BARTLETT SCHOOL OF PLANNING

UCL

PROJECT PROFILE

Netherlands

Beneluxlijn

omega centre

Centre for Mega Projects in Transport and Development

A global Centre of Excellence in Future Urban Transport
sponsored by Volvo Research and Educational Foundations (VREF)

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A PROJECT INTRODUCTION

Beneluxlijn is an extension of the Rotterdam metro network, connecting the two existing lines and connecting Rotterdam with the bordering municipalities of Schiedam and Spijkenisse. Through the related Beneluxtunnel, the project provides an additional crossing of the River Nieuwe Maas (*De Nieuwe Waterweg*).

Rotterdam is the second largest city in the Netherlands, with 582,951 inhabitants (Amsterdam is the largest, with 747,093). It has one of the largest and busiest harbours in the world. It also has a large number of smaller municipalities that are outside of its area, but are part of its urban fabric. The StadsRegio Rotterdam (city region Rotterdam, SRR) has about 1,185,000 inhabitants. Table 1 presents a list of the municipalities that are part of the region and their populations.

Table 1: Population of municipalities in the City Region of Rotterdam

Municipality	**Inhabitants**
Albrandswaard	22,848
Barendrecht	45,941
Bernisse	12,541
Brielle	15,601
Capelle aan den IJssel	65,352
Hellevoetsluis	39,661
Krimpen aan den IJssel	28,928
Lansingerland	51,050
Maassluis	31,360
Ridderkerk	44,698
Rotterdam	584,107
Rozenburg	12,475
Schiedam	75,406
Spijkenisse	72,657
Vlaardingen	70,331
Westvoorne	14,034
Total	1,186,990

Source: www.metapos.org [accessed 01.01.08]

After completion, the project became part of the existing Calandlijn and the name 'Beneluxlijn' was no longer used. The project was part of the 3M plan, which proposed three possible extensions of the Rotterdam metro network. These were the Noordlijn (now developed as the RandstadRail), the Beneluxlijn and the Ridderkerklijn. The last has not been progressed, nor is it expected to be built in the near future.

Project name

Beneluxlijn.

Built: 1995-2002.

Located: StadsRegio Rotterdam.

Owner: Rotterdamse Elektrische Tram (RET) / Ge-meente Rotterdam.

Contractors: RET.

Description of mode type

Beneluxlijn is a light rail and metro system, incorporating multi-modal transfer points, viaducts and tunnels, and a people mover.

Technical specification

The Beneluxlijn uses the same technology as the older metro lines in the Rotterdam region. It has an automated train blocking system, eliminating the need for light signalling systems. It has a standard voltage of 750.

Principal transport nodes

The Benuluxlijn connects the Calandlijn with the Erasmuslijn through the bordering municipalities and neighbourhoods of Schiedam, Vlaardingen, Hoogvliet and Pernis. The line starts at the former endpoint of Marconiplein. It then moves to a viaduct and runs along the rail line to Schiedam Centrum station. On leaving the station it goes down again, below the ground, towards the underground station Parkweg. It then goes up again to the semi-open station of Troelstralaan, and then down again for 500m. It then goes above ground to the station of Vijfsluizen, crosses the River Nieuwe Maas through the Beneluxtunnel and continues into the harbour area. It follows the A4 highway until it reaches the station of Pernis, and finally connects with the Erasmuslijn at Tussenwater station.

Major associated developments

The project is associated with one important development, the station area near Schiedam Centrum. The bus terminal was transferred to the other side of the station, which created space to provide new housing and redevelop the station square.

Parent projects

The Beneluxlijn is part of the Rotterdam metro system. It connects the Calandlijn, running from west to east, with the Erasmuslijn running from north to south and then east.

Figure 1: image of Beneluxlijn

(Source: PeeTNeeT, flickr.com)

Spatial extent

The total length of the Beneluxlijn track is 11.5km of light rail track. Of the total length, 6.6km are on a viaduct, 3.2km in a land tunnel and 1.7km in the Beneluxtunnel under the river (which is also used by cars).

The line has six stations, each of which has been designed by a different architect. One station, Schiedam Centrum, connects to the railway line.

There are three important multimodal transfer stations forming part of the project or associated with it: Schiedam Centrum; Vijfsluizen and Tussenwater.

Schiedam Centrum Station

Schiedam Centrum station is built next to Schiedam Centrum railway station. It includes crossings for easy transfer between the two platforms. The railway station was first opened in 1846 and is on the railway line between Amsterdam and Rotterdam, and between Schiedam and Hoek van Holland. With the construction of the Beneluxlijn, it is now connected to the Rotterdam metro network. Until 1998, Schiedam Centrum station was named Rotterdam West, which illustrates its strong connection to the city of Rotterdam. One of the principal reasons for choosing this name for the station was to make it more recognisable for foreign travellers as, although the city of Schiedam was less well known than that of Rotterdam, it provided an interchange for international boat-train services to Germany, Russia and Denmark.

The station now has the status of ‘fast train station’, which means that all trains below the intercity category will stop there.

Figure 2: Schiedam Centrum in 1990

(Source: stationsweb.nl)

Figure 3: Schiedam Centrum in 2006

(Source: stationsweb.nl)

Figure 4: Schiedam Centrum in 2006

(Source: stationsweb.nl)

Vijfsluizen Station

Vijfsluizen metro station is an important transfer point between the metro network and the buses serving the western part of the Rotterdam region. The architects were Zwarts & Jansma. It also offers park and ride facilities.

Figure 5: Platform at Vijfsluizen station

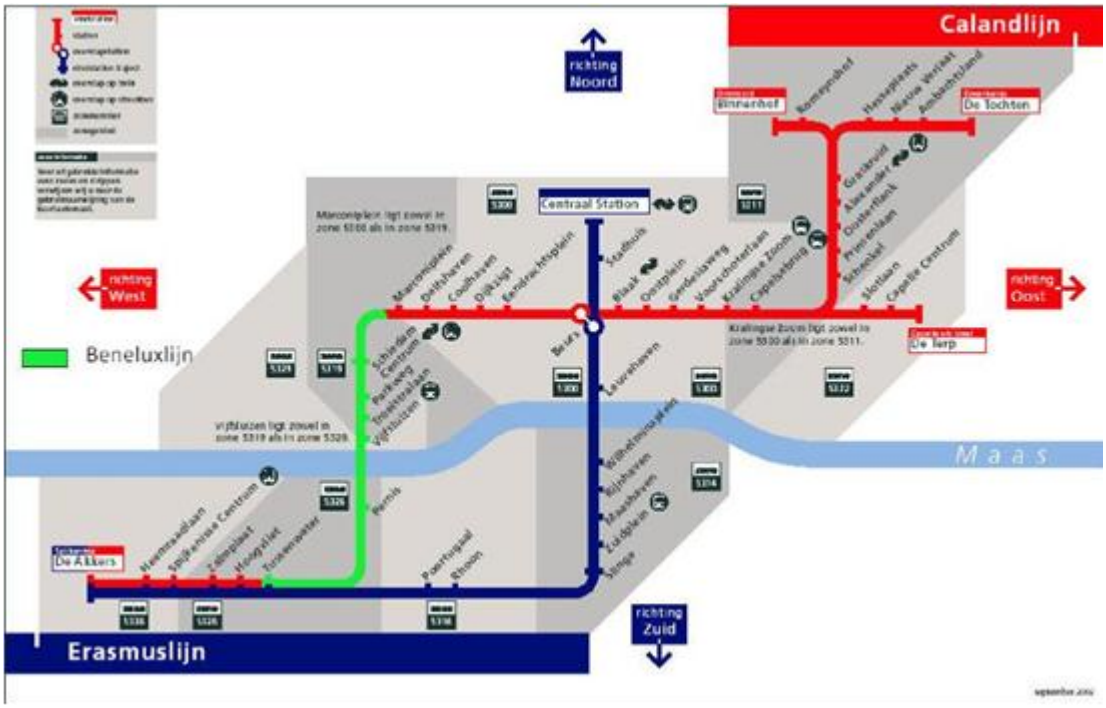
Figure 6: Vjfsluizen station

Tussenwater Station

This station provides an interchange between the two metro lines of the Rotterdam metro network, the Calandlijn and the Erasmuslijn. The only other interchange station is Rotterdam Central Station. From this point the two lines continue on the same route west towards Spijkenisse – De Akkers. The station was designed by Maarten Struis.

Figure 7: Tussenwater Station

Figure 8: Map of metro network (the green section is the Beneluxlijn project)



Current status

The Beneluxlijn was opened in 2002 and has been in operation since as part of the Calandlijn. The name Beneluxlijn was only used during project planning and development. All subprojects are also finished.

Trains run every ten minutes during the day and every fifteen minutes in the evening. The trains used are the standard trains for the metro system as a whole. Trains run with three cars because the station platforms on the eastern section of the line are only 90m long. The new station platforms are 120m long and could potentially accommodate trains with four cars. The trains are from Bombardier and are of the 5300 and 5400 series. From 2008, the new RSG3 series from Bombardier have been phased into the network.

Figure 9: RSG metro Bombardier

Table 2: Characteristics of the Bombardier Flexity Shift

Company and type	Bombardier Flexity Shift
Direction	Both directions
Length	30.16m
Width	2.66m
Width of track	4.435mm
Turning radius	150m
Voltage	750 DC
Maximum speed	100 km/h
Low Floor area	0%
Number of seats and folding chairs	72
Standing places	153

B PROJECT BACKGROUND

Principal project objectives

- Owner: The RET - Rotterdam Elektrische Tram/Municipality of Rotterdam;
- Associated Municipalities: Rotterdam, Schiedam, Vlaar-dingen;
- Operator: RET;
- Construction: Gemeentewerken for Rail track, Rijkswaterstaat for the tunnel section;
- Finance: Ministry of Transport.

The Beneluxlijn is a purely public sector project, because the RET was still a department of the municipality of Rotterdam at the time it was built. The objectives of the project, from the Rotterdam perspective, were to link the two metro lines and to provide a connection for travellers from the satellite towns of Schiedam and Vlaardingen. The Beneluxlijn is part of a programme to reduce traffic jams in the direction of Rotterdam harbour, and thus the main objective is to offer an alternative to the car. Another objective was to create distinctive and individual metro stations. This was a deviation from the previous approach, which imposed a uniformity of design on the metro stations and the line.

Key enabling mechanisms

Plans to extend the metro network were made soon after the opening of the east-west Calandlijn in 1982. At the end of the 1980s a feasibility study was conducted, assessing three proposed extension projects. This (3M) report proposed a south-eastern line in the direction of Ridderkerk, a line to the north, which has now been completed as the RandstadRail project, and the Beneluxlijn, extending the metro network to the east. The lines were perceived to be in this order of importance. However, although the Beneluxlijn was perceived as the least important, it was the first to be built. Several crucial enabling mechanisms led to this remarkable choice.

Firstly and most importantly is the political importance of the second Beneluxtunnel. The Beneluxtunnel connects the section above the river with the harbour south of the river, but becomes extremely congested at times. At the beginning of the 1990s the state government decided that a second tunnel was needed. The municipality of Rotterdam supported the proposal for an additional tunnel, but the municipalities of Schiedam and Vlaardingen were strongly opposed to it, fearing that it would attract extra traffic through their cities. This created an enormous deadlock that was only broken with a marathon designing session, and an agreement that nobody could leave before a solution was found. Eventually, the inclusion of a metro tunnel and a bicycle tunnel in addition to the road tunnel was the solution accepted by all parties. This compromise was of course a ‘camel’s nose’ for the metro: if a tunnel is built, then surely it needs a metro connection.

Another mechanism was the so-called ‘Tour de Force’ programme of the municipality of Rotterdam. This programme was aimed at maximizing Rotterdam’s influence and the benefits of the central government’s annual budgeting for major infrastructure projects. Generally, at the end of the year there would be some money left over in the budget that could fund a new project. However, because municipalities did not invest in making plans for projects they were very uncertain about getting funding, and often did not have any

projects ready to offer to the ministry. The Tour de Force programme was a break with this tradition, in which Rotterdam decided to plan several projects without their being in the financing option of the Ministry's budget. Because the planning process for the Benelux tunnel had already been finished, the construction could begin almost immediately. This Tour de Force proved, perhaps in this case a little coincidentally, to be a very successful approach.

Principal decision makers

- Ministry of Transport: Finance and owner/constructor of Beneluxtunnel;
- Rotterdam City Region: Owner;
- Municipality of Rotterdam: Delegated owner;
- RET/Projectbureau Beneluxlijn: Delegated owner.

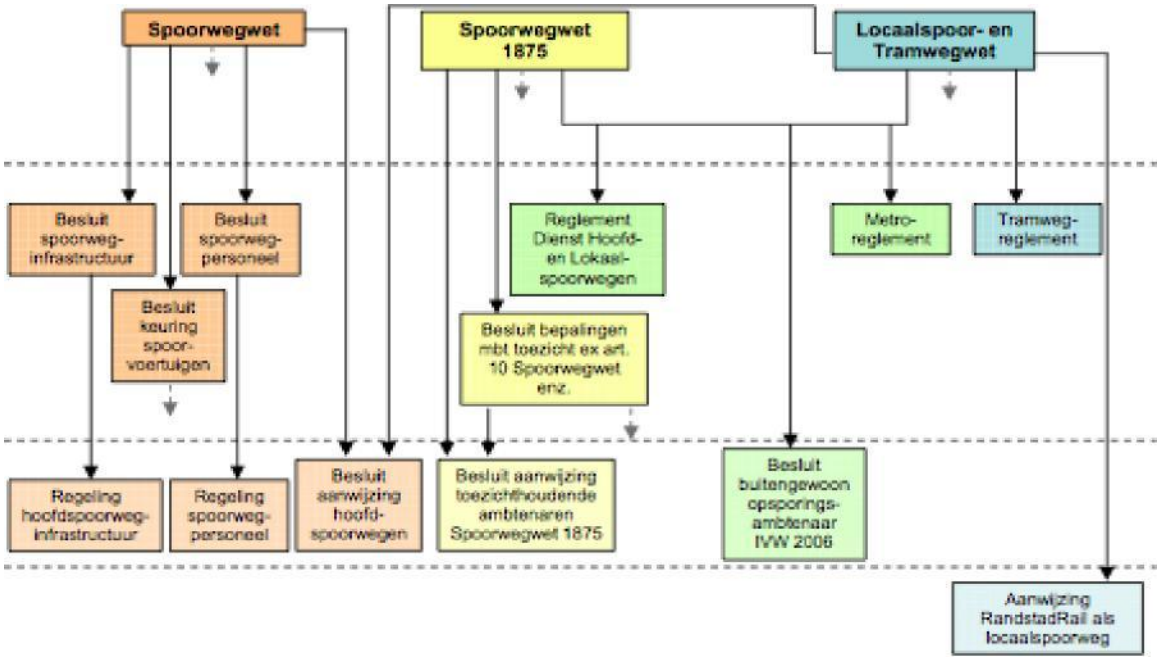
Councillors, aldermen and mayors or the municipalities of Rotterdam, Schiedam, Vlaardingen and Spijkenisse, and the boroughs of Rotterdam Delfshaven, Hoogvliet and the neighbourhood council of Pernis were also involved, as was the borough of Prins Alexander. Although they are at the other side of the city, the main emplacement needed extending because of the added train capacity.

Outline of planning legislation and policy

The legislation surrounding rail transport is reasonably complicated. The original heavy rail, the tram and the metro are all subject to different legislative frameworks. The *Spoorwegwet* (Railway Act) dates from 1875, although it has been revised many times. But the *Locaalspoor- en-Tramwegwet* had had very few updates. The Beneluxlijn, as a metro line, is subject to the metro section of the *Locaalspoor- en-Tramwegwet*. Issues of security are controlled by the *IVW* (*Inspectie Verkeer en Waterstaat*).

Concerning exploitation of the track, the *Wet Personenvervoer* (Public Transport Act) is the institution providing the concession of one single framework. However, the Beneluxlijn is perhaps one of the last large rail projects for which the concession is not publicly tendered. Consequently, exploitation is by RET, and the Beneluxlijn is purely an extension of the current metro network also exploited by RET.

Figure 10: Legal structure



(Source: TU Delft, 2008)

The main financing legislation for these types of projects is the *MIT* (*Meerjarenprogramma Infrastructuur en Transport*). Infrastructure projects in the Netherlands are still funded primarily by the national government. The majority of the budget for infrastructure is allocated in the Infrastructure Fund. The Infrastructure Fund Act was introduced in 1993 to make an integral approach to the financing of infrastructure possible. It enables finances to be transferred between projects or between time periods, to ensure that budgetary bottlenecks do not cause unnecessary delays. The Fund is financed primarily from the budget of the Ministry of Transport and Water Management and the Fund for Economic Structure Enhancement (FES), which is compiled from the profits from the sale of natural gas and shares owned by the state. The Infrastructure Fund had a planned budget in 2007 of about EUR 7bn (source: www.rijksbegroting.nl).

The government budget also includes a list of projects that are either on the agenda or are already being built. For a project to get funded, it is essential to get on this list. The

The MIT is updated annually as part of the State Budget and has a scope of four years. Since 2004, it has had an outlook until 2020. Some developments can easily remain in the MIT for decades without ever being built. This is possible because the MIT categorizes projects in three different phases (Koenders and Noordsij 2004):

- exploratory phase: projects are placed on the agenda by political parties or ministries and their desirability is discussed;
- plan study phase: projects have proven their desirability and it can be reasonably be expected that these projects will be developed. Plans are studied to identify the best approach to the technical, judicial and political dimensions of the project;
- execution phase: projects are ready to be carried out or are already being realized.

As already mentioned, projects can stay in the MIT for a very long time, never leaving the first two phases. This often happens because the consociational nature of Dutch politics (Lijphart 1999) demands that many different parties are consulted and more or less agree on the importance and route of the project. Because of the large number of parties involved

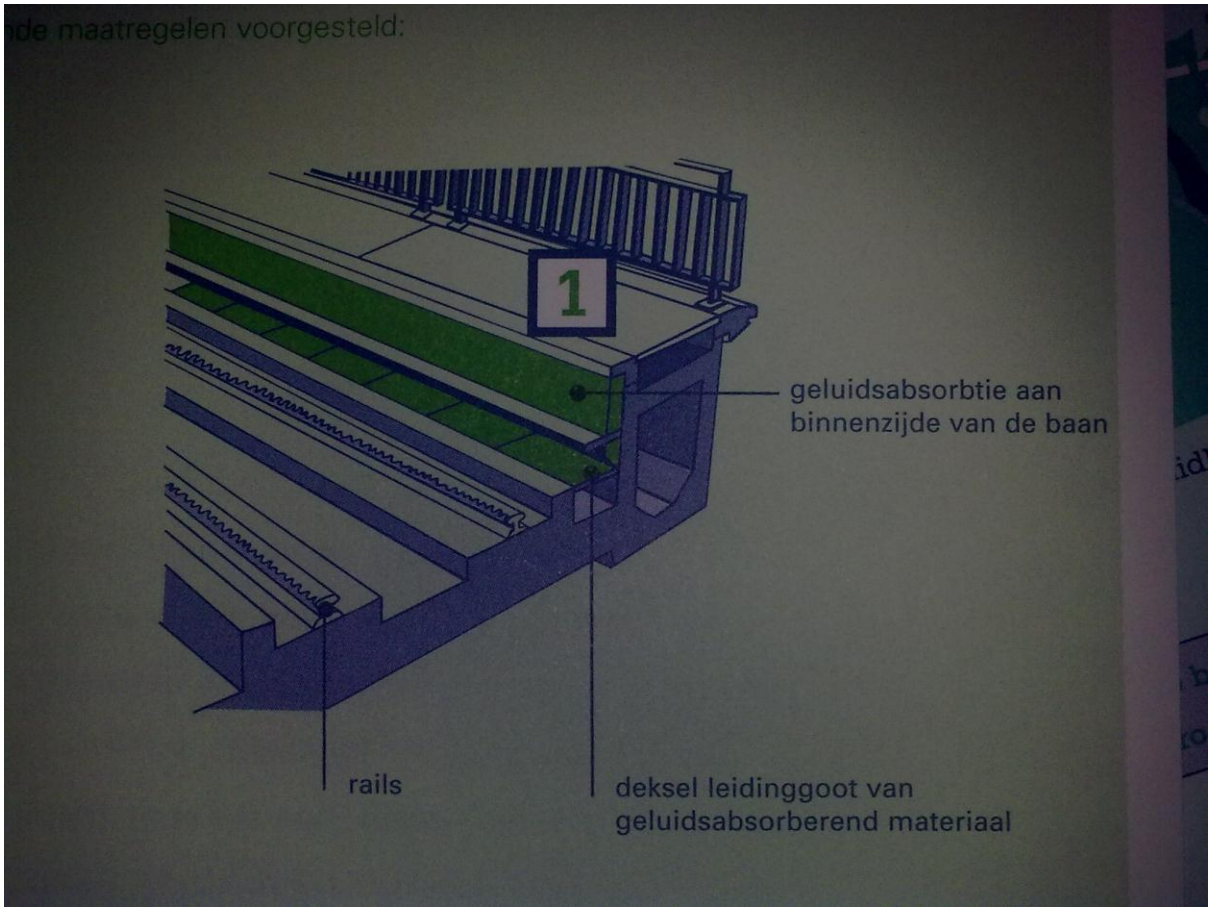
and the many potential projects, there are very narrow windows of opportunity for projects to get past the first two phases and into the third.

It is usually only after finishing the whole decision-making process that attempts are started to acquire external funding. However in the budget of the proposals, assumptions were made about possible contributions from third parties in the private sector as well as from the EU.

Environmental statements and outcomes related to the project

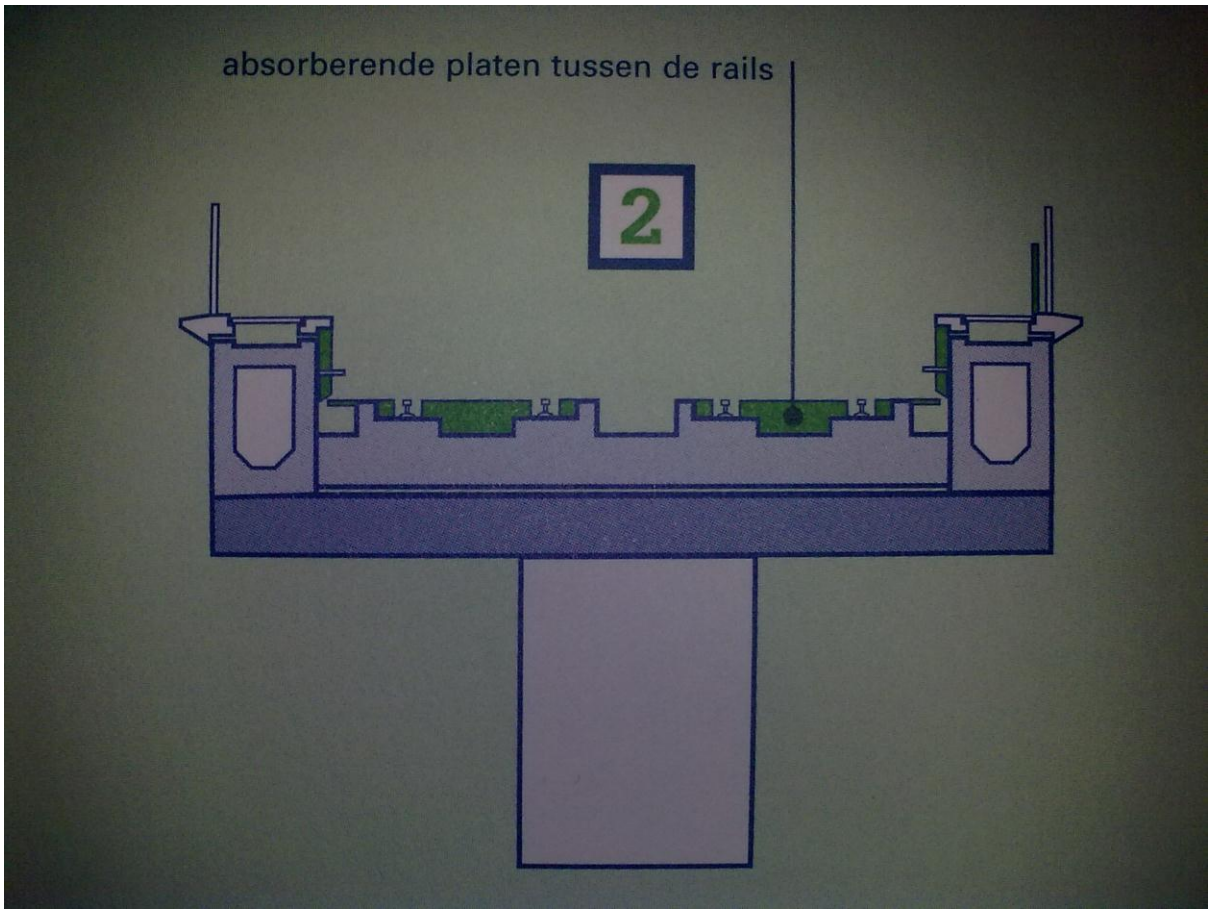
Because noise is a crucial environmental impact of rail transport, a measurement was taken to determine the noise along the route. As a result several mitigation measures were taken. The first measure was an adaptation of the footpaths that run along the tracks, for inspection and evacuation purposes. These are about 90cm above the ground, which is almost the same as the platforms. A noise-absorbing material was placed on the inside of the footpaths, and also provided a lid on the tube for the electrical wiring.

Figure 11: Treatment of footpaths



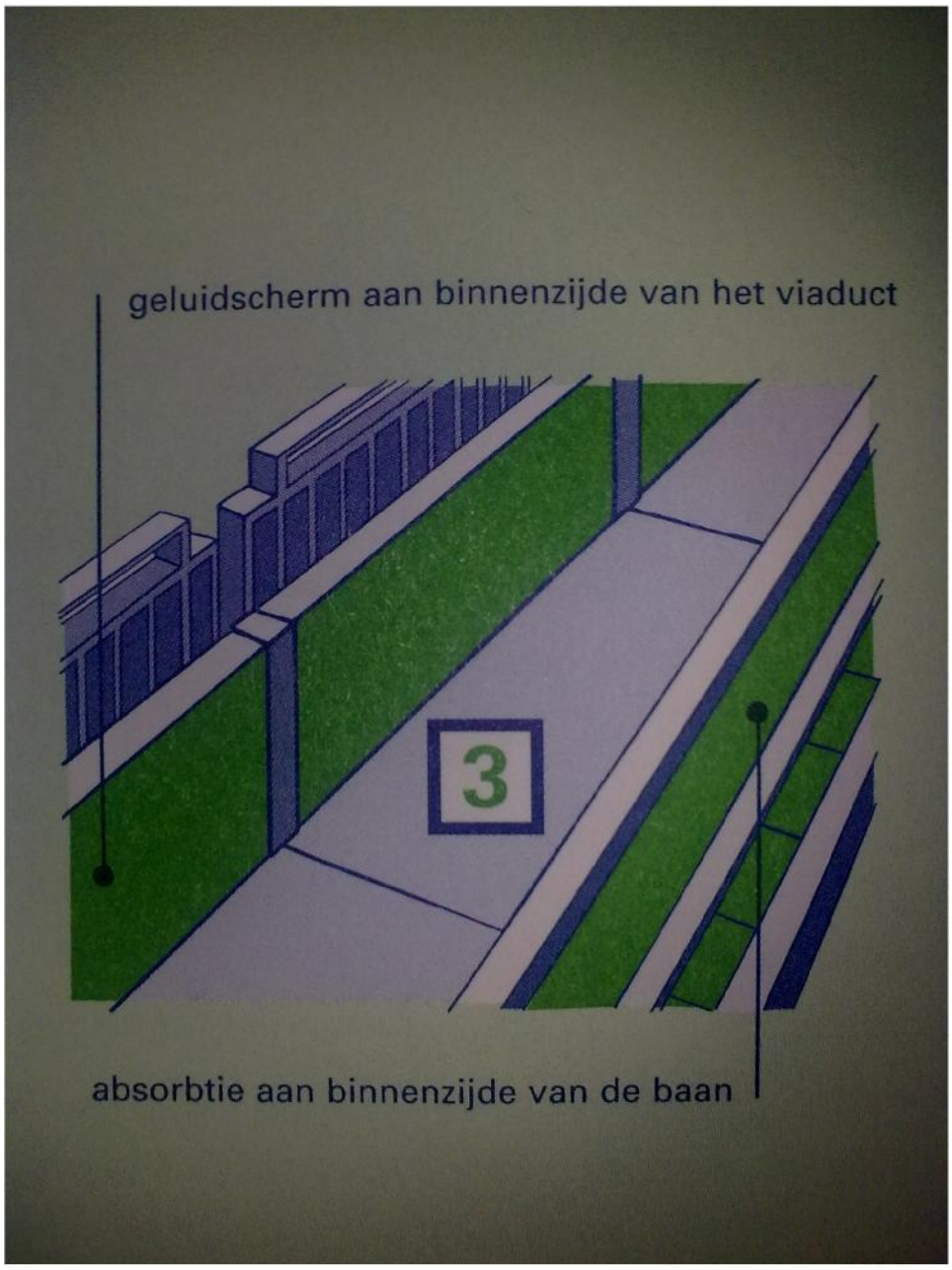
The second measure was to incorporate noise-absorbing plates between the tracks. As with the treatment of the footpaths, it is highly effective because it is close to both the wheels and the rails. Both measures also have the benefit of being invisible from the outside.

Figure 12: Noise-absorbing plates



A third measure is necessary on some parts of the route, because of the presence of schools or other objects, where stricter legal limits on noise apply than in the case of, for example, housing. In those cases a sound screen is added of about 75cm in height.

Figure 13: Sound screen



Overview of public consultation

Only the required public consultation was carried out. During the design and construction phase, intensive external project management was carried out. From previous experience, the project team understood the importance of good communication. Communication measures included letters to inhabitants, special metro newspapers, public meetings, and plan-and-guidance commissions for each of the six sections of the route. The topics of these commissions were the design of public spaces, noise reduction measures, the planning of the work, work methods and work plans, traffic and safety measures, progress and planning, and general safety.

Regeneration, archaeology and heritage

Before the project was started, historical research was carried out to determine possible locations of archaeological importance. This resulted in two important excavation areas. At one location the foundations of a 17th century farm, called Vreelust, were found. Below it were the remains of a medieval building. At another location a 13th century dam was found.

No regeneration projects are associated with the Beneluxlijn.

Complaints procedures

Complaints could be called in to the information centre. There was also the possibility of receiving financial compensation for loss of income or business, or a fall in the value of a house or building. If the application for compensation was approved, 75% compensation would be paid. However, there were several preconditions that had to be fulfilled:

- applicants had to demonstrate that the damage was solely due to the construction of the Beneluxlijn;
- applicants could not apply to any other compensation fund;
- the application had to be submitted within two years of the year concerned;
- the applicant had to have done everything possible to prevent or limit the damages.

An independent advisory commission evaluated applications. An advance payment was possible.

C PRINCIPAL PROJECT CHARACTERISTICS

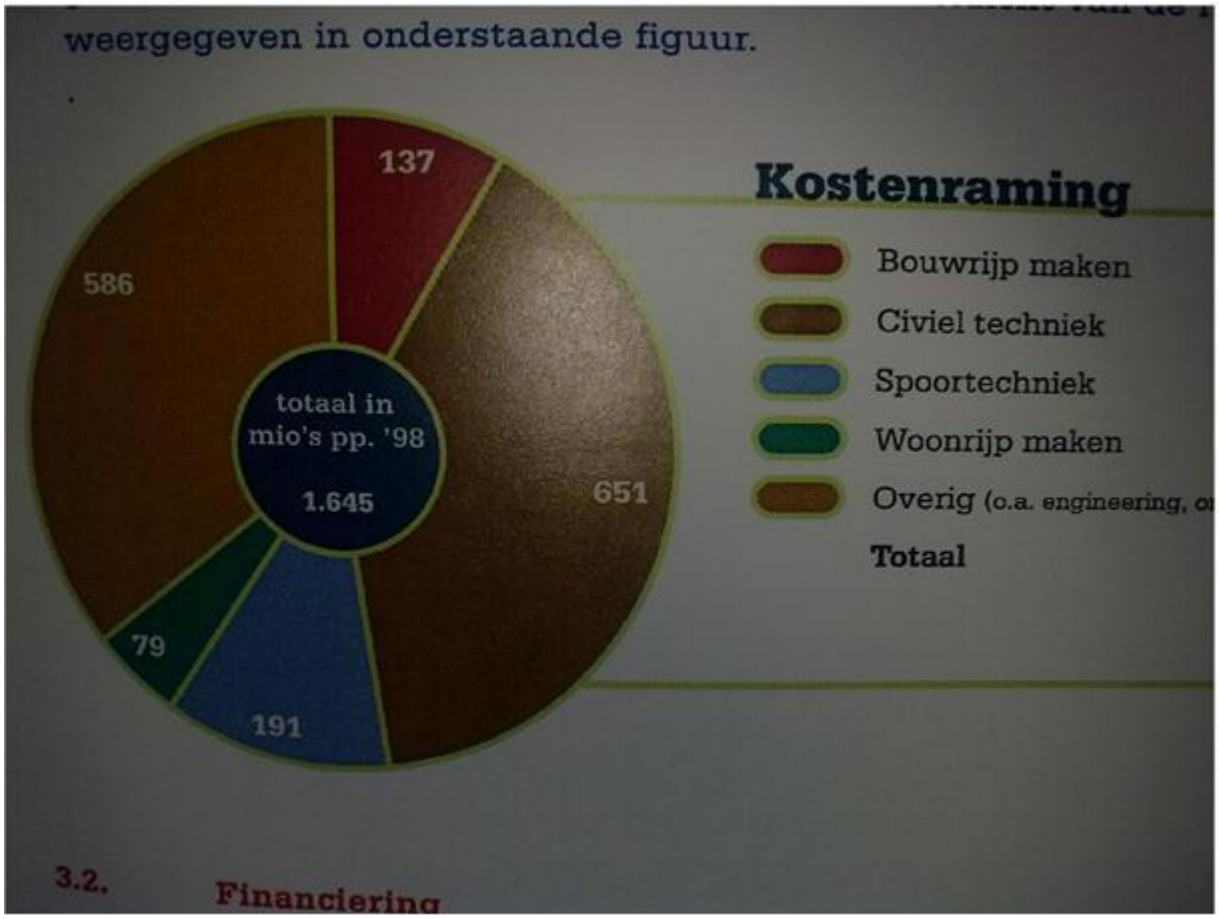
Detailed description of route

The project starts at Marconiplein station, the previous endpoint of the Calandlijn. In this underground station the walls of the metro tube had to be broken down. The route then rapidly surfaces, leaving the tunnel and continuing above ground. Over the tunnel exit a staircase is built to connect a school with a children's *tiergarten* ('animal garden'). To prevent people from jumping in the tunnel and onto the tracks, a six-metre high wall, with viewing holes, is placed on top. The route then continues up to a viaduct. It makes a long turn to arrive at the first station on the line, Schiedam Centrum, which connects the metro with the train. An additional track is provided to enable the metro to terminate here or to travel over the Hoekselijn towards Hoek van Holland (another of the routes proposed in the 3M feasibility report, and the only one that has not yet been built). After the station, the route passes the River Schie to go steeply into a tunnel again to the underground station Parkweg. The route then continues in the direction of Troelstralaan Station. This station is like a *sous terrain* and the route surfaces for a quick breath of air before going into a tunnel again. It is only a short distance before the route surfaces once again onto a viaduct, continuing southwards in the direction of the river. The metro then stops at Vijfsluizen Station, before continuing into the second Beneluxtunnel under the river. At the other side of the river it surfaces again to travel parallel to the A4 highway to the village and station of Pernis. The metro then continues through the industrial Beneluxster area to Tussenwater Station, where a connection is made with the Erasmuslijn and the two lines continue as one.

Project costs

The estimated cost (in Dutch guilders, at 1998 price levels) includes: NLG 137m for preparing the ground; NLG 652m for civil engineering; NLG 191m for technical rail elements; NLG 79m for restoring the ground after construction and NLG 586m for other costs including additional engineering features and a risk reservation. The total estimated cost was thus NLG 1.645bn.

Figure 14: Breakdown of project costs



The cost was funded primarily by a financial grant from the Ministry of Transport, of NLG 1.4bn. The remaining funds were to be acquired through a 5% contribution from RET and additional road measures from municipal or national road funds.

The final cost was NLG 1.25bn (1998 prices).

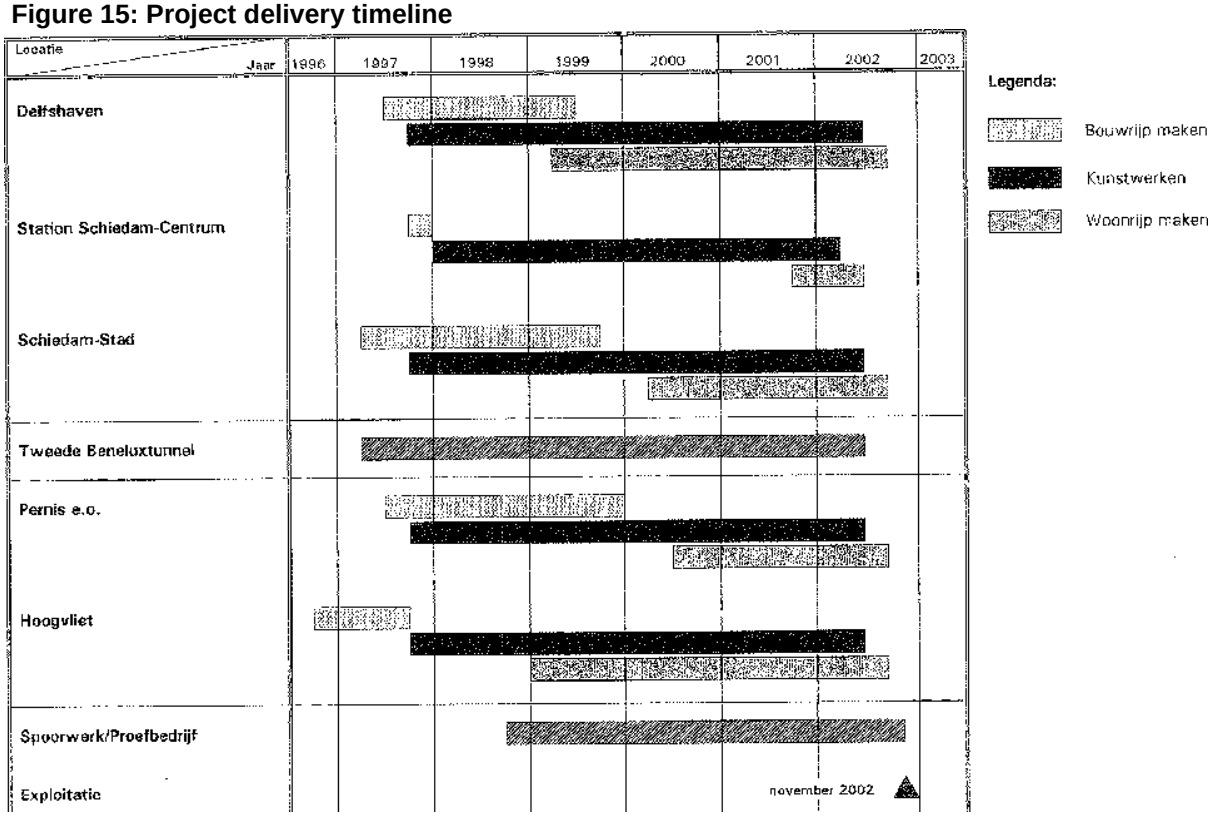
D PROJECT TIMELINE

Table 3: Project timeline

	EVENT
1992	The presentation of the 3M study into the feasibility of three metro extensions is discussed. The 3M report proposed a south-eastern line in the direction of Ridderkerk, a line to the north (which has now been completed as the project RandstadRail), and the Beneluxlijn, extending the metro to the east.
1993	The government decides to build the second Benelux tunnel. The first tunnel was built in 1967 and was no longer sufficient for the level of traffic. After negotiations the second tunnel included separate tubes for bicycles and the metro, in addition to one for road traffic.
1993	The decision is made to start preparations for the construction of the Beneluxlijn.
1996	The decision-making procedure is finished and the preparation of the construction ground begins.
February 1997	The Ministry of Transport gives a decree of NLG 1.4bn for the construction of the metro line. This does not include the construction of the tunnel, which is carried out by the ministry itself.
End of 1997	Construction of civil structures and stations begins.
1999	Land used for construction is made habitable (*woonrijp*) again.
Second quarter 1999	The electrical wiring and rails are put in place.
2002	The Beneluxtunnel and Beneluxlijn are finished.
2 november 2002	The opening of the Beneluxtunnel and Beneluxlijn.
End of 2002	There are many complications due to malfunctioning of the trains and the security system. No accidents occur but many delays are experienced. A solution to this problem was found in reducing the frequency of the trains.

Figure 15 is a timeline of the delivery of the project (produced in 1996), divided into the six sections. The project did not experience any serious problems or adjustments and was delivered on time.

Figure 15: Project delivery timeline



Key timeline issues

The most interesting aspect of this project is that there are almost no timeline issues to be discussed. The project was delivered on time and within budget. From a project management perspective, it went as smoothly as such a project could possibly go.

The decision to build the second Beneluxtunnel was of course crucial, and in itself effectively became a decision to build the metro extension as well. This factor greatly increased the speed of delivery of the project, as it had previously been the lowest priority of the three 3M projects.

The project itself was not very controversial. Although it includes lengthy sections running above ground, the political desire of the neighbouring municipalities to extend the metro network to within their borders was great enough to transcend these objections relatively easily.

It is a project that has been kept as simple as possible, and this factor has contributed to its success in keeping on time and budget.

E PROJECT FUNDING

Basic philosophy

The Beneluxlijn is funded entirely from public sources, based on a lump sum agreement in which any unspent funds could be kept by the municipality and invested in other infrastructure projects. In this case, the unspent funds were used as a contribution to the financing of the RandstadRail.

The national government provided 95% of the funding, and 5% came from local sources.

Revenue forecast and actual revenue

Revenue is difficult to measure in the Dutch context as there is a national system of transport cards, through which revenue is shared amongst the many companies through a division key based on the estimated number of passengers and zones travelled. No data are available on the additional passenger numbers attracted by the Beneluxlijn.

Traffic forecasts

The forecast number of passengers for the Beneluxlijn was 67,000 passengers a day. No accurate data are available for actual passenger numbers as the Beneluxlijn is part of the existing metro network and is not an entity in itself.