

Netherlands

AMSTERDAM

Amsterdam is the largest city in the Netherlands as well as the capital of the country, although the seat of government and all the ministries are located in The Hague. Around 870,000 people live within the city limits, but the actual urban area includes the neighbouring municipalities of Amstelveen, Ouder-Amstel (with Ouderkerk and Duivendrecht) and Diemen (together around 135,000 inh.). The 'Vervoerregio Amsterdam' is now responsible for the planning and coordination of public transport, an entity which also serves towns such as Zaanstad and Purmerend in the north as well as the municipalities of Haarlemmermeer and Uithoorn in the south, thus reaching a total population of 1.5 million.

The Amsterdam metro and tram are operated by the municipal transport company GVB (originally short for Gemeentevervoerbedrijf). The GVB network also includes most bus routes within the City of Amsterdam as well as numerous free ferries across the IJ River. Daily or multi-day passes are available for the GVB network (up to 168 hours = 7 days for €36.50). Due to the lack of public transport integration, these tickets are not valid on NS trains or buses from other operators! An 'Amsterdam Region Travel Ticket' (including e.g. Schiphol, Almere, Zandvoort, Haarlem, Hilversum) is also on sale and valid with all operators, but it costs €19.50 for one day, €28.00 for two and €36.50 for 3 days. All tickets, including day passes, must always be scanned upon boarding and alighting.

The Amsterdam Tram

During daytime hours, the Amsterdam tram network now comprises 15 lines (although lines 6 and 11 do not run all day), with only buses operating at night. The routes used in passenger service have a total length of 90.5 km (from late 2020 ~96 km), while some 4.5 km currently has no regular service (notably the route of line 16, which was cancelled in 2018). From December 1990 to March 2019, the tram network was interconnected with the metro network via the former Sneltram line 51. Currently, the route operated by lines 5 and 6 to Amstelveen is being rebuilt for the exclusive operation with low-floor trams while being subsequently extended from Westwijk to Uithoorn (5.4 km).

All the tram routes are double-track, except for three short single-track sections along Utrechtsestraat (line 4 between Rembrandtplein and Frederiksplein) and five sections with interlaced tracks: three along Leidsestraat (between Koningsplein and Leidseplein); a 100 m section along Czaar Peterstraat on line 7 in the area of the stop 1e Leeghwaterstraat; and a very short stretch on Amstelstraat between Rembrandtplein and Waterlooplein (line 14).

Tram history

The first horse tramway, which ran from Plantage Kerklaan via Frederiksplein to Leidseplein, was opened in 1875 by the AOM (Amsterdamsche Omnibus Maatschappij). By the end of the 19th century, a total of 15 horse-drawn lines criss-crossed the city. In 1900, the previously privately operated routes were taken over by the municipal 'Gemeentetram Amsterdam' (GTA). By 1906, most of the routes had been regauged from 1422 mm to 1435 mm and electrified. The last horse trams disappeared in 1916, when the route from Haarlemmerplein to Sloterdijk was electrified. As the city began to spread in the first half of the 20th century, the tram routes were extended accordingly. The highest number of lines was reached in 1931 with a total of 25. In 1943, the Gemeentevervoerbedrijf (GVB - urban transport company) was founded after the GTA and the Gemeenteveren (ferry services) had merged. In the 1950s, when the first articulated vehicles refreshed the image of the tramway, some lines were switched to bus operation, but some new routes were later added to serve the new 'garden cities' in the western suburbs: from Bos en Lommerplein to Slotermeer (4 km, 1954) and from Surinameplein to Osdorp Dijkgraafplein (partly in the central strip of a highway, 5.5 km, 1962). Even during the construction of the metro in the 1970s, the tram network was further expanded in the west of the city (see table below).

Besides the urban tram routes operated by GVB, three **interurban trams** once connected Amsterdam with the surrounding region:

- 1) the 'Gooische Stoomtram' – from Weesperpoortstation (at Weesperplein) along the route of today's line 19 to Diemen and then via Laren to Hilversum. This steam railway was shut down in 1940 and later partially replaced by the municipal tramway.
- 2) the heavily used NZH (Noord-Zuid Hollandsche Vervoer Maatschappij) metre-gauge line from Spui via Rozengracht and Admiraal de Ruijterweg to Sloterdijk, and then on to Haarlem (parallel to the NS route) and Zandvoort as an interurban tramway. This electrified line, which opened in 1904, shared an alignment with city trams in the urban area, where mixed-gauge tracks were therefore laid. The complete link to Zandvoort was closed down in 1957.
- 3) the interurban NZH metre-gauge line from a ferry terminal on the north shore of the IJ River to Het Schouw, and from there a branch to Edam (1888) and another to Alkmaar (1895). When it was electrified in 1932, the Alkmaar branch was curtailed at Purmerend, whereas the Edam service was extended to Volendam. While the Purmerend branch was abandoned in 1949, the Volendam route remained in service until 1956.

While metro construction came to a halt after the completion of the Oostlijn, some extensions have opened on the urban tram network since 1980 (see table). In 2013, line 25 was withdrawn, with the route south of Victorieplein to the terminus President Kennedylaan being abandoned permanently. In 2017, the route along Witte de Withstraat between Postjesweg and Admiraal de Ruijterweg also lost its tram operation.

The opening of the Noord/Zuidlijn in July 2018 led to an extensive restructuring of the tram network, although the parallel route along Ferdinand Bolstraat and via Vijzel-

straat and Rokin to the main railway station has remained in place (line 24).

The most important addition to the tram network in recent years is the 8 km **IJtram**, which was opened on 30 May 2005 and links the Centraal Station to the new developments on the artificial islands of IJburg. Due to its alignment, it can be classified as an express tramway. Line 26 starts at Centraal Station, where it shares the eastern loop with other tram lines. It then runs on a separate right-of-way all the way to Rietlandpark, where it enters the 1.6 km Piet Heintunnel, which was completed earlier in 1997 together with a road link, the IJweg. This tunnel was built to full metro standard and is equipped with a train protection system (ATP) to allow speeds of up to 70 km/h, and instead of a conventional catenary, a power rail was mounted on the ceiling. The impressive Enneüs Heerma Bridge, designed by the British architect Nicholas Grimshaw, takes the tram to Steigereiland, the first of the new islands. The route in IJburg is that of a typical modern tramway, entirely segregated from road - traffic but with several level crossings, mostly at stops. The stops have 280 mm high platforms, thus providing level access into the Combino vehicles.

With the end of Sneltram operation on 3 March 2019 and the rerouting of line 51 from Zuid to Isolatorweg, the connection between the tram and metro networks west of Station Zuid was severed. The route along Buitenveldertselaan and Beneluxbaan to Amstelveen is now being rebuilt, with all elevated platforms being demolished and replaced with longer low platforms. The Kronenburg and Zonnestein stops are being put into a cutting to avoid conflicts at major road intersections. While line 5 has continued to operate as usual though with some disruptions, the southern section of the former Sneltram line 51 has since been out of service. Four of the previously eleven stops on this section will disappear as part of this project. Due to open in December 2020, the new line 25 (Amsteltram) will run between Zuid and Westwijk, and from ca. 2024, it will continue as an interurban tramway to the neighbouring town of Uithoorn (5.4 km); this extension can take advantage of the alignment of the former Haarlemmermeerspoorlijnen. On the way through Uithoorn, the tracks will be laid on the existing busway.

A special feature of the Amsterdam tram worth mentioning is the conductors sitting at the second-last door of the Combinos. Passengers have to board either there or at the front next to the driver, while the other doors are for exiting – this system regularly causes confusion, especially among the numerous tourists. In the case of the older vehicles, however, sporadic ticket inspections take place inside the trams.

The Amsterdam Metro

Today's network consists of five real metro lines that are completely grade-separated, but only the **Noord/Zuidlijn** (M52) operates independently, while the other four lines are intertwined. Lines M53 and M54 start at the Centraal Station and head southeast on the **Oostlijn**. The **Ringlijn** circles the inner city to the west and south and is used by lines M50 and M51, which both continue onto the Oostlijn. Before March 2019, however, instead of serving the western ring route to Isolatorweg, line M51 used to run as a Sneltram from Station Zuid south to Amstelveen Westwijk (**Amstelveenlijn**). The metro

operates from 06:00 until just after midnight.

The 3.5 km underground section of the **Oostlijn** was mostly built with caissons, which is why numerous houses had to be demolished between Centraal Station and Weesperplein, which led to violent protests. The rest of the route is at ground level, on an embankment or elevated, partly between the tracks of the railway line to Utrecht, partly through the then emerging district of Amsterdam Zuidoost. At Amstel and Duivendrecht stations, convenient transfer between metro and NS trains is provided on the same platform – but this requires checking out and in again! The Oostlijn is now 17.8 km long, with 6.1 km shared by lines M53 (Gaasperplaslijn) and M54 (Geinlijn).

The section of the **Ringlijn** between the Spaklerweg junction and Station Zuid was opened in 1990 as part of the ‘Sneltram’ or **Amstelveenlijn**, which like in Rotterdam was intended to run partly as a metro and partly as light rail; until March 2019, trains switched at Station Zuid from metro operation with third-rail power supply to light rail operation with pantographs and overhead catenary. From Station Zuid, the tracks of the Sneltram were shared with tram line 5, which is why the stops had platforms with a 65 m long and 1040 mm high section as well as a 30 m long and 230 mm low section. Since the Sneltram cars are narrower than the metro vehicles, they were equipped with fold-out side boards that bridge the gap between platform and vehicle at metro stations.

The western section of the Ringlijn from Station Zuid to Isolatorweg as well as the Overamstel – Van der Madeweg connection followed a few years later, now completely grade-separated in metro style, but initially used by vehicles only 2.65 m wide (M4). Line M50 was an immediate success, so just a few years after commissioning, the platform edges were rebuilt to allow operation with wider metro trains. Most of the Ringlijn runs parallel to NS tracks, either at ground level, on an embankment or elevated.

In 2018, the **Noord/Zuidlijn** (M52) was put into operation after 16 years of construction. It runs mostly underground through the city (6.4 km of a total length of 9.3 km), with 3.1 km being excavated with tunnel boring machines. Only the stations were built by cut-and-cover, while the crossing of the IJ River as well as the construction of a part of the underground station at Centraal Station were achieved with caissons. At Station Zuid, line M52 has so far only used one track, as it is still unclear whether and how it will be extended west (possibly to Schiphol); for a long time it had been planned to continue on the former Sneltram alignment to Amstelveen. Between Station Zuid and RAI, the M52 goes underground between the Ringlijn tracks and reaches the first subterranean station Europaplein at the exhibition centre. At De Pijp station, the respective platforms lie on top of each other. On the north bank of the IJ River, there is an option to build another station called Sixhaven. Shortly before Noorderpark, the metro trains emerge from the tunnel in the median strip of an urban motorway which they follow to the terminus ‘Noord’ at Buikslotermeerplein; beyond the terminus there is a multi-track stabling facility.

Following the success of the new Noord/Zuidlijn, new metro lines are again being considered in Amsterdam, but a clear decision in this regard has yet to be taken.

THE HAGUE — DEN HAAG

The Hague (Dutch Den Haag or 's-Gravenhage), the capital of the province of Zuid-Holland (South Holland), is the third largest city in the Netherlands. It is the seat of the national government and the location of the royal residence and numerous international institutions. The continuously built-up area includes the municipalities of Rijswijk, Leidschendam-Voorburg and parts of Westland (Wateringen) and Pijnacker-Nootdorp; the metropolitan area extends to Delft and Zoetermeer. Since 2014, the coordination of public transport projects has been the responsibility of the 'Metropoolregio Rotterdam Den Haag' [mrdh.nl] (~2.3 million inhabitants).

Trams and all urban buses in The Hague are operated by 'HTM Personenvervoer NV'. HTM trams also serve the surrounding municipalities, and via 'RandstadRail' Zoetermeer too, while Rotterdam's Metro line E invades HTM territory to reach Den Haag Centraal – but there are no integrated fares! HTM day tickets are thus valid up to the southern outskirts of Delft and the eastern parts of Zoetermeer, but not on RET line E or NS trains! However, a 'Tourist Day Ticket' for the entire province of Zuid-Holland is available for €14.50, and is valid for all operators except NS trains.

The Hague's Tram System

Today's HTM tram network consists of 12 lines and has a total length of almost 140 km, of which 28.8 km from the junction at Beatrixkwartier to the east of the Centraal Station belongs to the RandstadRail network (5.6 km of which is shared with RET line E). Lines 15 and 17 are operated jointly by changing their line numbers at Centraal Station. The network has a high proportion of dedicated right-of-way and there are also two underground sections – along the central Grote Marktstraat and in Leidschendam along line 19.

In as early as 1864, the first Dutch horse-drawn tramway started running from the city centre to Scheveningen on a route similar to today's line 1. A second route to - Scheveningen, which largely corresponded to the current line 9, followed soon after, while an interurban line to Delft (operated with steam power from 1887) was also launched. In 1879, the national railway company opened a steam tramway to Scheveningen, and in 1886 yet another steam tramway was added by HSM (Hollandsche IJzeren Spoorweg-Maatschappij) on what is now line 11. Gradually, an extensive network of horse and steam tramway routes emerged.

In 1887, the Haagsche Tramweg-Maatschappij (HTM) was founded to operate all the urban lines as well as the interurban line to Delft. A separate steam tram network, operated by the Westlandsche Stoomtram Maatschappij (WSM), existed from 1882 to 1932, running from The Hague (Westeinde) to Loosduinen, with branches into the Westland region. The 1067 mm steam tramway lines from The Hague to Leiden via Voorburg, and the Staatsspoor line to Scheveningen, were electrified with 1200 V dc in 1924 and transferred to the NZH (Noord-Zuid-Hollandsche Tramweg-Maatschappij). The HSM line was electrified and became HTM line 11 in 1927.

After a trial operation with accumulator trams on the eastern route to Scheveningen, the electrification of the network with overhead power supply was

started in 1904. By 1907, all the lines had been converted to electric traction except for the interurban line to Delft, which remained steam-powered until 1923/24. HTM then built another interurban line to Leiden via Wassenaar, known as the 'Gele Tram' [yellow tram], which only lasted until 1961. In 1924, the NZH interurban lines were also electrified and became known as the 'Blauwe Tram' [blue tram], which was also abandoned in 1961.

During the 1950s and 1960s, several tram lines were converted to bus operation, but nonetheless, in 1969, when about 50% of the existing tram network was already on segregated rights-of-way, the construction of a 'semi-metro' system was approved: a kind of light rail network with underground sections through the city centre and viaducts where necessary, following the example of German cities like Cologne. In the first step, an elevated route including stops at Ternoote and Centraal Station was brought into service on 29 May 1976. The continuing tunnel under Grote Marktstraat, however, was only completed 28 years later on 16 October 2004.

Apart from the 'semi-metro' project, since the 1970s the network has been expanded into the western outskirts and the neighbouring municipalities (see table).

The last major extension project was line 19, designed as a tangential link between Leidschendam and Delft via Leidschenveen and Ypenburg: 11 km of new route including the 1 km Sijtwendetunnel, which had already been built in 2003 together with a road tunnel. Part of the line 19 project was a new branch south of Delft Station to serve the Technische Universiteit Delft – tracks have been lying there since 2015, but the reconstruction of Sint Sebastiaan Bridge has delayed the completion of this new branch.

RandstadRail

Despite its name ('Randstad' roughly refers to the densely populated area from Amsterdam and Utrecht to Rotterdam and The Hague), the RandstadRail project only extends across the region of The Hague and Rotterdam. For The Hague, this meant:

- 1) the rebuilding of two tram lines for the use of wider low-floor vehicles;
- 2) the construction of a viaduct in the Beatrixkwartier, including the relocation of the elevated Ternoote station and the reconstruction of the tram stop at Centraal Station (e.g. removal of the loop);
- 3) the reconstruction of the former Hofpleinlijn (from 1908) and the Zoetermeer Stadslijn (1977-79) from S-Bahn to low-floor light rail operation, and the construction of the additional stations at Forepark, Leidschenveen and Voorweg Hoog;
- 4) the construction from scratch of the branch to Oosterheem (originally 3.5 km long, extended by 1.9 km in 2019).

Since October 2007, Zoetermeer has been served by HTM Lines 3 and 4 with RegioCitadis vehicles. Between Laan van NOI and Leidschenveen, these lines share tracks with RET Metro line E, which is why the stations on this section have both a 75 m low-floor section (30 cm high platforms) and a 60 m long high-floor section (100 cm). However, on the western branches of lines 3 and 4 to Loosduinen and De Uithof, the platforms are only 37 m long, and thus only single units can be used.

ROTTERDAM

Rotterdam is the second largest city in the Netherlands. The city territory includes the extensive port facilities and the coastal town of Hoek van Holland. In between are the independent towns of Schiedam, Vlaardingen and Maassluis. The continuously built-up area also includes the municipalities of Spijkenisse, Albrandswaard and Barendrecht in the south as well as Capelle aan den IJssel, Krimpen aan den IJssel and Ridderkerk in the east. The larger metropolitan area extends southeast to Dordrecht and northeast to Gouda while in the north, it borders the metropolitan area of The Hague. Since 2014, the coordination of public transport projects has been the responsibility of the ‘-Metropoolregio Rotterdam Den Haag’ [mrdh.nl] (~2.3 million inhabitants).

The metro and trams as well as most urban buses in Rotterdam and the surrounding municipalities are operated by RET. Metro line E extends all the way to the centre of The Hague – there are no shared fares with HTM! In addition to an RET day pass, however, a ‘Tourist Day Ticket’ for the entire province of Zuid-Holland is available for €14.50, which is valid for all operators except NS.

The Rotterdam Tram Network

Like the metro, the tram system is operated by RET (Rotterdamse Elektrische Tram). Since a major line rearrangement in December 2006, the network has remained the same, except for line 20, which has been downgraded to ‘rush hour only’. The network thus consists of eight all-day lines, although lines 21 and 24 can be considered as a single line with two branches at its western end. There is also some 7 km of non-revenue tracks, which are frequently used during line diversions. All of Rotterdam’s trams have conductors onboard for ticket inspection; they also sell 2-hour tickets for €4.00.

Since the last high-floor articulated cars (the ZGT 800 – some are still in service in Galați, Romania – and ZGT 700) were withdrawn from service in 2014, only Citadis trams from Alstom (see table) have been running on the Rotterdam tram network. Besides the main RET workshops at Kleiweg, additional workshops opened in 2011 at Beverwaard to replace the former facilities at Hilledijk. While the tram depot at Kralingen is also still in use, the old Hillegersberg depot is now home to the tram museum maintained by the RoMeO foundation.

Tram History

The origins of the Rotterdam tramway date back to 1879, when the RTM (Rotterdamsche Tramweg Maatschappij) began operating the first horse-drawn tramway route, which ran from the city centre to the northern suburb of Crooswijk. From 1882, a steam tramway linked Rotterdam to its western neighbour Schiedam. Between 1898 and 1915, the RTM developed an extensive interurban network of steam-hauled light railways with a gauge of 1067 mm, mainly covering the region south of Rotterdam. For the introduction of electric traction on the urban tramway routes, a new company was founded in 1904: the RETM (Rotterdamsche Elektrische Tramweg Maatschappij). The first electrified tram line opened in 1905 from Honingerdijk in Kralingen via the city centre to ‘Het Park’ (Westerlaan). In 1926, the trams began riding over the Willemsbrug and Koninginnebrug to serve the south bank of the Nieuwe Maas River. In 1927, the RETM was municipalised and became the RET.

Over the following decades, the network did not experience any significant modifications,

though after the severe destruction caused by German air raids in May 1940 and the city's subsequent reconstruction with a partly modified street layout, many tram lines had to take new routes through the city centre.

In the mid-1950s, due to the increasing population on the south side of the river, studies were carried out for the construction of a tram tunnel under the Nieuwe Maas, which eventually resulted in the construction of Rotterdam's first metro line. Upon the opening of the metro in 1968, all cross-river tram services were discontinued, leaving on the south bank only the 9.6 km line 2, most of which ran on a dedicated right-of-way. In 1969, a new route was added to Schiebroek in the north of the city, featuring a viaduct over the A20 motorway and the railway line to Gouda. After that, network expansion paused until the 1980s (see table). In the mid-1990s, with the opening of the Erasmus Bridge, tram service across the Nieuwe Maas River was resumed. In the new millennium, the long route to Carnisselande is worth mentioning, as it includes a 350 m long bridge over the A15 motorway and the Betuwe freight railway.

The Rotterdam Metro

At present, there are five letter-marked lines on the Rotterdam metro network; they all run every 10 minutes and overlap on lengthy sections. Two main routes lead through the city centre, one in a north-south and the other in an east-west direction. Two peculiarities of the Rotterdam metro system are, on the one hand, the branches in the east of the city known as the 'Sneltram' (light rail), and on the other hand, two overland routes taken over from the national rail network, i.e. the lines to The Hague and to Hoek van Holland, which are also operated in Sneltram mode. The Metro has two depots, one at 's-Gravenweg between Kralingse Zoom and Capelsebrug, where the RET control centre is also located, and one at Waalhaven between Slinge and Rhoon. The main RET workshops at Kleiweg serve both metro and tram vehicles.

On the **Noord-Zuidlijn** (also known as the 'Erasmuslijn' from 1997 to 2010), lines D and E overlap between Centraal Station and Slinge. Likewise, on the southwestern section through Hoogvliet and Spijkenisse, line C shares tracks with line D.

Planned as a tram tunnel in the mid-1950s, the north-south line was eventually built in the 1960s as a fast link between the districts north and south of the New Maas River. For the underground route through the city centre, a canal was dug into which pre-fabricated tunnel segments were lowered. Caissons were also used to cross the New Maas. South of the river, the metro runs elevated up to Slinge. Opened in 1968, the route was gradually extended south to Spijkenisse, mostly at ground level though partly on viaducts. Only the crossing of the Old Maas was put into a tunnel.

A northern extension was only added in 2010 as part of the RandstadRail project: the former Hofpleinlijn to The Hague was taken over from the national railway and converted to Metro operation. Within Rotterdam, the stations Melanchthonweg and Meijersplein replaced other stations located nearby. In addition, south of the junction where the Zoetermeerlijn branches off (see The Hague p. 40-42), new stops were added at Nootdorp, Pijnacker Zuid and Berkel-Westpolder. At Kleiweg, a level crossing for motorised traffic has remained, while at the Nootdorp, Pijnacker and Pijnacker Zuid stops only pedestrians and cyclists can cross the tracks. When the RandstadRail trains reached Den Haag Centraal in 2007, they terminated at ground level on the easternmost tracks of the railway station. By 2016, however, a double-track terminus had been built for the Metro directly above these tracks.

Until the completion of the shield-driven tunnel via Blijdorp in 2010, trains continued to

depart from the old terminal station Hofplein. Now, line E trains switch from third-rail power supply to overhead catenary and vice versa at Melanchthonweg. Line D trains from Spijkenisse still terminate at Centraal Station, where the underground station has been expanded to three tracks.

Today the Noord-Zuidlijn has a total length of 45.5 km (7.8 km underground), of which 5.6 km is shared with The Hague's tram (lines 3 and 4) and 5.9 km with Metro line C.

The **Oost-Westlijn** (formerly also known as the 'Calandlijn') is served by lines A, B and C, resulting in a train every 3-4 minutes on the common section between Capelsebrug and Schiedam Centrum. While line C continues east on an elevated alignment into the neighbouring town of Capelle a/d IJssel, lines A and B switch to 'Sneltram' operation by lifting the pantograph while the train is in motion between Capelsebrug and Schenkel, since the ground-level route features numerous level crossings, all equipped with barriers since 2001.

The tunnels on the east-west line, which went into operation in 1982, were mostly built by cut-and-cover using sheet piling. Around Gerdesiaweg/Voorschoterlaan, several houses had to be demolished, but they were later rebuilt. From Coolhaven to Delfshaven, caissons were used. Below the Blaak metro station, an underground station was opened in 1993 on the railway line to Dordrecht.

In the mid-1990s, the construction of the so-called Beneluxlijn began from Marconiplein to Schiedam and under the New Maas to Hoogvliet, partly on an elevated alignment and partly in shallow tunnels. The 1.4 km underwater tunnel was built together with a motorway tunnel using caissons. West of Schiedam Centrum station, the middle tracks dive down an encased ramp, while the outer ones continue for about 500 m on a viaduct and were initially used for reversing. To merge the new extension with the existing north-south line, a new station called Tussenwater was inserted between Poortugaal and Hoogvliet, allowing line C to continue to De Akkers in Spijkenisse since 2002, while lines A and B terminated at Schiedam Centrum. At the other end of line B, a 1.4 km elevated extension was built from Zevenkamp (De Tochten) to Nesselande – to reduce the visual impact, a third-rail power supply was installed here instead of a catenary.

The most recent extension to the Rotterdam metro network was again achieved by taking over a former railway line. In March 2017, the traditional suburban rail service between Schiedam and Hoek van Holland ended (24 km). The line was intended to be converted to metro operation and connected to the east-west line within just a few months. Due to persistent problems with the train control system, however, the phased introduction of passenger service could only start on 30 September 2019. On this route, which at times is also used by freight trains, numerous level crossings as well as a drawbridge (at Vlaardingen Centrum) and a swing bridge (at Maasluis Centrum) have been retained. The new section continues to be operated with an overhead line, although now with 750 V DC instead of the previous 1500 V DC. The trains switch from third-rail to catenary operation in the area of Schiedam Nieuwland. While all the existing stations were upgraded, a new station was added at Steendijkpolder in Maasluis, which like Vlaardingen West serves as an intermediate terminus. For the time being, line B terminates at Hoek van Holland Haven as the former terminus Hoek van Holland Strand was abandoned, and by 2022, a new terminus will be built a little further west, closer to the beaches.

The Oost-Westlijn now has a total length of 58 km (excluding the 5.9 km shared Tussenwater – De Akkers section), with 11.8 km lying underground.

UTRECHT

The city of Utrecht is the capital of the province of the same name in the east of the 'Randstad', the densely populated region in the west of the Netherlands. Public transport in Utrecht is provided by Qbuzz under the brand name U-OV [for Utrecht Openbaar Vervoer]. This includes mainly buses, a light rail line with two southern branches (Sneltram), as well as a recently opened tram line, but not the S-Bahn-style network developed as 'Randstadspoor', i.e. frequent Sprinter trains operated by NS. 'Dagkaarten' are only valid within the city of Utrecht, while day tickets offered for the entire province are only available for OV-chipkaart holders!

Utrecht Tram History

The first horse tramway in Utrecht started operating in as early as 1879. Over the following decades, a large standard-gauge network of urban and interurban lines was built, with electrification starting in 1906. In addition, some interurban 1067 mm gauge lines in the eastern part of the province reached as far as Arnhem. With the urban tram routes having disappeared by 1939, all the interurban lines had also been abandoned by 1949.

In the area south of Utrecht, a steam railway operated from 1883 to 1893. This ran via Jutphaas to Vreeswijk in what is now Nieuwegein to end at the ferry terminal near the present terminus Nieuwegein-Zuid, from where passengers crossed the Lek River to get to Vianen on the south bank. Later, this railway became a horse-drawn tramway and in 1923, a 'tractor-hauled tramway', which however only lasted until 1928. 55 years then passed before trains returned to this area in the form of the modern 'Sneltram'.

Sneltram

With the satellite towns Nieuwegein and IJsselstein having emerged in the 1960s, the decision was taken in 1974 to connect them to Utrecht Centraal Station with a Sneltram. Within Utrecht, the new line was to serve the southwestern districts on Kanaleneiland. Later, the route was to be extended via the city centre and De Uithof east to Zeist, while a second route was envisaged from Maarssen in the north to Houten in the south. The initial terminus of the first route was to be placed on the eastern side of the railway station, i.e. on the side of the Old Town.

The Sneltram route runs mostly at ground level; of note is a purpose-built 188 m bridge over the Amsterdam-Rhine Canal as well as a short tunnel under the A2 motorway between Nieuwegein and IJsselstein and another one under a dual carriageway. The Sneltram was finally opened on 17 December 1983 with a total length of 14.2 km. In the beginning, the southern termini were Nieuwegein-Zuid and Doorslag; a 3.8 km long route through IJsselstein to the Achterveld stop followed two years later. While the city council opted in 1997 for exclusive busways instead of more Sneltram lines, the IJsselstein branch could still be extended in 2000 to IJsselstein-Zuid, the present terminus in the new neighbourhood of Zenderpark.

The Sneltram vehicles were designed using the German Duewag Stadtbahn car B as a

model, a tram which had been in use in Cologne since 1973. The cars were manufactured, however, by the Swiss company S.I.G., and having in the meantime undergone several modernisations, are still in use today. Between 2009 and 2014, ex Vienna Stadtbahn cars of type E6/e6 reinforced the fleet during peak hours.

Due to extensive reconstruction work at Utrecht Centraal Station and the planned construction of the Uithoflijn, the Sneltram stop on the eastern side of the railway station (the original terminus Moreelsepark had already been out of service since 2009) was abandoned in April 2013 and relocated to Jaarbeursplein on the western side. At the same time, the Westplein stop disappeared. The connection between the two sides of the railway station was completely re-aligned in 2015/16, and now has much tighter curves on both sides; nothing remains of the original Sneltram stop at Centraal Station.

Similar to what is being done along the Amstelveenlijn in Amsterdam, from summer 2020, the entire Utrecht Sneltram line will be rebuilt for the use of low-floor vehicles. In the future, the longer CAF trams will operate here, partly coupled with the shorter trams, which for the time being are running on the new line 22, forming 75 m long two-car trains.

Uithoflijn

In the east of Utrecht, numerous university and medical institutions are located in the district of De Uithof, now also known as Science Park. In 2001, the first 'Busbaan' [busway] was opened from the railway station via the city centre to this area. It was soon followed by another busway link, this time bypassing the city centre on its southern side. The latter route used to be operated at high frequency by line 12 using double-articulated buses, but this still resulted in overcrowding during peak times; and so in 2012, the decision to build a modern low-floor tram along the southern bypass route was taken.

Starting from Centraal Station, the first 3.5 km runs mostly grade-separated parallel to the railway line to 's-Hertogenbosch; about halfway along, the elevated stop Vaartsche Rijn lies directly next to the NS station of the same name. The rest of the route resembles a modern French-style tram line, with some sections shared with buses. The terminus at P+R Science Park has been built over with a multi-storey car park. Behind it is a four-track stabling facility. The city-side terminus at Centraal Station, which is located near the original Sneltram terminus Moreelsepark, has also been built over. This terminus features two central stub tracks for trams ending here and returning to De Uithof while the outer tracks continue, and will allow the joint operation of the two lines in the near future.

The Uithoflijn, now line 22, finally started passenger service on 16 December 2019. A ride on the 7.9 km route takes 17 minutes. The new line does not operate on weekends and holidays! CAF's low-floor trams are serviced together with the older Sneltram cars at the depot in Zuilenstein.

Belgium

ANTWERP

Despite its location about 80 km up the River Scheldt, Antwerp (205 km²) is one of Europe's most important seaports. Most of the city lies on the east bank of the river, with just around 15,000 people of the city's population of over 500,000 living in the district of Linkeroever [left bank]. Brussels is only 50 km south of Antwerp, and Brussels-Zaventem Airport is easily accessible by train in just half an hour too.

Throughout Flanders, and therefore also in Antwerp, public transport is operated by De Lijn (Vlaamse Vervoermaatschappij), and only the regional trains and IC trains are operated by the Belgian national rail company NMBS/SNCB. Fare integration between De Lijn and NMBS only exists for monthly (City Pass) travelcards. Day tickets bought in Antwerp (since April 2020 only issued on electronic cards and available for one or three days) are valid on De Lijn's entire network, including the trams in Ghent and on the coast, as well as on almost every bus throughout Flanders. Day passes must also be held against the card reader each time you board. The Antwerp tram system covers not only the entire city, but also reaches the surrounding municipalities of Wijnegem, Wommelgem, Mortsel, Boechout and Zwijndrecht, although this is irrelevant for passengers thanks to the simple fare system.

Antwerp's tram network includes just about everything this means of transport can offer – from single-track routes through the narrow streets of the Old Town, to well-aligned new lines and to metro-style tunnels (around 11 km) with a total of 14 underground stations (counting the interchanges at Astrid and Opera twice). Currently, eight of a total of 14 lines run partly underground. Another special feature of the Antwerp tram system is the high-floor PCC cars, which are still used daily and even as coupled pairs, and which will only be replaced by new CAF cars from around 2022. With the exception of some PCC cars taken over from Ghent, only single-ended vehicles operate in Antwerp, and therefore turning loops are available at all termini. Three depots are strategically located around the network: Punt aan de Lijn in the north (also the main workshops), Deurne in the east and Hoboken in the south. The former Groenenhoek depot is now home to the tram museum.

With the first horse-drawn tramway having already been put into operation in 1873 from the city centre to Berchem, all the horse tramway companies which were founded thereafter were merged into the 'Compagnie Générale des Tramways d'Anvers' in 1900 with the aim of standardising and electrifying the network, a process completed by 1903. Subsequently, the network was expanded into the suburbs lying beyond the - fortification beltline, whose course corresponded roughly to today's motorway ring. In 1946, the 18 tram lines which then served a network with a total length of 69 km were transferred to the company 'Tramwegen van Antwerpen en Omgeving' (TAO), which until 1964 also operated some trolleybus routes.

Since the late 19th century, numerous interurban tramways, initially with 1067 mm gauge and pulled by steam locomotives, had connected Antwerp with the surrounding

region (including Kapellen, Schoten, Turnhout, Broechem, Mechelen and Boom). However, it was not until 1933 that these trams were able to use the urban tram tracks to reach the present Rooseveltplaats in the centre of Antwerp. Nevertheless, these routes all gradually disappeared after the mid-1950s; the last route to be abandoned being the one to Schoten in 1968.

In 1963, TAO became MIVA (Maatschappij voor het Intercommunaal Vervoer te Antwerpen). This came after numerous tram lines had been switched to bus operation since the early 1950s, with the result that by 1960 the tram network had shrunk to 55 km. On the other hand, from the early 1960s, the remaining system was modernised through the purchase of PCC cars. Following the examples of Brussels and Cologne, Antwerp then began planning tram tunnels through the city centre. Since these tunnels were meant to become part of a proper metro system in the long term, the project was referred to as the 'Premetro', a term still applied today to the underground sections of Antwerp's tram network. Two trunk routes with several branches were envisaged. While the first one with its central east-west tunnel through the Old Town and its southern and northeastern branches had been brought into service in stages by the mid-1990s, the second trunk route has remained unfinished to this day. After lying idle for decades, the tunnel under the Turnhoutsebaan, where in the end the surface tram was retained too, opened in 2015 between Astrid and Muggenberglei, albeit with just one intermediate

underground station. Later, the ramps at Hof ter Lo and Opera were added, so that today's line 10 can cross the city from northeast to south. Line 8, however, was shortened in December 2019, and now once again reverses in the underground loop just west of Astrid station. The Carnot, Drink, Collegelaan, Morckhoven and Foorplein stations remain unused concrete shells, just like an approximately 1.4 km branch under Kerkstraat/Pothoekstraat with its two underground stations St-Willibrordus and Stuivenberg; this branch was planned to end at the existing Schijnpoort station.

While the future of the tunnels built in the 1980s remained unclear for a long time, the surface network has been significantly expanded in recent decades, since 1991 under the administration of De Lijn (see table on the left). After new routes towards the east (Wijnegem and Wommelgem) and the south (Mortsel, Boechout), the focus in recent years has been on the north of the city, where among other things, the redevelopment areas in the port were to be served by new lines. This 'Noorderlijn' project was completed on 8 December 2019 with the introduction of line 1 and the opening of the lower level at Opera underground station. At the same time, a short section served by the temporary line 70 between the loop at Eilandje (MAS) and the Londenstraat stop lost its regular service because the bascule bridge on this section was causing severe delays due to the frequency with which it opened, a situation not acceptable for line 7, which was to be extended to P+R Luchtbal.

In the long term, the tram network may be extended south towards Wilrijk, Edegem and Kontich and east towards Ranst. The completion of some partly-built Premetro stations is also on the agenda.

BRUSSELS — BRUXELLES · BRUSSEL

Nowadays, the name 'Brussels' generally refers to the 'Brussels Capital Region' (161 km²), a federal district rather like Berlin or Washington D.C. It is made up of 19 municipalities, some of which are rather small; among these is the 'Ville de Bruxelles' or 'Stad Brussel' with an area of just 32.6 km² and some 182,000 inhabitants. The Capital Region is officially bilingual, although French is predominant in everyday life. Dutch now plays a secondary role, even though Brussels is geographically a part of Flanders, and in addition to being the seat of the Belgian government and numerous EU institutions, also assumes the function of capital for the Flemish region. For ease of reading, only French place names are used in this book. On our maps, Dutch (Flemish) equivalents have been added in italics (a practice also followed on official network maps and signs).

Brussels' metro and tram are operated by the public transport company STIB or MIVB (in French 'Société des Transports Intercommunaux de Bruelles' and in Dutch 'Maatschappij voor het Intercommunaal Vervoer te Brusse*l*'). In the Capital Region, there is limited fare integration (so-called JUMP tickets) which includes national rail operator SNCB/NMBS as well as De Lijn and TEC for buses coming into Brussels from the surrounding regions. However, 24-hour single-use tickets (€7.50) are only sold for the STIB network. If you want to use every means of transport, you need to get an electronic MOBIB card for €5.00 and load a JUMP ticket onto it: 24 hours — €7.50; 48 hours — €14.00; 72 hours — €18.00.

The Brussels Tram System

The Brussels tram network currently comprises 17 lines, plus the evenings-only line 32, which then replaces line 82 on its southern section. The network features several underground sections, including a 6 km north-south tunnel through the city centre which is served by lines 3 and 4 and in the evening by line 32 too, and which will be upgraded in the medium term to become metro line 3. The southern section of this Premetro tunnel is also used by line 51. In the Gare du Midi/Lemonnier area, lines 81 and 82 also dive underground. Another Premetro route with four underground stations can be found in the east of the city along the Grande Ceinture, and is served by lines 7 and 25. The latter terminates underground along with line 55 on the intermediate level at Rogier station, above lines 3 and 4. At the Montgomery hub, lines 39 and 44 end in an underground loop. While line 19 has been serving the underground Simonis hub since 1986, a three-track terminal station was opened there in 2018 for the new line 9. In the north of the city, a tunnel for interurban SNCV trams was put into operation in 1957 in the run-up to the World Expo. The Premetro and subsurface tram routes add up to a total of about 10 km.

On the surface routes, the tram system offers everything from on-street sections through narrow streets in the suburbs to modern, light rail style routes such as lines 3 and 7 in the north of the city to interurban routes such as lines 39 and 44 in the east. Except for two larger block loops, the entire network is double-track and lies mostly

within the Capital Region, although a few stops on line 39 (Wezembeek-Oppem), line 44 (Tervuren), line 32/82 (Drogenbos) and line 19 (Groot-Bijgaarden) are located in the 'Vlaamse Rand', the commuter belt in the Flemish region.

History of the Brussels Tram

The first horse-drawn tramway in Brussels started running in 1869 from Porte de Namur towards the southeast to the Bois de la Cambre. Numerous other lines followed soon afterwards, and before long they merged to form the transport company 'Tramways Bruxellois' (TB) in 1875. In 1894, TB started electric operation on the Petite Ceinture [small ring] between the railway stations Gare du Nord and Gare du Midi, i.e. on the corridor which roughly corresponds to the eastern section of today's Metro line 2. The urban standard-gauge network eventually reached its largest extent of over 240 km in 1952. In addition, numerous metre-gauge interurban tram lines reached Brussels from the surrounding region. These were part of the SNCV network and operated all with electric power from 1937. Some sections were equipped with three-rail tracks to enable them to use the routes of the urban tramway. The decline of the interurban tram network began in the early 1960s, and by 1978, all the routes around Brussels had disappeared.

In 1954, STIB took over the operation of the tram system. While numerous routes were abandoned in the 1950s and 1960s just like in many other cities, the four-track underground junction between Lemonnier and Gare du Midi, which is still in use today, was completed in 1957 under the Place de la Constitution. Later, all the inner-city tram routes were to be put underground, with tunnels allowing for a future upgrade to full metro standard, which is why the project was named 'Premetro'. With stations that are rather cramped by today's standards, the construction of the east-west line began in the mid-1960s, not least to provide an optimal link to the new - European Quarter emerging around Schuman station. The first Premetro tunnel opened between Schuman and De Brouckère in 1969, but by 1976 it had already been upgraded to become Brussels' first metro line (see p. 118). Just a few years later, more Premetro tunnels were brought into service: along the Petite Ceinture (opened in stages between 1970 and 1985, now lines 2/6); along the Grande Ceinture (1972-1975, now lines 7/25); and on the north-south route (1976, now lines 3/4). While the - Petite Ceinture route was converted to Metro in 1988, the other two tunnels are today still served by trams, which makes some stations like Georges Henri seem rather oversized. By the mid-2020s, the north-south route, which was extended south to Albert in 1993, is to be rebuilt to become Metro line 3 before being extended north to Bordet in the following stage.

In the course of the Premetro construction, several routes had been shut down since the 1970s, while no new lines were built for a long time. Finally in 1982, an extension from CERIA to Erasme was opened, but it only survived until 1999/2003 due to the expansion of the Metro. In 1993, a lengthy suburban route from Schaerbeek to Volvoorde was abandoned (line 58; 6.8 km). Since the 1990s, there have been some network extensions (see table), most recently in 2018 the new line 9 from Simonis to

the university hospital UZ Brussel in Jette and line 8 (formerly line 94) to the metro station Roodebeek.

In recent years, various projects have been discussed. For example, line 9 will soon be extended to Heysel, while a branch from Van Praet to the district of Neder-over-Heembeek as well as a Gare du Nord – Belgica cross-link to serve the redevelopment area Tour et Taxis are likely. Together with De Lijn, the Brussels tram is planned to cross the borders of the Capital Region and run north along the A12 motorway to Londerzeel and Willebroek as a ‘Sneltram’, while line 62 is to be extended from its terminus at Eurocontrol to the airport. A third route originally included in De Lijn’s ‘Brabantnet’ project, namely a tangential line from UZ Brussel via Heysel, Strombeek-Bever and Vilvoorde to the airport, will initially be implemented as a ‘Ringtrambus’, i.e. a busway served by double-articulated buses.

The Brussels tram fleet still includes numerous articulated PCC cars from the 1970s, which from 2020 will be replaced with new Flexity trams ordered from Bombardier. The longer Flexity T4000 vehicles are in service on the ‘Lignes fortes’ 3, 4 and 7. Currently, there are seven depots and a smaller workshop (Cureghem). Part of the Woluwe depot is home to the tram museum.

The Brussels Metro

Although there are four metro lines on the Brussels metro map, they could also be considered as just two lines, with the east-west line featuring two eastern branches while the other line is a sort of false circular line with a northwestern branch, with line 2 representing just a short working of line 6.

Both trunk routes were built from the mid-1960s as ‘Premetro’ tunnels, i.e. similar to the Stadtbahn sections in the German Rhine-Ruhr area, with tunnels designed large enough to be used later by proper metro trains. Initially, however, they were used by conventional trams that went underground via temporary ramps, just as they still do today on the north-south route (planned metro line 3) and the Grande Ceinture route between Boileau and Diamant (once planned metro line 5).

The now partly overcrowded **east-west route**, which opened on 17 December 1969, used to have two ramps east of Schuman station and one in the area of today’s Sainte-Catherine station where all the lines running through the tunnel terminated in a surface loop. However, Premetro operation on this route lasted only seven years before the platforms were raised along their full lengths, and the tunnel was connected to the new eastern extensions, which enabled full metro operation to start between De Brouckère in the city centre and the eastern termini Tomberg and Beaulieu (near the Metro depot) in 1976. To avoid conflicts at the Merode junction, the platforms in this station were built adjacent to each other, but on different levels (inbound -3, outbound -4). Although line 1 was originally planned to be extended due west (Berchem), two western branches were added instead in 1982. The northern one (now part of the line 6) features left-hand operation to avoid conflicts at the four-track Beekkant - station, where lines 1 and 5 now use the inner tracks. All four branches were gradually extended until 2003. From 1982 to 2009, trains running between Roi Baudouin and

Herrmann-Debroux were designated as line 1A, and between Erasme and Stockel as line 1B.

The tunnel of the second trunk route, that along the **Petite Ceinture** [Small Ring], was extended twice as a Premetro before being upgraded to Metro standards in 1988, when it was simultaneously extended to Simonis (now Elisabeth) and Gare du Midi [South Station] to become Metro line 2. At Gare du Midi, a bi-level underground station was built to allow convenient transfers between line 2 and the north-south line. From its southern terminus, this line was originally intended to head west to Saint-Guidon, but eventually the decision was taken to create a ring, despite the fact that no real circular operation would be possible. However, the ring was not completed until 2009, when line 2 took over the northern branch previously served by line 1A. At the same time, today's line numbers were introduced, i.e. line 1B became line 5 and the extended line 2 is now line 6. From then on, line 2 operated between Simonis (Elisabeth) and Simonis (Leopold II), which led to some confusion, and so since 2013, the lower platform at Simonis has simply been known as 'Elisabeth'.

While the rather oversized underground stations on the Grande Ceinture will probably continue to be used by trams, now after all with 43 m vehicles, there have always been plans to rebuild the approximately 6 km tunnel of the central **north-south route** for full metro operation, which would increase capacity and allow for a more stable operation. At present, it looks as if the project might actually be realised during the 2020s. While in most stations, only the platforms and technical devices need to be adapted, major work is required in the area of Lemonnier and Albert. As a replacement for today's simple underground tram stop at Lemonnier, a new underground station called Toots Thielemans would be built under the parallel Avenue de Stalingrad; this would also increase the radius of the curve leading towards Gare du Midi. At Albert, where now different lines diverge in various directions, the future Metro line 3 would terminate on the lower level (the partly-built platforms are currently used by outbound line 51 trams), while on the mezzanine level, tram lines 4 and 7 on the one hand and line 51 on the other hand would end on separate stub tracks. The option of a southern metro extension as originally planned would be maintained. In the medium term, an approximately 4 km extension is to be built at the northern end from Gare du Nord via Place Liedts and through Schaerbeek to Bordet train station in Evere. Despite its largely parallel alignment, tram line 55 may be retained.

CHARLEROI

The Walloon industrial city of Charleroi is located just 50 km south of Brussels (it is connected half-hourly by train from Bruxelles-Midi). Here you can find the only urban rail system in French-speaking Wallonia – the metre-gauge 'Métro Léger de Charleroi', which is actually not a real metro, but a light rail system with underground sections. It is operated by the Walloon transport company TEC (for Transport En Commun), which has otherwise only ever run buses. In the fragmented TEC zonal fare system, the city of Charleroi represents zones 7101 (city centre) and 7102 (peripheral districts including Gosselies and Gilly/Soleilmont). Towards the west, the light rail trains also traverse

zones 7107 (Fontaine-l'Évêque) and 7118 (Anderlues). Besides conventional paper tickets, day passes can also be loaded on a MOBIB card with a discount of 20%; MOBIB cards also allow the purchase of a 3-day pass for €8 (2 zones) or €16 (entire TEC network). Alternatively, the urban rail network can be explored with a 24-hour CITY PASS, which is valid not only on TEC but SNCB trains too, and costs €7 for the Charleroi region.

The Charleroi light rail network comprises four lines, all of which follow a circular route around the city centre: lines M2 and M3 clockwise and lines M1 and M4 counter-clockwise. While line M1 turns directly from Piges towards Ouest without serving Beaux-Arts station, lines M2 and M3 use an underground loop before stopping there, which enables them to leave the ring towards Piges. Line M4 takes a loop ride at Waterloo to head to Soleilmont. Apart from the loop at Beaux-Arts station, all the junctions are flat. Since everything was planned differently in the past, the trains on the Gilly branch run on the left, with the tracks crossing each other at grade to the west of Samaritaine! However, the once ambitious metro plans led to long sections on the eastern and western branches being built grade-separated. The platforms are only 55 cm high and do not allow stepless boarding, because the cars feature a fixed step inside the vehicle. The newer route towards Gosselies and the last section opened on the city loop were built on a tram alignment and partly with raised platforms. The westernmost section of the network runs on-street through Anderlues; this section was double-tracked in 2019 in the area around the depot. In the evenings, light rail operation ends at 20:00, when buses take over.

The route through Anderlues dates from 1910 and is the oldest section of today's network; it was once part of the large Belgian interurban tram network operated by SNCV (Société Nationale des Chemins de Fer Vicinaux), which originated on the coast in 1885 and reached its greatest extent in the 1940s with a total network length of around 4800 km. While the network began to shrink rapidly from the 1950s onwards, numerous sections remained in operation in the Charleroi region until the 1980s, mainly to the west and north of the city. From Anderlues, the trams continued to La Louvière until 1993. A section of the branch to Thuin, which until 1983 had diverged at the stop called Jonction, is now used by vehicles from the museum dedicated to the SNCV [www.asvi.be].

Besides the SNCV network, Charleroi also had an urban electric tramway from 1904, with lines mostly serving the eastern parts of the city and the neighbouring municipalities. Operated in the end by STIC (Société des transports intercommunaux de Charleroi), the routes had all disappeared by 1974.

In the early 1960s, the Belgian government planned metros not only for Brussels and Antwerp, but for Ghent, Liège and Charleroi too. Rather like in many West German cities, the Charleroi system was to be developed from the existing SNCV and STIC routes. The Charleroi network was designed with a central 4.3 km ring from which several so-called antennas were to radiate. Since no independent lines were intended, the system was labelled 'Métro Léger' [light metro], featuring platforms which were shorter and not as high as well as at-grade junctions on the ring. However, the metro

was planned to be segregated from road traffic, running either through tunnels or on viaducts. Although construction began in the early 1970s, the network remained incomplete for a long time. The western branch to Fontaine l'Évêque gradually replaced the old SNCV route until only the original section west of Pétria remained. Towards Gilly, the underground Métro replaced the tram that had been abandoned almost 20 years earlier. However, it took a long time for the central ring, essential for the originally proposed network layout, to be completed, while the southeastern branch to Centenaire was finished in 1987 but never brought into service. Other routes once planned to the northwest or south were never started.

In 1991, as a result of the regionalisation of the Belgian state, the network was transferred to the Walloon transport company TEC, which then continued the construction of the eastern part of the ring. However, it was not until the new millennium that political decisions were finally made to invest in a more useful network. As a result, the branch to Gilly was extended to Soleilmont, now without the formerly applied standards of grade-separated routes in order to create a convenient tram/bus interchange. Similarly, the long-missing section between Parc underground station and Charleroi Sud, the city's main railway station, was eventually built in tramway style. A 4 km double-track route along Chaussée de Bruxelles had been used since 1988 only to access the tram depot at Jumet, while the continuing single-track route through Gosselies had lain idle. Instead of the once planned 'antenna' towards Gosselies and the airport, which was to branch off the ring at Waterloo, the depot access tracks were upgraded and the line extended; due to the narrowness of the central Rue de Jumet in Gosselies, a new alignment on the eastern outskirts of Gosselies was chosen for the inbound track.

Despite its considerable length of 7.5 km (excluding the ring), the new line M3 did not require the purchase of additional vehicles, since TEC has always had an excess of them. Alstom has been chosen to carry out yet another overhaul of these almost 40-year-old articulated cars in the coming years, so a replacement and thus a barrier-free use of the light rail network cannot be expected in the near future. The central workshops and main depot are located in Jumet, while a smaller depot can be found in Anderlues.

Ghent — Gent

The Flemish city of Ghent is located just 50 km northwest of Brussels and can be reached by train from Bruxelles-Midi several times an hour in just 30 minutes. Ghent has one of the three rail networks operated by the Flemish transport company De Lijn. Unlike the Kusttram or the tram in Antwerp, the tram vehicles in Ghent are bidirectional and a turning loop is only available at the Flanders Expo terminus. Day passes (since April 2020 only sold as an electronic card or via an app) are always valid throughout De Lijn's network, i.e. on all trams and almost every bus in Flanders, regardless of whether they are purchased in Ghent, Antwerp or on the Kusttram. Day passes must also be held against the card reader every time you board. The entire tram

network lies within the Ghent city limits except for two stops at the northern end of line 1 and the eastern terminus of line 2, but fare-wise this is irrelevant thanks to the simple fare structure.

Since the eastern branch in Gentbrugge was abandoned in 2017, Ghent has only had three tram lines; line 4 could be considered as two north-south lines linked at Muidebrug in the north. On line 1, during daytime hours every other northbound journey ends at Industrieweg in the district of Wondelgem.

The history of urban rail transport in Ghent dates back to 1874, when a horse tramway started operating from Korenmarkt to the former South Station (Zuid). In 1899, testing with accumulator trams started before the first electric trams ran through the city in 1901 – this was, however, an interurban line to Merelbeke, a town south of Ghent. The urban network of the ETG (Elektrische Tramwegen van Gent) was operated with electric power from 1904. Numerous lines once led from Ghent into the surrounding region, but they all disappeared during the 1950s.

With the operation of the tram network having been taken over by the MIVG (Maatschappij voor Intercommunaal Vervoer te Gent) in 1961, the important east-west line 3 was switched to bus operation in 1969 (from 1989 to 2009, trolleybuses operated on the Mariakerke – city centre – Dampoort – Gentbrugge route; for the planned reintroduction of trams, tracks have been lying in the Korenmarkt area since 2009/ 10!). Even before the tram system was integrated into De Lijn in 1991, line 1 was extended north from Van Beverenplein (Wondelgem 1984, Evergem 1989). After a 20-year absence, trams returned to Melle in 1993 though with just a short extension from Gentbrugge (Arsenaal) to the city border. In the new millennium, the network was once again expanded to the area south of the city's main railway station, Gent Sint-Pieters: in 2000 to Zwijnaardebrug (Gestichtstraat), in 2004 to Maalte (M. Middelaes) and in 2005 further on to Flanders Expo. To cross the railway route, all the lines originally used an underpass just to the west of the station building, with the tram routes - splitting on the southern side of the railway station. Since 2009, lines 21 and 22 (now line 2) have been running on new tracks along Pr. Clementinalaan on the north side of the railway route to reach the station square, while in around 2010, a new underpass some 100 m west of the original one was opened for line 1. For transferring passengers, the distances between stops have thus become longer.

More recently, on 13 March 2016 a short branch (750 m) was opened for line 4 to connect the University Hospital (UZ Gent), which was followed on 24 October 2016 by a 1.9 km long extension to Zwijnaarde Bibliotheek. This features a dedicated bridge over the Ringvaart Canal, but otherwise the tracks are mostly embedded in the roadway. After the former line 22 had been cut back in Gentbrugge from Boswachterstraat to Braemkasteel in 2010, De Lijn eventually ceased operation on this branch, which lies partly under an elevated road, in 2011; the remaining tracks are used to stable tram vehicles.

Ghent's only tram depot is located in Gentbrugge near the former junction of line 2 (therefore previously known as lines 21 and 22). A second depot has been planned for a long time in the north of the city.

While the once-planned reintroduction of trams on line 3 has been postponed, the construction of line 7 between Sint-Pieters and Dampoort railway stations through the southern parts of the city centre is included in the current coalition agreement of the Flemish Government. Later, line 7 may continue southwest to Sint-Denijs-Westrem (3 Sleutels).

KUSTTRAM

The Belgian coastal tramway is certainly one of the world's most unique tram routes: at 68 km probably the longest tram line in the world, it connects all the coastal towns along the Belgian North Sea coast. About 60 km of the route runs either directly by the beaches or, when traversing different towns, a few hundred metres inland. Only in the Nieuwpoort area does the Kusttram make a proper detour into the hinterland (since 2019 partly on a new alignment). The same applies to the southernmost section from De Panne Esplanade to the terminus at De Panne railway station in Adinkerke. About halfway down the line lies Ostend (approx. 72,000 inhabitants), the largest and most important town along the coast, although Zeebrugge, which is part of the Bruges municipality, is Belgium's most important port of those located right by the North Sea. Before the opening of the Eurotunnel, Ostend used to be the final destination of many European long-distance trains with a connection to the ferries to England.

Like the trams in Ghent and Antwerp, the Kusttram is operated by De Lijn, and therefore not only do the same fares apply but the same tickets can also be used, i.e. a day ticket purchased in Ghent or Antwerp is at the same time valid on the coast! In addition to these day tickets valid on all trams and buses in Flanders (24 hours €7, 3 days €14), the province of West Flanders also offers a 7-day pass for €26. Along the route of the Kusttram, many ticket counters (so-called Lijnwinkels) are open during the summer, while in the off-season, tickets can also be bought from the driver. Even day passes must always be held against the electronic ticket reader every time you board.

The Belgian coast is connected to the rest of the country by five railway routes, four of which run via Bruges. De Lijn tickets are not valid on SNCB/NMBS (national rail) trains, however.

The Kusttram operates as line 0 and normally provides a 15-minute headway along the entire route, although on weekdays during the winter months it only runs every 20 minutes. During July and August, the frequency is increased to a tram every 10 minutes, with additional trips starting from Oostende Station, e.g. heading for Westende, and mostly operated with Hermelijn cars transferred to the coast from Ghent or Antwerp for the summer services. The route is double-track throughout, but despite the use of single-ended cars, it has only a few loops or triangles to reverse, while there are numerous crossovers. To keep the trams running when the bridges at the port entrances in Zeebrugge and Ostend are open, alternative routes are available at three locations. A ride on the entire route takes around 2 hours and 25 minutes, with several minutes scheduled at Oostende Station. In addition to the stabling facilities at the two termini, De Panne and Knokke, the Kusttram has also had a new depot since 2017. This is located on Slijkensesteenweg between Oostende Station and Weg naar

Vismijn; it replaced the sidings directly south of the railway station. The main workshops remain on Eduard de Cuypersstraat in the west of Ostend. Historical vehicles are stored in a small car shed in De Panne.

The coastal tramway can look back on more than 100 years of history. On a route 'through the villages' a little further inland than today, the first steam trams started running in 1885 from Ostend to Nieuwpoort, and soon after to Veurne. The current route along the coast, however, was opened in 1897 by the company 'Tramways Électriques d'Ostende – Littoral' (TEOL) and has operated with electric trams since the beginning. In Ostend itself, some urban lines were also built.

Along the northern coastal strip, various local railways also began emerging from the mid-1880s, for example, from Bruges to the coast or parallel to the coast, but some also further inland. From 1905, electric trams ran from Ostend to De Haan, gradually reaching today's northern terminus Knokke by 1912.

In 1927, after the section through Koksijde had been finished, the coastal tramway became part of the 'Société pour l'Exploitation des Lignes Vicinales d'Ostende et des Plages Belges' (SELVOP), and the electrification of today's route was completed.

While in the 1950s all the urban routes in West Flanders ceased operations, in 1956 the coastal tramway was integrated into the large network of Belgian interurban lines operated by SNCV/NMVB and in 1991, it was transferred to what was then the new Flemish operator 'De Lijn'. For decades, the route had remained unchanged until finally in 1998, a 3.3 km extension was put into operation from De Panne (Esplanade) to De Panne railway station in the district of Adinkerke (Adinkerke had already been served by electric trams before 1956, albeit on a different route).

More recently, on 17 May 2019, a new route was opened on the edge of the village of Lombardsijde, which shortened the overall length of the line by about 300 m, and with it, one of the last original routes through those typical villages disappeared. Also in mid-2019, a completely rebuilt tram stop was put into operation right next to Oostende railway station.

The almost 40-year-old fleet of high-floor articulated trams with retrofitted low-floor middle sections will be replaced in the near future by new low-floor trams from CAF.

Luxembourg

LUXEMBOURG | LËTZEBUERG

The city of Luxembourg is the capital of the Grand Duchy of Luxembourg, which has a total population of just 620,000. The city itself has just under 120,000 inhabitants and is home to many European institutions. Although the Moselle-Franconian Luxemburgish or Lëtzebuergesch is the national language, everyday life is dominated by French, which is used as an official language along with German. However, compared to Belgium, the use of the different languages is barely regulated. This also applies to public transport (see Pafendall vs. Pfaffenthal), which is very well integrated in

Luxembourg. Uniform and simple fares have always been applied throughout the country (€ 4 for a day), but since March 2020, local transport in Luxembourg has been completely free anyway!

A first-generation electric tramway, then metre-gauge, already existed in the city of Luxembourg from 1908 to 1964. The largely single-track network reached a total length of around 24 km. In the district of Hollerich, the 'Musée de Tramways et de Bus de la Ville de Luxembourg' has some tramcars from that era on display. On the main axis between Place de l'Étoile and the railway station, where trams will soon return, the old tramway route was shared until 1954 with 'Charly', the steam-powered local railway to Echternach.

While Luxembourg's old town lies high above the rivers Alzette and Petrus, a modern district with some European and cultural institutions (e.g. Philharmonie, Musée d'Art Moderne) as well as banks and universities has emerged since the 1960s on the Kirchberg plateau east of the Alzette River. To connect this area, where only about 6,000 people live but about 25,000 work, the construction of a tram via the 'Rout Bréck' (the Pont Rouge/Red Bridge – officially the Grand Duchess Charlotte Bridge) had already been proposed in the late 1980s, and a tram-train was even considered. However, it was not until 2014 that the final project was eventually approved. It included plans for a line from the southwest (Cloche d'Or) via the railway station and the city centre up to the Kirchberg, with an option for an extension to the airport. Since the depot was located at the top of the Kirchberg Plateau, the northeastern section had to be built first. This section was opened on 10 December 2017 between Rout Bréck and Luxexpo (3.5 km) as a conventional French-style tramway, i.e. on a continuous dedicated right-of-way but with numerous level crossings. In conjunction with the tram project, a new railway station was built at Pfaffenthal-Kirchberg on Luxembourg's Northern Railway. To overcome the considerable difference in altitude of over 40 m between the railway line and the Red Bridge, two parallel fully automatic funiculars with a length of 200 m were added; like the regional trains, they are operated by the Luxembourg State Railways CFL, and together they can carry 7,200 passengers an hour.

In the second stage, on 27 July 2018 the tram line was extended over the Red Bridge to Stäreplaz/Place de l'Étoile (1.6 km), where long-unused terrains shall soon be developed with new housing and a bus terminal. The tram makes a little detour around the Glacis festival grounds to better serve the district of Limpertsberg. This stretch, as well as the following section down to the railway station, which ought to go into operation by the end of 2020, was built without a catenary. Instead, CAF's vehicles use CAF's proprietary GREENTECH FREEDRIVE technology with supercaps that store energy for up to 10 km without a power supply. At the tram stops, fast-charging devices have been installed in the ground between the tracks. This system had already been successfully used for several years in Zaragoza, Sevilla and Granada.

On its way south, the tram will cross the railway tracks on the Büchler Bridge (which needs to be widened) just south of the railway station to serve the Bonnevoie area and the Howald district of the neighbouring municipality of Hesperange. At

Howald railway station, opened in 2017 as the first element of a future interchange, the tram will once again cross the railway line to Bettembourg, but now on a new bridge. In order to reach Rue Albert Einstein in the newly laid-out area along Boulevard de Kockelscheuer (Ban de Gasperich), a viaduct over the A3 motorway has to be built, too. Further south, the tram will cross the A6 motorway in the median of the recently extended boulevard, and after a turn to the west, will reach the terminus Cloche d'Or where a large Park+Ride facility will be built. The extension to the airport at Findel (3.9 km) will be less complex, although it also requires a new bridge over the A1 motorway directly behind the depot. On this extension the Héienhaff stop will have an adjoining Park+Ride facility.