed information about the German rail infrastructure from the aforementioned Atlas.

12.5 Openrailwaymap

[Openrailway--map[44]]

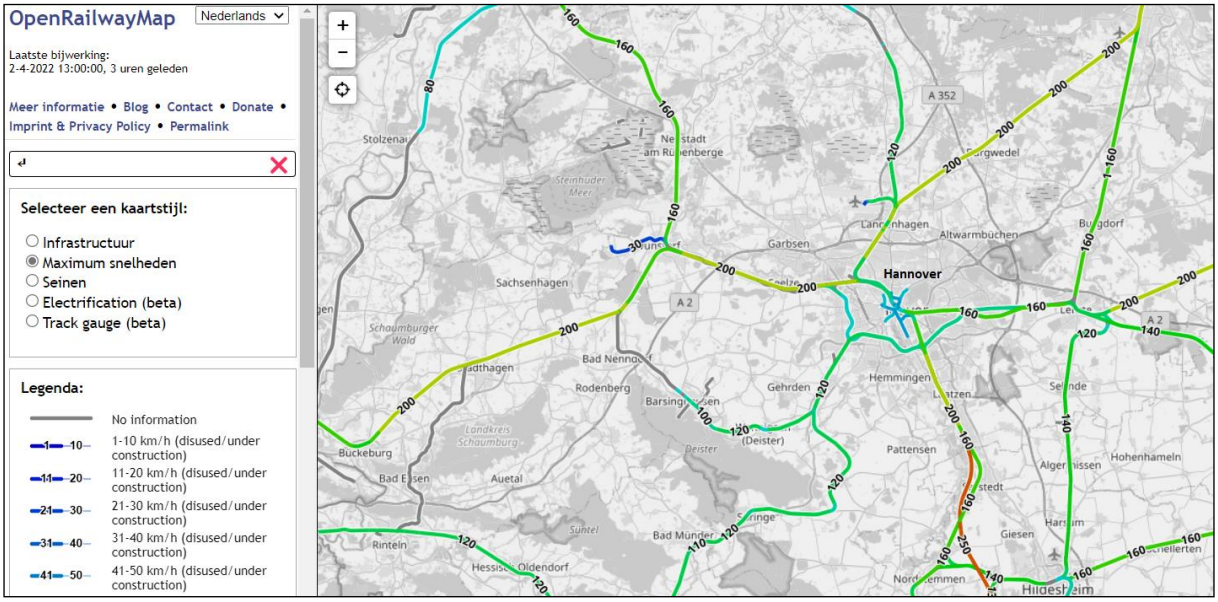


Figure 101: Determination of Maximum Speeds

On the above web-site the Vmax of the all routes are available.

12.6 HSL-East infrastructure - Speed 200 km/h

[HSL-Oost infrastructuur[45]]

Tabel 2.1 Minimale reistijden per traject in de 200 km/u en 300 km/u alternatieven

	Situatie 1997	basis-alternatief	200 km/u alternatief	300 km/u alternatief
		Reistijd in minuten		
Utrecht - Arnhem	32	32	21	18
A'dam - Arnhem	59	53	41	38
A'dam - Keulen	156	135	118	115
A'dam - Frankfurt	310	205	188	185
		Tijdwinst tussen varianten in minuten		
Utrecht -Arnhem		0	11	3
A'dam - Arnhem		6	12	3
A'dam - Keulen		21	17	3
A'dam - Frankfurt		105	17	3

Bron: Intraplan; Projectdirectie HSL-Oost

Figure 102: Travel times for 200 km/h route Utrecht-Arnhem

Utrecht -Arnhem (Distance 57,5 km)

140 km/h	200 km/h
NS.nl Travel time 32 min.	Travel time 21 min
V(average)=108 km/u	V(average)=164 km/u

B1 Flights with distance <750 km from Schiphol

Below a list of destinations and distance from Schiphol (<750 km) (December 2021)

UK	
Londen Heathrow (LHR)	405 fl 357,32 km
London City (LCY)	252 fl 357,32 km
London Luton (LTN)	140 fl 357,32 km
London Gatwick (LGW)	132 fl 357,32 km
London Stansted (STN)	54 fl 357,32 km
Dublin (DUB)	314 fl 754,68 km
Manchester (MAN)	205 fl 493,57 km
Edinburgh (EDI)	163 fl 658,70 km
Birmingham (BHX)	130 fl 460,00 km
Newcastle (NCL)	116 fl 516,53 km
Bristol (BRS)	115 fl 523,37 km
Aberdeen (ABZ)	112 fl 693,74 km
Glasgow (GLA)	110 fl 710,61 km
Leeds / Bradford (LBA)	85 fl 458,18 km
Liverpool (LPL)	51 fl 538,64 km
Cardiff (CWL)	23 fl 579,61 km
Norwich (NWI)	20 fl 244,79 km
Southampton (SOU)	17 fl 463,97 km
Humberside (HUY)	17 fl 375,46 km
Durham(MME)	16 fl 503,37 km
20x (Airportss)	2477 (Fl/Month)
Noord-Duitsland (en verder)	
Kopenhagen (CPH)	318 fl 620,98 km
Berlijn (BER)	243 fl 575,92 km
Praag (PRG)	172 fl 710,04 km
Hamburg (HAM)	138 fl 365,87 km
Göteborg (GOT)	121 fl 744,13 km
Billund (BLL)	120 fl 466,15 km
Stavanger (SVG)	93 fl 735,35 km
Hannover (HAJ)	91 fl 328,67 km
Aalborg (AAL)	66 fl 611,56 km
Bremen (BRE)	61 fl 275,03 km
Kristiansand (KRS)	42 fl 467,38 km
Dresden (DRS)	21 fl 626,62 km
12x	1.486
Zuid-Duitsland (en verder)	
München (MUC)	273 fl 668,72 km
Frankfurt (FRA)	249 fl 364,50 km
Zürich (ZRH)	247 fl 615,30 km
Stuttgart (STR)	148 fl 501,44 km
Bazel(BSL)	127 fl 568,68 km
Düsseldorf (DUS)	122 fl 181,96 km
Neurenberg (NUE)	86 fl 541,88 km
7x	1.252

France-Belgium	
Parijs (CDG)	303 fl 430,10 km
Genève (GVA)	218 fl 692,26 km
Brussel (BRU)	131 fl 173,48 km
Lyon (LYS)	118 fl 735,68 km
Luxemburg Stad (LUX)	101 fl 305,06 km
Nantes (NTE)	68 fl 736,01 km
Parijs (Orly) (ORY)	36 fl 430,12 km
Rennes (RNS)	17 fl 665,07 km
8x	891

B2 Amsterdam-Cologne via Arnhem or Venlo

Amsterdam – Utrecht	40 km		
Utrecht - Arnhem	58 km		
Arnhem-Oberhausen	92 km		
Oberhausen-Düsseldorf	32 km		
Düsseldorf-Köln	41 km		
	263 km		

Amsterdam - Utrecht	40 km		
Utrecht - Eindhoven	80 km		
Eindhoven - Venlo	52 km		
Venlo - Neuss	41 km		
Neuss- Düsseldorf	20 km	Neuss - Cologne	34 km
	233 km		247 km

0:20 Amsterdam-Utrecht
0:02 Stop Utrecht
0:21 Utrecht-Arnhem
0:02 Stop Arnhem
0:46 Arnhem-Duisburg
0:02 Stop Duisburg
0:15 Duisburg- Düsseldorf 1:48 to Düsseldorf
0:02 Stop Düsseldorf
0:32 Düsseldorf- Cologne
2:22

0:20 Amsterdam-Utrecht
0:02 Stop Utrecht
0:36 Utrecht - Eindhoven
0:02 stop Eindhoven
0:25 Eindhoven-Venlo
0:02 Stop Venlo
0:20 Venlo – Neuss

0:10 Neuss – Düsseldorf	0:20 Neuss – Cologne
1:59 Hour/Min	2:09 Hour/Min

B3 URLS

[1] https://www.spoorbeeld.nl/sites/default/files/2021-07/inspiration/180413-sb-spoor%3Dcorridor.pdf
[2] https://www.flightconnections.com/nl/vluchten-vanaf-amsterdam-ams
[3] https://open.overheid.nl/repository/ronl-d37c462c-0506-4dd2-ba17-d888d65a9e50/1/pdf/bijlage-1-actieagenda-trein-vliegtuig.pdf
[4] https://nieuws.ns.nl/internationale-trein-is-hoogvlieger/
[5] https://www.lok-report.de/news/deutschland/verkehr/item/10549-bmvi-deutschland-und-niederlande-wollen-gemeinsam-die-bahnverbindung-amsterdam-berlin-attraktiver-gestalten.html
[6] https://www.bmvi.de/SharedDocs/DE/Anlage/E/praesentation-deutschlandtakt.pdf?__
[7] https://www.fernbahn.de/datenbank/suche
[8] https://zoek.officielebekendmakingen.nl/kst-29984-950.html
[9] https://www.treinreiziger.nl/treinreis-naar-berlijn-eind-2023-toch-sneller-dankzij-lease-locomotieven/
[10] https://cleantechregio.nl/nieuws/1662-flinke-toename-reizigers-bij-investeringen-in-huidige-berlijntrein
[11] https://twitter.com/Buijtelaar/status/1370811055979573248?s=20
[12] https://ovinnederland.nl/search.php?keywords=Berlijn&t=14320&sf=msgonly
[13] https://l1.nl/elektrificatie-maaslijn-maakt-sneltrein-mogelijk-24716
[14] https://www.treinenweb.nl/nieuws/9243/prorail-maaslijn-is-eind-2024-geelektrificeerd.html
[15] https://www.euregio.eu/projecten/euregiorail/
[16] https://www.ovpro.nl/trein/2016/03/31/zwolle-wil-aangesloten-worden-op-treinverbinding-naar-berlijn/?gdpr=accept
[17] https://www.eerstekamer.nl/overig/20190131/quick_scan_verbetering/meta
[18] https://www.destentor.nl/zwolle/snellere-treinverbinding-tussen-randstad-en-zwolle-enschede-munster-kost-3-5-miljard~a7e42451/
[19] https://www.tubantia.nl/enschede/weinig-enthousiasme-bij-staatssecretaris-voor-snellere-trein-zwolle-enschede-munster~aac1e46c/
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B4 Number of travelers per border crossing for a trip from the Netherlands to Berlin.

1.Provincie Zuid-Holland 3.753.944
All passengers from this province travel via Utrecht to Amersfoort where you can transfer to the fast direct train to Berlin via border crossing Hengelo.

2.Provincie Noord-Holland 2.909.827
Most travelers from this province travel to Amsterdam where you can transfer to the fast direct train to Berlin via the Hengelo border crossing. Travelers from Hilversum and surroundings travel to Amersfoort where you can transfer to the train to Berlin. All travelers from the province of North Holland travel to Berlin via the Hengelo border crossing.

3.Provincie Noord-Brabant 2.592.874
Most travelers from this province travel via Eindhoven and the Venlo border crossing to Düsseldorf where you can transfer to the ICE to Berlin. Residents from Oss and the surrounding area travel to Arnhem where they can change to a train to Duisburg. This results to the following distribution per border crossing.

Border crossing Venlo	2.492.874
Border crossing Arnhem	100.000
Total	2.592.874

4.Provincie Gelderland 2.110.472

Apeldoorn	170.000	Arnhem	170.000
Hardewijk	50.000	Nijmegen	180.000
Zutphen	50.000	Ede	110.000
Winterswijk	30.000	Zevenaar	24.000
Groenlo	10.000	Wageningen	40.000
Eibergen	45.000	Doetichem	60.000
Barneveld	60.000		584.000
Nijkerk	45.000		
Dieren	15.000		
Brummen	20.000		
Lochem	35.000		
Lichtenvoorde	15.000		
Epe	35.000		
Twello	15.000		
Wezep	15.000		
	625.000		

The above inventory shows that there are slightly more potential travelers for Hengelo in the province of Gelderland than for the Arnhem border crossing. This results to the following distribution per border crossing for the province of Gelderland.

Grensovergang Hengelo	1.110.472
Grensovergang Arnhem	1.000.000
Totaal	2.110.472

5.Province Utrecht 1.369.873
All passengers from this province travel to Amersfoort where they can change to the fast direct train to Berlin via the Hengelo border crossing.

The travelers below travel via the Arnhem border crossing to Berlin.

Driebergen	20.000
Veenendaal	65.000
	100.000

This results to the following distribution per border crossing for the province of Utrecht:

Grensovergang Hengelo	1.269.873
Grensovergang Arnhem	100.000
Totaal	1.369.873

6.Province Overijssel 1.171.910
All travellers from the province of Overijssel travel via the Hengelo border crossing to Berlin.

7.Province Limburg 1.118.302
Maastricht/Geleen via Venlo

Other

Landgraaf	37.000
Heerlen	88.000
Kerkrade	47.000
Total	172.000

This results to the following distribution per border crossing for the province of Limburg:

Grensovergang Venlo	946.302
Grensovergang Overig	172.000
Total	1.118.302

8.Province Friesland 654.019
All travelers from the province of Friesland travel via the Hengelo border crossing to Berlin.

Leeuwarden-Groningen	0:34		
Groningen - Oldenburg	1:32	Leeuwarden -Hengelo	1:48
Oldenburg-Berlijn	3:48	Hengelo – Berlijn	3:30
Total	5:54	Total	5:18

9.Province Groningen 590.170

Groningen - Oldenburg	1:32	Groningen -Hengelo	1:55
Oldenburg-Berlijn	3:48	Hengelo – Berlijn	3:30
Total	5:20	Total	5:25

All travelers from the Province of Groningen travel via the border crossing Other (Nieuweschans) to Berlin.

10.Province Drenthe 497.743

Assen via Groningen		Assen – Hengelo	1:39
5:20 + 17 = 5:37		Hengelo – Berlijn	3:30
		Total	5:09

Other(Coevorden)

Emmen	60.000
Coevorden	40.000
Totaal	100.000

This results to the following distribution per border crossing for the province of Drenthe:

Grensovergang Hengelo	397.743
Grensovergang Overig	100.000
Totaal	497.743

11.Province Flevoland 434.771
All travelers from the Province of Flevoland travel via the Hengelo border crossing to Berlin.

12.Province Zeeland 386.767
All travelers from the Province of Zeeland travel via the Venlo border crossing to Berlin.

B5 Number of passengers per border crossing Germany(and beyond) to The Netherlands.

This annex determines for each German(Bundesländ) which border crossing is travelled along on the route to Amsterdam. If there are more options for different border crossings within a Bundesländ, this is determined per Kreis. If there are also different options within a Kreis, a percentage of the inhabitants of a Kreis are respectively assigned to a border crossing.

A: Germany

1. NRW 18.000.000 Inhabitants

Figure 102B: All Kreise of NRW

All travellers from NRW are assigned to the Arnhem Border Crossing. Below is an investigation into which travelers from certain Kreisen (sub-areas) will travel along other border crossings to Amsterdam.

Hengelo

Steinfurt	450.000
Kreis Minden-Lübbecke	300.000
Kreis Herford	125.000 (50%)
	875.000

Venlo

Kreis Viersen	300.000
Mönchengladbach	260.000
Rhein-Erft-Kreis	470.000
Krefeld	225.000
Düsseldorf	620.000
Köln	1.075.000
Leverkusen	165.000
Bonn	330.000
Rhein-Sieg-Kreis	600.000
Rheinisch-B-Kreis	280.000
Oberbergischer	270.000
Solingen	160.000
Remscheid	110.000
	4.865.000

Other

Münster	300.000
Kreis Coesfeld	1.100.000
Kreis Borken	190.000 (50%)
	1.590.000
Kreis Heinsberg	260.000
Städteregion Aachen	560.000
Kreis Euskirchen	200.000
Kreis Düren	270.000
	1.290.000
Total	2.880.000

Kreis Herford is allocated 50% to Hengelo and 50% to Arnhem.
Kreis Borken is allocated 50% to Other and 50% to Arnhem.

Total Not Arnhem =	8.620.000
Arnhem= NRW – total	9.380.000

2. Bayern 13.177.000 Inhabitants

All travelers from Bayern via Venlo to Amsterdam.

3. Baden-Wurtenberg 11.125.000 Inhabitants

All travelers from Baden-Wurtenberg via Venlo to Amsterdam.

4. Lower Saxony 8.027.000 Inhabitants

Figure 103: Alle Kreise van Lower Saxony

The travelers from Lower Saxony are awarded to the Border Crossing Hengelo.

Gottingen via Hengelo of Arnhem/Venlo?

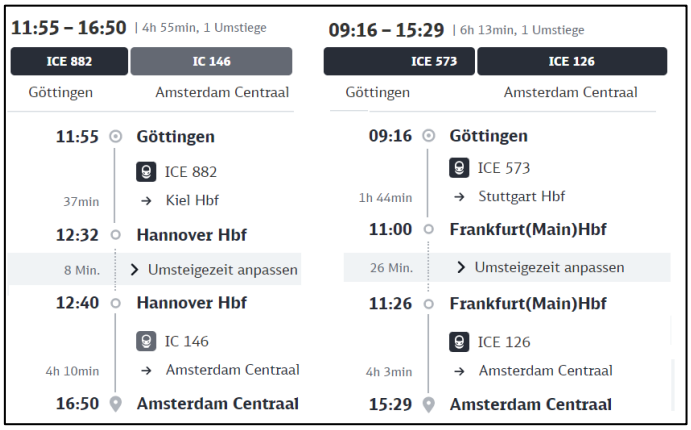


Figure 104: Gottingen via Hengelo or Arnhem/Venlo

Gottingen is already today faster via Hannover to Amsterdam than via Frankfurt and Arnhem. When the fast connection Amsterdam-Hengelo-Hannover is constructed, this route will certainly be faster than via Arnhem or Venlo.

Other

Emden	50.000
Landkreis Aurich	190.000
Landkreis Wittmund	60.000
Landkreis Friesland	100.000
Landkreis Wesermarsch	90.000
Wilhelmshaven	75.000
Landkreis Leer	175.000
Landkreis Ammerland	130.000
Oldenburg (Oldb)	170.000
	1.040.000

Total Not Hengelo =	1.040.000
Hengelo= Niedersachsen – Niet H	6.987.000

5. Hessen 6.025.000 Inhabitants

Figure 105: All Kreise of Hessen

Passengers from Lower Saxony are assigned to the Venlo border crossing.

Hengelo

Landkreis Fulda	225.000
Landkreis Hersfeld-Rotenburg	120.000
Schwalm-Eder-Kreis	180.000
Werra-Meißner-Kreis	100.000
Landkreis Kassel	240.000
Landkreis Waldeck-Frankenberg	156.000
Kassel	200.000
	1.221.000

Venlo= Hessen - 1.221.000 =
6.025.000 - 1.221.000 = 4.804.000

6. Reinland-Paltz 4.106.000
All travelers from Reinland-Paltz via Venlo to Amsterdam.

7. Sachsen 4.043.000
All travelers from Sachsen via Hengelo to Amsterdam.

8. Berlijn 3.677.000
All travelers from Berlin via Hengelo to Amsterdam.

9. Schleswig-Holstein 2.922.000
All travelers from Schleswig-Holstein via Hengelo to Amsterdam.

10. Brandenburg 2.538.000
All travelers from Brandenburg via Hengelo to Amsterdam.

11. Sachsen-Anhalt 2.169.000
All travelers from Sachsen-Anhalt via Hengelo to Amsterdam.

12. *Thuringia* 2.109.000

Figure 106: All Kreise of Thuringia

Most travelers from Thuringia via Hengelo to Amsterdam

Heilbad Heiligenstadt	100.000 Hengelo
Landkreis Nordhausen	82.000 Hengelo
Kyffhäuserkreis	73.000 Hengelo
Gotha	135.000 Hengelo
Landkreis Schmalkalden-Meiningen	123.000 Hengelo
Landkreis Hildburghausen	62.000 Hengelo
	575.000

Wartburgkreis	160.000 Venlo

Hengelo= 2.109.000 – 160.000 = 1.949.000

13. Hamburg 1.854.000
All travelers from Hamburg via Hengelo to Amsterdam

14. Mecklenburg-Vorpommern 1.611.000
All travelers from Mecklenburg-Vorpommern via Hengelo to Amsterdam

15. Saarland 982.000
All travelers from Saarland via Venlo to Amsterdam

16. Bremen 676.000
All travelers from Bremen via Hengelo to Amsterdam

B: Denemarken
Inhabitants 6.000.000

All residents of Denmark live within the 750 km border of Amsterdam and will travel to Amsterdam via the Hengelo border crossing.

C: Poland
Inhabitans: 40.000.000

Figure 107: Poland

A limited number of inhabitants of Poland are located within/around the 750 km border from Amsterdam. For our quantitative determination of the number of passengers who will/can travel to Amsterdam by train, we go for 6,000,000 potential passengers. [High Speed rail 2021[65]]

From Warsaw to Helsinki are concrete plans in the Rail Baltica project. Travel time between Poznań and Warsaw will be less than 2 hours. [Design works for Polish high-speed rail project begin[66]]

High-speed lines planned in Poland

LINE	MAXIMUM SPEED (km/h)	YEAR	DISTANCE (KILOMETRES)
Warsaw - Poznan - Wroclaw	350	2030	448
Warsaw - Bialystok - Ełk	200	2030	277
Elk - Lithuanian border (Rail Baltica)	250	2030	80
			Total km = 805

Figure 108: High Speed Train in Poland

Bahnhof	an	ab
Berlin Hbf		06:41
Berlin Ostkreuz	06:50	06:52
Frankfurt(Oder)	07:30	

Figure 109: Travel time from Berlin to the polish border

From "Berlin Hbf" to the Polish border (Frankfurt on the Oder) the travel time is 49 minutes. From Hengelo to the Polish border the travel time will be: 3:14 + 10 (Change) + 49 min = 4:13 min.

D: Oostenrijk
Inhabitans: 8.000.000

Figure 110: Austria

A limited number of inhabitants of Austria are within/ around the 750 km border from Amsterdam. For our quantitative determination of the number of passengers who will/can travel to Amsterdam by train, we go for 2,000,000 potential passengers.

E: Zwitersland
Inhabitans: 9.000.000

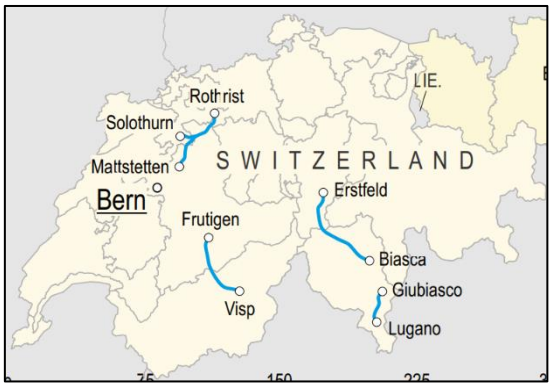


Figure 111: Switzerland

A limited number of inhabitants of Switzerland are within/around the 750 km border from Amsterdam. For our quantitative determination of the number of passengers who will/can travel to Amsterdam by train, we go for 4,000,000 potential passengers.

F: Sweden
Inhabitans: 10.000.000

Figure 112: Sweden

A limited number of inhabitants of Sweden is within/ around the 750 km border from Amsterdam. For our quantitative determination of the number of passengers who will/can travel to Amsterdam by train, we go for 1,000,000 potential passengers.

G: Tsjechië
Inhabitants: 10.000.000

Figure 113: Czech Republic

A limited number of inhabitants of the Czech Republic are within/ around the 750 km border from Amsterdam. For our quantitative determination of the number of passengers who will/can travel to Amsterdam by train, we go for 6,000,000 potential passengers.

At the moment there are concrete plans for a fast train connection from Prague to Berlin.

For this research we award::
- 4 Million travelers to the Hengelo border crossing. (Prague-Berlin-Hengelo-Amsterdam)
- 2 Million travelers to the Venlo border crossing. (Pilsen-Frankfurt-Venlo-Amsterdam)

B6 High-speed trains in China

China High-speed Rail Development Goals.

[China High-speed Rail Planning Map (topchinatravel.com)[49]]

Figure 114: A Chinese High speed train

The term of this planning is from 2016 to 2025, and the long-term outlook is to 2030. By 2020, China high-speed railway network has reached 150,000 kilometers, with 30,000 kilometers of high-speed railways covering more than 80 percent of the major cities.

By 2025, the railway network scale will be up to 17,5000 kilometers, about 38,000 kilometers of which are high speed railway. The network coverage will further expand, and the network structure will optimize better to play a role of safeguard to social and economic development.

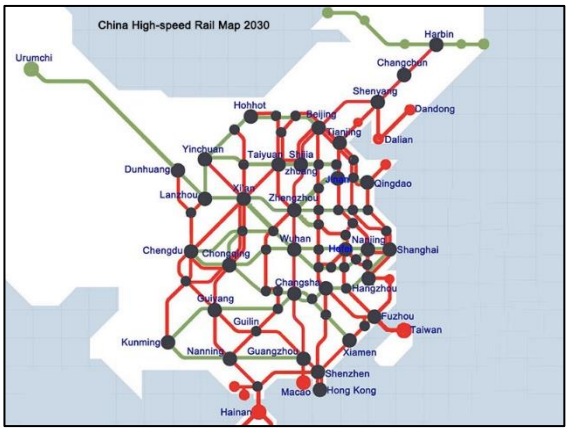


Figure 115: High speed channels in China

The "eight vertical and eight horizontal" high-speed railway network refers to the "eight vertical" channels along the coastal and Beijing-Shanghai, and the "eight horizontal" channels and land bridges along Yangtze river with inter-city railways supplemented.

The "eight vertical and eight horizontal" can realize a traffic circle within 1-4 hours between the adjacent large and medium-sized cities, and 0.5 to 2 hours in the urban agglomeration

Train from Shanghai to Nanjing

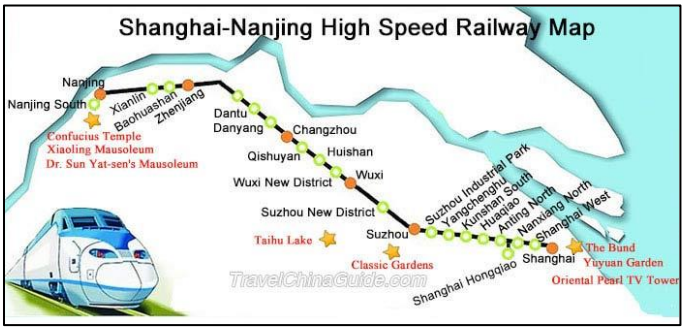


Figure 116: Connection from Shanghai to Nanjing

There are about 218 high-speed trains on the Shanghai-Nanjing route, so it is very convenient to take a train between Shanghai and Nanjing. At the moment (2022), a trip between the two cities has been shortened from 2 hours to just 59 minutes. The trains depart regularly. The time interval between departing trains is often no more than 5 minutes. If you miss your train, you can easily get a replacement ticket at a ticket office and catch a train shortly after.

Distance: 296 kilometers (187 miles)
Shortest travel time: 59 minutes
Number of trains: 275 pairs of trains (218 high-speed trains, 57 regular trains)

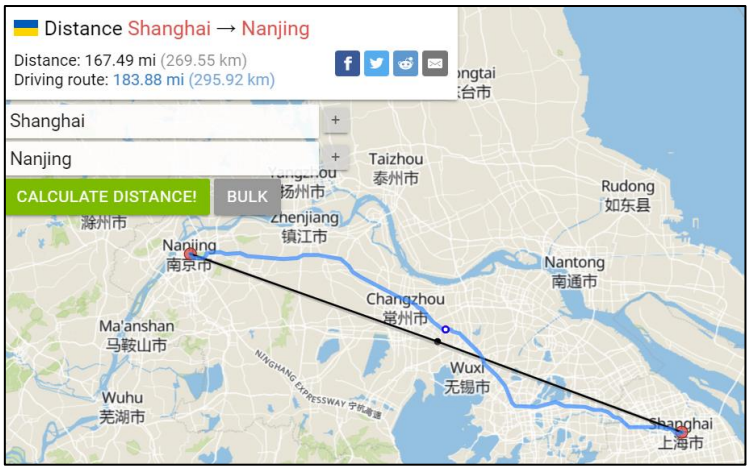


Figure 117: Distance Shanghai - Nanjing

China High-speed Timetable [50]

Train number	Shanghai Hongqiao	Nanjing South	Travel time
G8	09:00	09:59	59min
G1236	09:04	10:32	01h 28min
G1806	09:09	10:37	01h 28min
G7492	09:11	11:10	01h 59min
G378	09:14	10:45	01h 31min
D3022	09:16	11:42	02h 26min
G1920	09:20	10:41	01h 21min
G7372	09:26	11:30	02h 04min
G1204	09:33	11:04	01h 31min
G3164	09:38	11:14	01h 36min
G7132	09:41	11:35	01h 54min
D3060	09:46	11:56	02h 10min
G1476	09:51	11:29	01h 38min

Table 18: More than 10 trains per hour between Shanghai and Nanjing

Part of the timetable, between 09:00 and 10:00, for the trains of Shanghai Hongqiao to Nanjing South. More than 10 trains per hour per direction.

Compare connections Rotterdam-Colgne and Shanghai-Nanking.
Now we compare for the routes Rotterdam-Cologne and Shanghai-Nanking on:
- Length
- Journey time
- Average speed

Shanghai-Nanking
(2022) travel time: 0:59 hour/min.
V-Average (distance) = 270/59 x 60= 274 km/hour
V-Average (driving route) = 296/59 x 60= 301 km/hour

Rotterdam- Cologne
(2022 via Arnhem) travel time: 3:02 hour/min.
V-Average (distance) = 204/182 x60= 67 km/h
V-Average (driving route) = 288/182 x60= 95 km/h

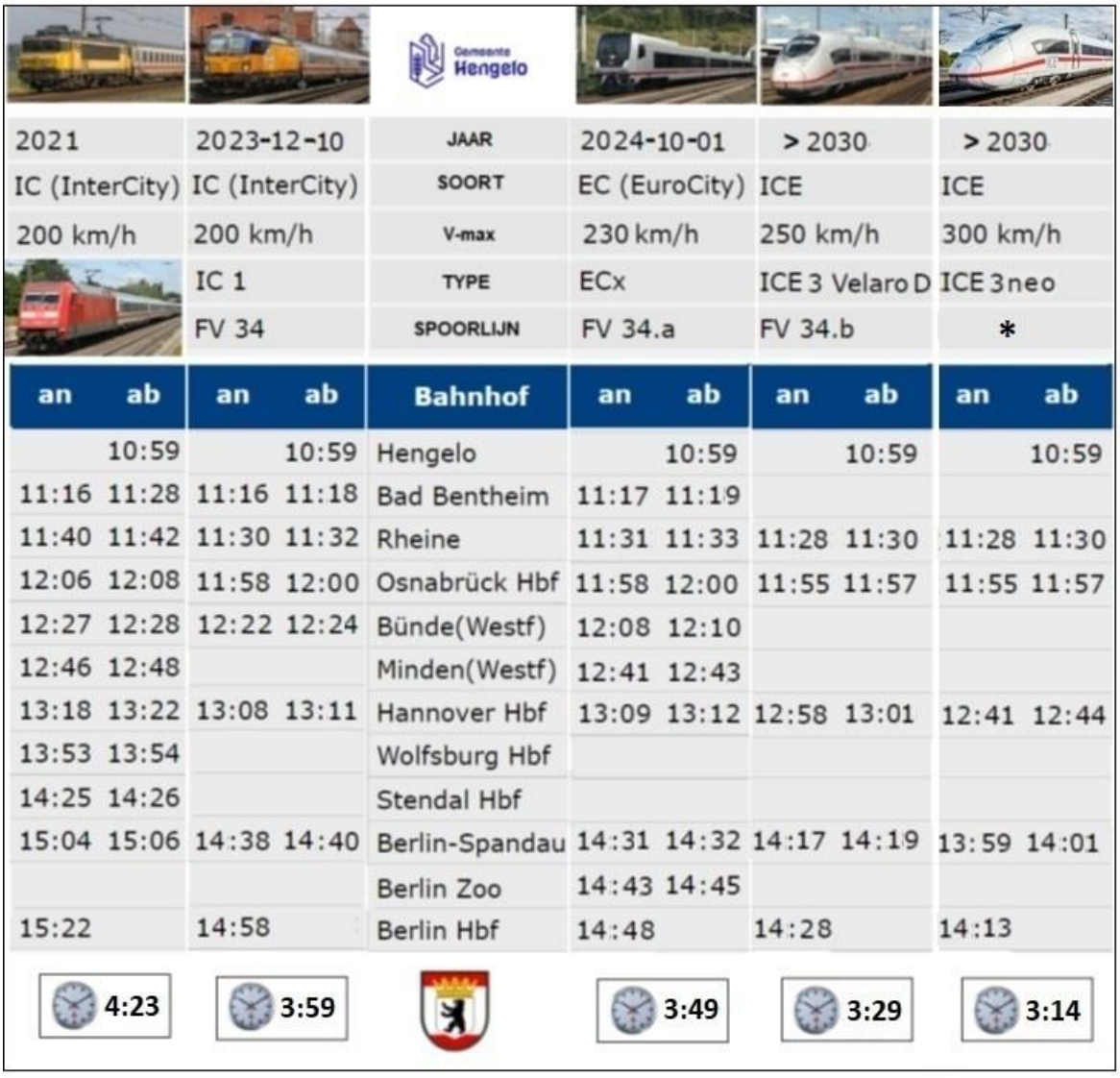
(>2030 Fast route via Eindhoven) travel time: 2:07 hour/min.
V-Average (distance) = 204/127 x60= 96 km/h
V-Average (driving route) = 233/127 x60= 110 km/h

V-Average	km/h
Rotterdam- Cologne (2022 Arnhem)	67
Rotterdam- Cologne (>2030 Eindhoven)	96
Shanghai-Nanking (2022)	274

Table 19: Average speeds compared

Conclusion : The Rotterdam-Cologne (2022 Arnhem) connection by train has a V-Average of only 67 km/h. The important Shanghai-Nanking train connection in China has a V-Average of 274 km/h. Within the Netherlands/Europe, major steps still need to be taken in reducing the travel time at, among other connections, the above-mentioned connection.

B7 The Berlin train with the same departure time from Hengelo for all variants



2021	2023-12-10	JAAR	2024-10-01	> 2030	> 2030
IC (InterCity)	IC (InterCity)	SOORT	EC (EuroCity)	ICE	ICE
200 km/h	200 km/h	V-max	230 km/h	250 km/h	300 km/h
	IC 1	TYPE	ECx	ICE 3 Velaro D	ICE 3neo
	FV 34	SPOORLIJN	FV 34.a	FV 34.b	*

an	ab	an	ab	Bahnhof	an	ab	an	ab	an	ab
	10:59		10:59	Hengelo		10:59		10:59		10:59
11:16	11:28	11:16	11:18	Bad Bentheim	11:17	11:19				
11:40	11:42	11:30	11:32	Rheine	11:31	11:33	11:28	11:30	11:28	11:30
12:06	12:08	11:58	12:00	Osnabrück Hbf	11:58	12:00	11:55	11:57	11:55	11:57
12:27	12:28	12:22	12:24	Bünde(Westf)	12:08	12:10				
12:46	12:48			Minden(Westf)	12:41	12:43				
13:18	13:22	13:08	13:11	Hannover Hbf	13:09	13:12	12:58	13:01	12:41	12:44
13:53	13:54			Wolfsburg Hbf						
14:25	14:26			Stendal Hbf						
15:04	15:06	14:38	14:40	Berlin-Spandau	14:31	14:32	14:17	14:19	13:59	14:01
				Berlin Zoo	14:43	14:45				
15:22		14:58		Berlin Hbf	14:48		14:28		14:13	
4:23		3:59			3:49		3:29		3:14	

Figure 119: The Berlin train from IC to ICE(For all variants the departure time Hengelo is the same

Figure 120: The train to Amsterdam living Berlin Hbf

B8 First ICE-L leaves the factory

Talgo launches first ICE L train for DB Fernverkehr

On 02.03.2023, an ICE L train for DB Fernverkehr ran from the Talgo plant in Rivabellosa (Spain) to Madrid. José Félix Íñiguez Martínez was able to portray the transport[69] in La Bureba behind Renfe Mercancias 253 062.

Figure 121: A new ICE L set of coaches, on special transport bogies, La Bureba on 02.03.2023 © José Félix Íñiguez Martínez

Figure 122: Low Floor

Everything you need to know about the ICE L[70]:

- 23 new long-distance trains were ordered from the Spanish manufacturer Talgo.
- The "L" in the name stands for "Low Floor" and means low floor entrance. The stepless mention sets new standards in terms of accessibility.
- The "ICE L" is 256 meters long with locomotive and wagons.
- A train consists of a multi-system locomotive and 17 carriages.
- The maximum speed of the "ICE L" is 230 km/h.
- In total, the "ICE L" offers 562 seats, divided into 85 seats in 1st class and 477 seats in 2nd class.

Figure 123: The corresponding locomotive that acts as a pulling and pushing force for the trains.

The new DB train is a self-propelled multiple unit. The configuration is quite common for Germany, including a conventional locomotive at one of the train ends that push or pull according to the direction of travel, 16 intermediate non-powered passenger cars and another trailer on the other side of the unit equipped with a driver's cab. From the latter, commands are sent to the locomotive when it is in push mode.

B9 All reports

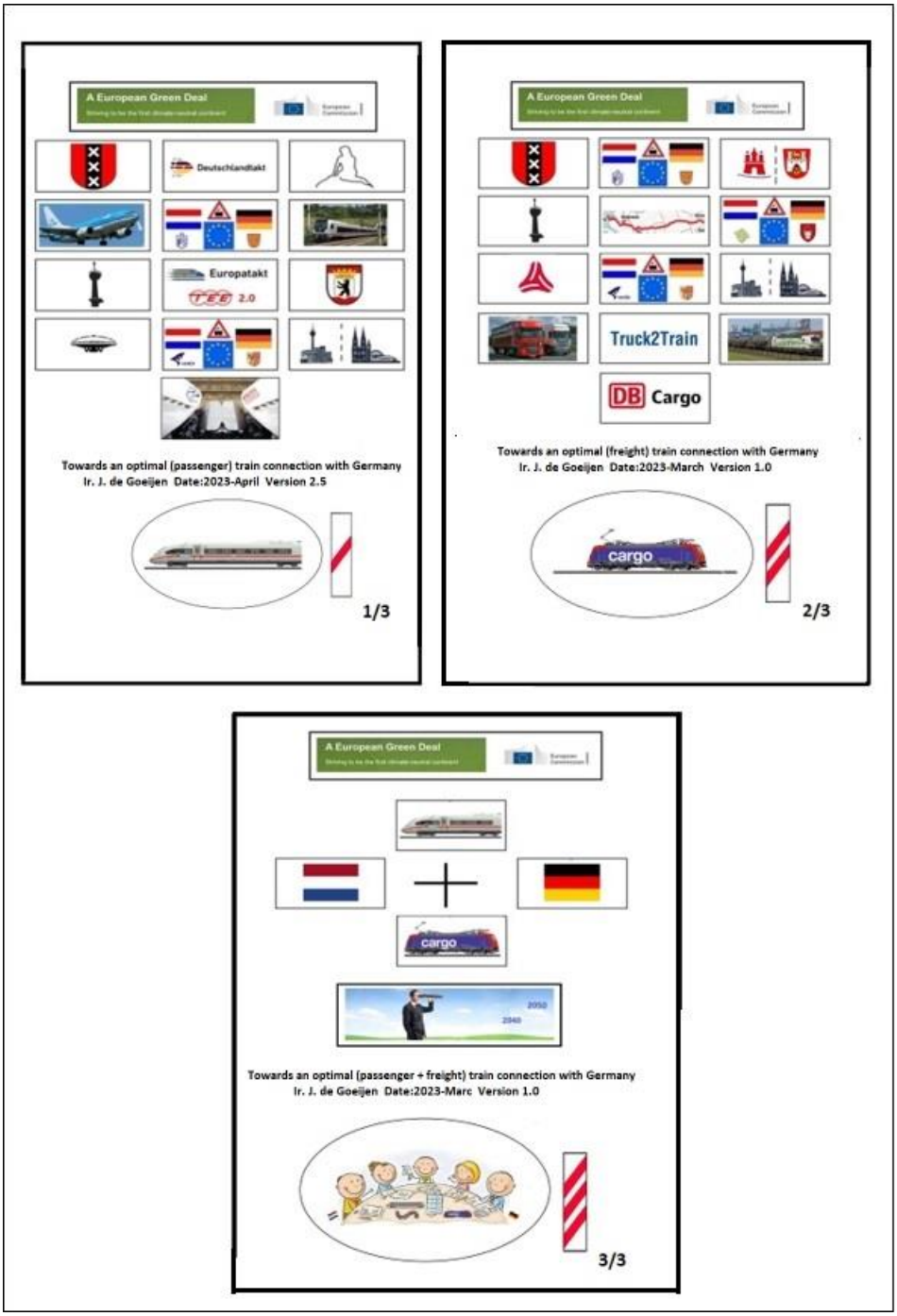


Figure 132: All Reports