

# The Evolution of The Berlin Urban Railway Network

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The history of Berlin's urban railways has been just as eventful as the city's history. Almost all the political changes that affected Berlin over the past 162 years also had major impacts on its railways. On the other hand, many milestones in the development of the urban railways caused social and political changes with unforeseen consequences.

Berlin was very late in beginning its transformation from little more than a small town to one of the world's capitals. In 1800, when London's population was about 1 million, Berlin had fewer than

170,000 inhabitants. Six decades later, London had grown to almost 3 million whereas Berlin still had fewer than 600,000 people. A further six decades later in 1920, Berlin had grown to almost 4 million people while London's population exceeded 7 million.

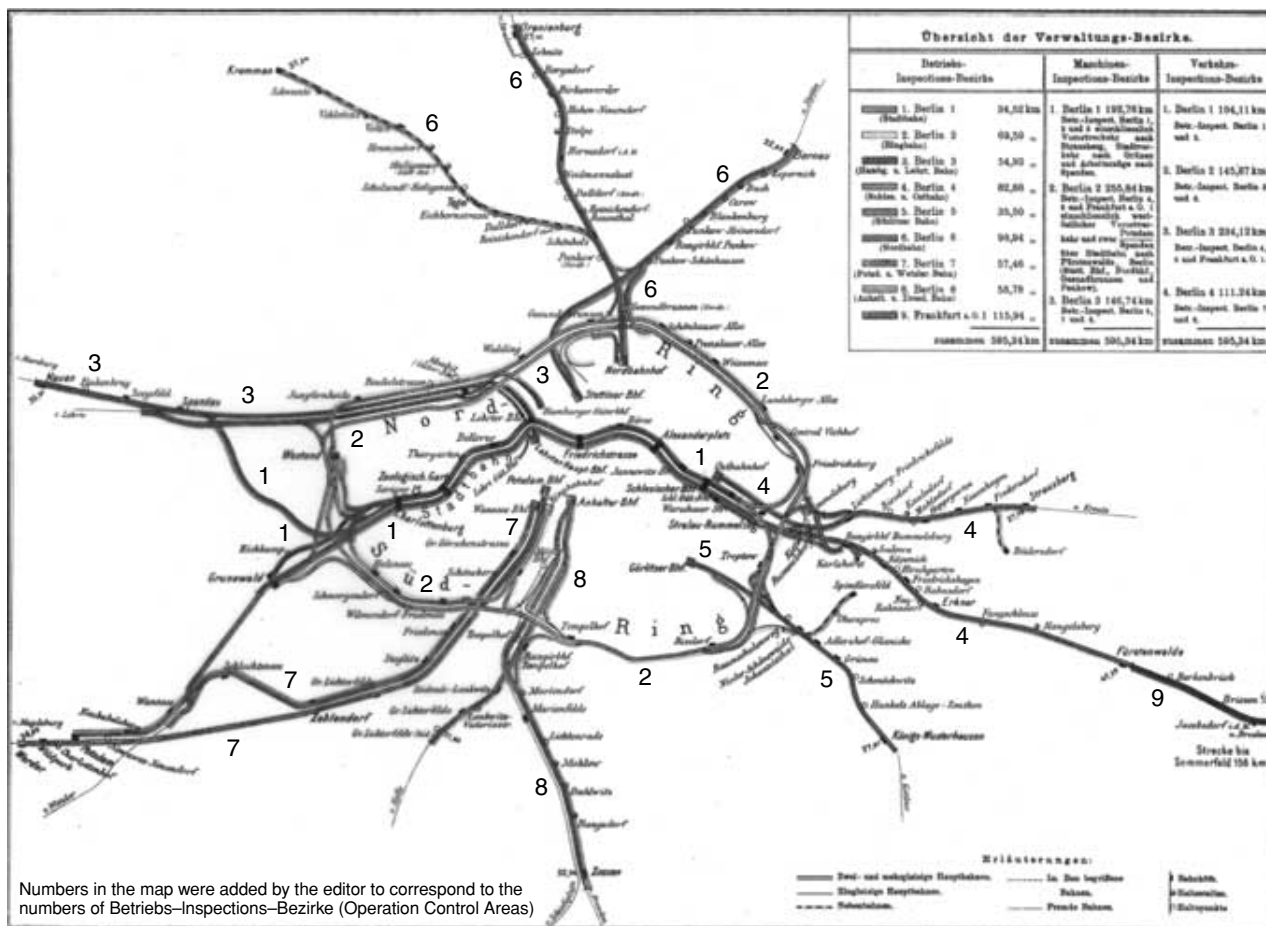
## The Beginnings

The 1838 opening of the first private railway line connecting Berlin and Potsdam marked the start of railways in

Berlin. At first, the new transport system faced a general lack of interest from the public and government. When asked what he thought about the new and lightning-fast vehicles running on tracks that would enable him to reach the city as early as 11 am, King Friedrich Wilhelm III is said to have replied, 'And what should I be doing in the city that early in the morning, when I can do just fine starting at 3 pm?'

Accordingly, none of the six radial lines connecting Berlin with Koethen (1841), Stettin (1842-43), Frankfurt (Oder)-

Berlin's Railway Lines in 1896



A.-Gottwald, Das Berliner U- und S-Bahnnetz. Eine Geschichte in Streckenplänen. Argon Verlag, Berlin 1995.

Breslau (1842–46), Hamburg (1846) and Magdeburg (1846) initially received any public funding or support. These lines formed an integral part of the national railway network first proposed by Friedrich List in 1833. However, the strategic importance of railways soon became obvious when soldiers using the new lines helped to suppress the March Days of 1848 in Berlin. Based on the experience of this rebellion, the Ministry of Defence demanded that the old medieval city wall be maintained so that the city could be closed against any future rebellions. The wall proved a constant obstacle to growth until it was torn down in 1867.

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### The Ringbahn

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Each of the six railway lines leading to Berlin ended in a terminus outside the city wall and hackney carriages transported passengers between the termini. However, travelling via Berlin usually meant an overnight stay at one of the many hotels close to the terminal stations. By 1844, the multiplicity of stations and inevitable delays and discomforts for passengers raised discussion of the need for a ring line linking the terminal stations. However, the project was constantly delayed because no agreement on funding and construction could be reached between the private railway companies. The ring-line project finally began to take shape in December 1850 when King Friedrich Wilhelm IV ordered construction of a line at street level and close to the city wall between Stettiner Bahnhof and Anhalter Bahnhof. When considerable transport deficits became obvious during a mobilization manoeuvre in 1850, military reasons again influenced public involvement in railway construction. The 1851 extension of the line to Schlesischer Bahnhof and subsequent operation under royal

administration during following years greatly enhanced the industrial development in the adjacent areas.

But despite all the benefits for industry and passengers, the line caused many problems for road traffic and nearby buildings, which suffered from the heavy vibrations. The increasing demand for transport by developing industries, which had moved to new locations in Moabit and Wedding a few miles north of the city, and the accelerating outward spread of the city boundary required a new ring line well outside the city wall. Primarily, the new Berliner Ringbahn was designed to serve freight needs, but it would eventually enhance passenger traffic between the suburbs and the city and between suburban towns as well. In order to avoid conflict with growing road traffic, the project included construction of numerous bridges and embankments. Ultimately, these works permitted complete grade separation of the Ringbahn from the roads. The necessary funding was provided by the state after the Seven Weeks War against Austria (1866) and construction began in 1867. However, the annual passenger volume on Berlin's railways was still relatively small even when the Ringbahn was completed 10 years later in 1877. For example, fewer than 2 million passengers used the Ringbahn in 1881, while horse-drawn railways (the predecessors of electric tramways) and horse-drawn buses carried more than 63 million passengers. There were two reasons for this lack of public acceptance. First, Ringbahn fares were quite high, so the majority of Berlin's population used the cheaper horse-drawn trams and buses or walked. Second, there was very little commuter traffic at all before 1890, because most industry was still within walking distance of employees' homes, and middle- or upper-class commuters to the inner city lived in the south-western suburbs.

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### The Stadtbahn

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The breakthrough in developing an efficient urban railway system in Berlin was the Stadtbahn (S-Bahn) project. It not only connected Berlin's inner city to the railway for the first time, but it also started the shift from long-distance to urban transport. Furthermore, the late-1870s bankruptcy of the private Deutsche Städteisenbahn-Baugesellschaft (DEBG), which was established to carry out the project, forced the state to take over and marked the switch from primarily private funding of railways to almost exclusively public funding. The S-Bahn was built as an east–west link from Schlesischer Bahnhof to Charlottenburg and when it was opened in 1882 with a total length of more than 12 km, it was called the 'Central Station of Berlin.' Since its route passed through the heart of the inner city, most of the line was elevated on 731 specially built viaduct arches. Even to this day, the S-Bahn viaduct shapes Berlin's inner city and houses a number of non-transport functions, such as restaurants, shops, and markets. The S-Bahn stations became the focus of urban life and received particular architectural attention. During the 1880s, the city grew rapidly to stretch far beyond the Ringbahn lines; new settlements were founded as industries moved out of town in the northern and south-eastern directions. As a result, the railway companies introduced special commuter trains on radial lines to the Ringbahn and to the inner city. As a result of the growth, all lines soon reached capacity and additional parallel tracks had to be built. Due to the enormous increase in passenger and freight volumes, long-distance, local and freight traffic was separated on most lines by WWI. As long-distance traffic increased on the S-Bahn, all local trains were moved to the S-Bahn tracks, with two lines exclusively for long-distance

trains. Finally, both the Ringbahn and S-Bahn were fully quadruple-tracked and the different lines were operated as one urban railway network.

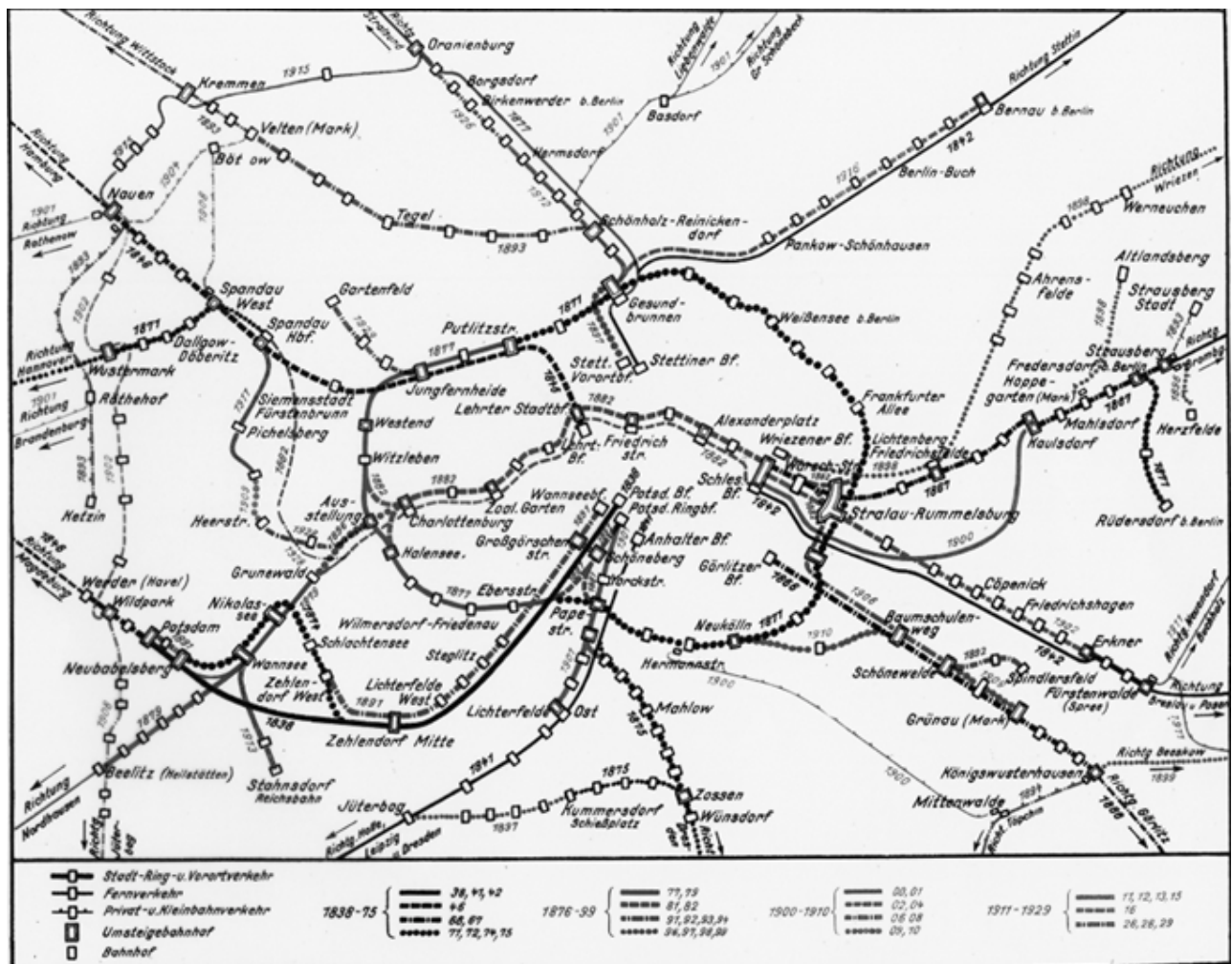
### Electrification of Stadtbahn

Tests on electric trains proved successful by the end of the 19th century, but a preliminary decision on electrification of the railway network was not reached until

1914. The outbreak of WWI delayed implementation of the project until 1924 when the first electric train ran from Stettiner Bahnhof to Bernau. The 'Great Electrification' between 1926 and 1929 improved the overall service quality and capacity of what is now called the S-Bahn. Almost 230 km of the network was electrified in just 3 years. The new electric trains offered at least three major advantages over the earlier steam trains. First, the improved acceleration

allowed the maximum speed to be raised to 55 km/h, cutting average travel times by 30%. Furthermore, use of electric signalling made it possible to increase the service frequency from 24 steam trains each hour to 28 S-Bahn trains during peak hours. The third major advantage of reduced noise, vibration and soot emissions was happily welcomed by Berliners and improved the quality of city life.

Berlin's Railway Lines in 1930



A.-Gottwald, Das Berliner U- und S-Bahnnetz. Eine Geschichte in Streckenplänen. Argon Verlag, Berlin 1995

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## The Hoch- und Untergrundbahn

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Another transport system, the Hoch- und Untergrundbahn (U-Bahn), was introduced towards the end of the 19th century. Short trips in Berlin had long been served by a dense network of horse-drawn tramway lines. These horse trams were converted to electric trams between 1896 and 1902. However, neither the electric trams nor the successful Ringbahn and S-Bahn could adequately meet the transport demands of the growing city.

A fast, mass-transit system was needed to link the spreading outskirts of Berlin with the inner city and to establish a connection between the S-Bahn and Ringbahn and the multiple city centres. These considerations dominated the early development of the electric U-Bahn network and still shape its operations today. At first, the public authorities did not welcome the idea of building an underground railway due to uncertainties about ground strength. Therefore, the first part of the U-Bahn network was designed as an elevated line. The private Gesellschaft für elektrische Hoch- und Untergrundbahnen, known as Hochbahngesellschaft, was established in 1897 to build and operate the first line from Warschauer Strasse (near the Schlesischer Bahnhof S-Bahn station in the east) to the Zoologischer Garten S-Bahn station in the west. After initial objections, part of the line was finally built underground to Zoologischer Garten.

As part of the concession, Hochbahngesellschaft was granted the right to charge whatever fares it wanted for the first 7 years of operation. When the line was opened in 1902, the company expected passenger demand to greatly exceed capacity and tripled fares during the first few days, which resulted in a rather slow start. In fact, during its first years, the U-Bahn never lost the image of being quite expensive, although the



The first elevated U-Bahn line

(U.-Lemke, U. Poppel, Berliner U-Bahn. Alba-Verlag, Düsseldorf 1992)

number of passengers increased rapidly as soon as its safety, speed and comfort became known. In 1903, almost 30 million passengers used the first line, while in 1913, at the end of the first extension period, more than 73 million passengers were counted on the network. At this time, the length of U-Bahn lines totalled 37.8 km, which grew to more than 70 km during a second extension period until 1930. During this second construction phase, two lines were built in the north-south direction and a second line was added to the existing east-west link. All proved important to development of the city outskirts, because they offered frequent and fast commuter services to the inner city.

The division of Berlin at the end of WWII precluded any further extensions to the U-Bahn network until 1953.

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## Rise and Fall of Berlin's Railways

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In the early 1930s, even after the 'Great Electrification' enormously enhanced the S-Bahn's attractiveness, Berlin still had more than 300 km of lines under steam operation. However, complete modernization was delayed by financial

restrictions and the marginal importance of these remaining non-electrified lines in terms of passenger volumes. Work to fully electrify the Wanneseebahn, Berlin's oldest railway to Potsdam, started in 1931 and was completed by 1933. Before full electrification, it had faced constantly declining passenger volumes, but after electrification, it regained its former importance for residential areas south-west of the city.

One idea that had long been discussed was the construction of a north-south tunnel under the city centre to directly connect the northern and southern S-Bahn lines and establish a link to the S-Bahn at Bahnhof Friedrichstrasse. Work started in 1933 and the northern section was completed just in time for the 1936 Berlin Olympics. Operations on the southern section and then on the entire north-south link started shortly after 1939.

Direct comparison of steam and electric operations demonstrates the major contribution of service and quality factors to the railway's attractiveness. In 1927 less than 358 million passengers had used the S-Bahn (including electrified S-Bahn and steam-operated lines), but this figure increased to 429 million in 1930 and

512 million in 1937. The war-related decline in bus traffic ultimately favoured the railways and resulted in more than 737 million passengers in 1943. This peak was never reached again. At the same time, the S-Bahn's share of all public transport increased from 24.3 % in 1927 to 34.8 % in 1937 and to more than 40% during WWII. The war finally brought stagnation and destruction for Berlin's railways. While services on most of the network remained almost undisturbed until 1943, Allied air raids against Berlin increasingly affected railway operations. Power cuts and bomb damage lead to suspended services on a number of lines. However, due to its operational flexibility, the S-Bahn maintained services overall until early 1945. In April 1945, artillery shelling completed the destruction; many bridges were destroyed and the Ringbahn embankments were heavily damaged by use as a last defensive perimeter around the city. S-Bahn trains ran on 24 April 1945, but services were finally suspended the next day due to the complete destruction of all power supplies. At the war's end in May 1945, Berlin's U-Bahn and S-Bahn, once the city's public transport backbone, faced total collapse. Destruction of most railway infrastructure, damage to countless carriages, endless

power cuts and reparations made the new start extremely difficult. However, by late 1945, some electric trains were again running on more than 200 km of tracks but most lines were only single track and it took some years for the S-Bahn network to return even partly to the previous standards. The north-south tunnel built just before the war under the city centre was destroyed and never used again. Similarly, more than 30% of U-Bahn tunnels were flooded and collapsed; many carriages were either damaged or destroyed or were handed over as reparations. However, despite the desperate situation, approximately 72 km of the 80-km U-Bahn network was in service again by late 1945. The last signs of the war damage finally disappeared in 1951 when restoration of the major stations was completed.

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## Cold War

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The history of Berlin's S-Bahn and U-Bahn networks between 1945 and 1989 reflects the Cold War relations between the East and West. Since the S-Bahn connected all major parts of the city in the east and west, it was often a political battlefield. After WWII, the Allies agreed that operational responsibility for the S-Bahn

network lay with the railway authorities in the East. However, the property rights of the western part remained with a trustee under Western control. This peculiar status caused numerous problems. Berlin railway workers went on strike when currency reforms were introduced independently in the West and East sectors in 1949. The West Berlin workers demanded at least part of their wages in western Deutschmarks, whereas the railway authorities in the East refused any negotiations on the issue. In 1953, the East Berlin railway authorities introduced regular S-Bahn trains that did not stop in West Berlin. Checkpoints were introduced at the east-west border of the S-Bahn. Finally, the network was divided in August 1962 with the erection of the Berlin Wall; the major S-Bahn station of Bahnhof Friedrichstrasse became a terminus for the 'eastern' and 'western' networks. Services were suspended on more than 32 km of lines and integrated operation of the S-Bahn came to an end. During the Cold War years, the S-Bahn and U-Bahn developed in completely different directions in both parts of the city. While West Berlin's S-Bahn of some 145 km was able to function independently, the East Berlin S-Bahn (about 165 km) required extensive adaptation to the new situation. The eastern Ringbahn, which



The S-Bahn tracks in 1928



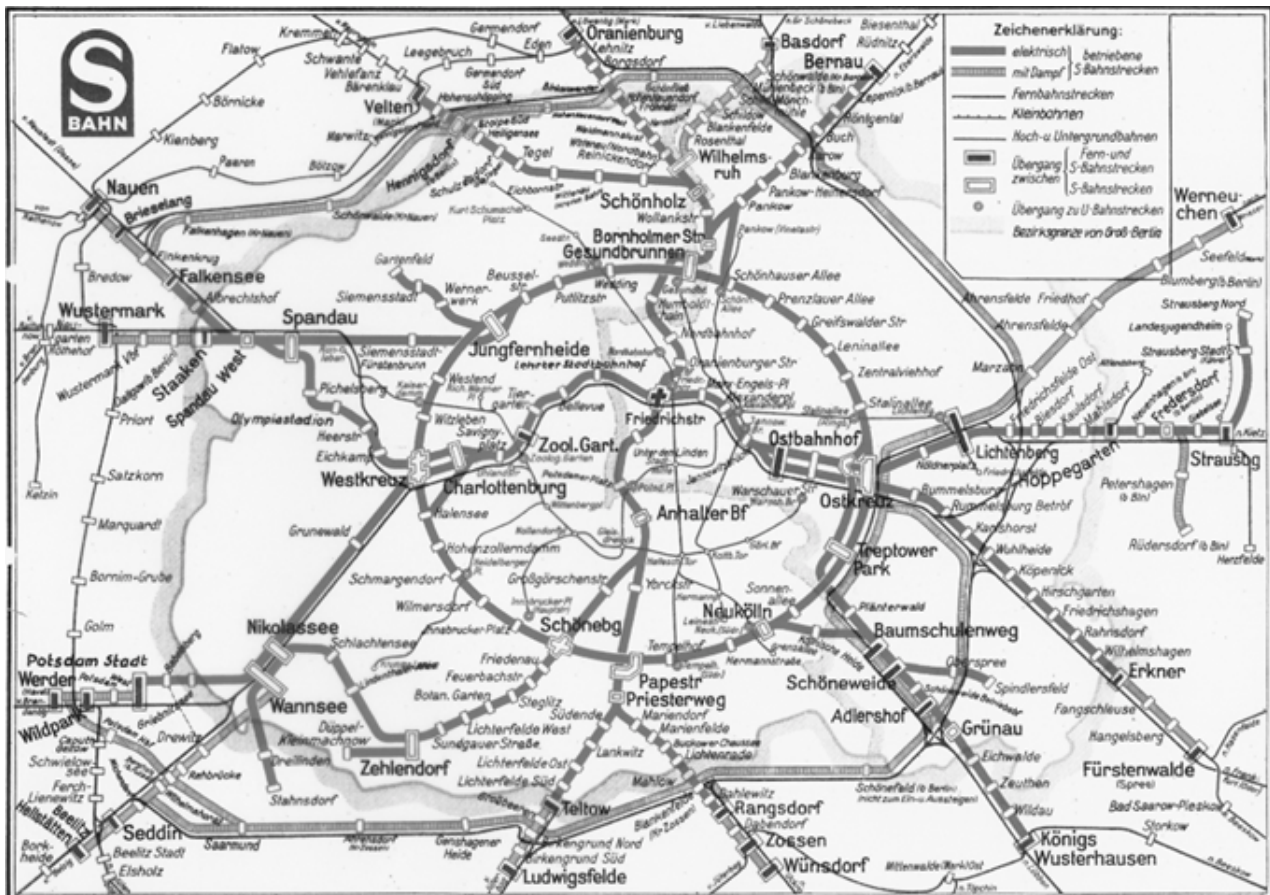
(P. Bley, Berliner S-Bahn. Alba-Verlag, Düsseldorf 1997)

once connected the outskirts of the city, now became the backbone of East Berlin's urban railway system. The required capacity was provided in the 1960s by extensions, especially to the north-east, and improvements to remaining lines. In the north-east, major conurbations were developed to house more than 100,000 people and transport demands were met by building a new S-Bahn line to Ahrensfelde in 1976. Further settlements in the east were connected to the city by a second new S-Bahn line to Wartenberg. During the 1970s, all older parts of the eastern network were renovated and

improved in order to raise the transportation standards. Because of these investments, the S-Bahn soon became the most important public transport system in East Berlin. Surveys during the 1970s and 1980s indicated that the S-Bahn accounted for almost 50% of all urban transport services in East Berlin. However, the lack of private car transport in the East contributed greatly to the success of East Berlin's urban transport. West Berlin's S-Bahn network followed a different path. Based on the Allied Yalta Conference and Potsdam Declaration, operational responsibility for the S-Bahn

remained with East Berlin's Reichsbahndirektion, so West Berlin's S-Bahn faced deterioration and neglect even before the Berlin Wall. Passenger volumes fell constantly and propaganda activities by the East Berlin authorities (East German flags in S-Bahn stations, etc.) as well as West Berlin media slogans like 'Taking the S-Bahn Finances the Wall' finally lead to service suspensions on more and more lines. After a strike in 1980, operations were suspended on more than 72 km of the 145-km network. West Berlin's S-Bahn network had ceased to exist. In 1984, the two German governments,

### Berlin S-Bahn and U-Bahn in 1960s



A.-Gottwaldt, Das Berliner U- und S-Bahnnetz. Eine Geschichte in Streckenplänen. Argon Verlag, Berlin 1995

Berlin representatives and Allies agreed that the operational responsibilities for the S-Bahn in West Berlin would be handed over to the West Berlin Public Transport Company (BVG). Due to financial restrictions, operations could only restart on 40 km of the network. However, after 40 years of neglect, passenger numbers slowly increased and by the late 1980s, the S-Bahn accounted for almost 11% of all public transport in West Berlin.

Although, public transport services in West Berlin did not reach the East-Berlin figures in terms of passenger numbers, network length, etc., the U-Bahn received good support in West Berlin. No extensions had been built since 1930 but the network was extended by more than 63 km to 134 km between 1953 and 1989. Most new lines were built in West Berlin where the U-Bahn was the most important public transport system in the late 1980s.

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## After 1989

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After the Berlin Wall was torn down in 1989, two very different urban railway systems had to be reunited. The S-Bahn was reopened in 1990 and the north-south lines returned to service in 1992. Many stations that had been abandoned for more than 30 years were reconstructed and quickly opened. Construction began on the southern and northern Ringbahn lines and is just being completed. Gaps in the U-Bahn network were closed and the urban railway system is finally a single operational unit once again.

Today, the U-Bahn totals more than 150 km with 169 stations. The S-Bahn is regaining its former importance and carries almost 700,000 passengers each day on its 300-km network.

The extraordinary challenge of reconstructing the entire S-Bahn to modern standards was not only a quantum leap for Berlin's urban transport, it also ensured Berlin's future integration into the

long-distance Trans European Network (TEN) and its connection to high-speed railways in Germany and Europe.

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## Conclusions

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The eventful history of the urban railways in Berlin provides some interesting lessons.

The Ringbahn, which was planned and constructed in the middle of the nineteenth century, had long-term consequences for Berlin's growth and development. Since it was built far beyond the city boundaries, it enhanced traffic between the suburbs and stimulated development of rural areas. At the same time, it ensured that Berlin's growth was limited to areas within a reasonable distance of the railway.

The S-Bahn provided the necessary capacities for inner-urban traffic and initiated development of multiple city centres. It was mainly supported by the U-Bahn, which made fast, short trips possible. Because of the painful political division of the city, it maintained a rather compact structure.

Today, this history provides an excellent basis for sustainable growth of Berlin and its neighbouring areas. The future role of urban railways in Berlin's transport system depends greatly on the combined action of political authorities, public transport companies, urban businesses, and the people.

It is essential for urban railways to focus on people's transport needs at the beginning

of the 21st century and to enhance the necessary structural adaptations. Future challenges will most likely be electronic ticketing, leisure traffic, individuality, comfort, and efficiency. ■

## Acknowledgement

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## Further Reading

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