07.01 Traffic Volumes (Edition 1995)

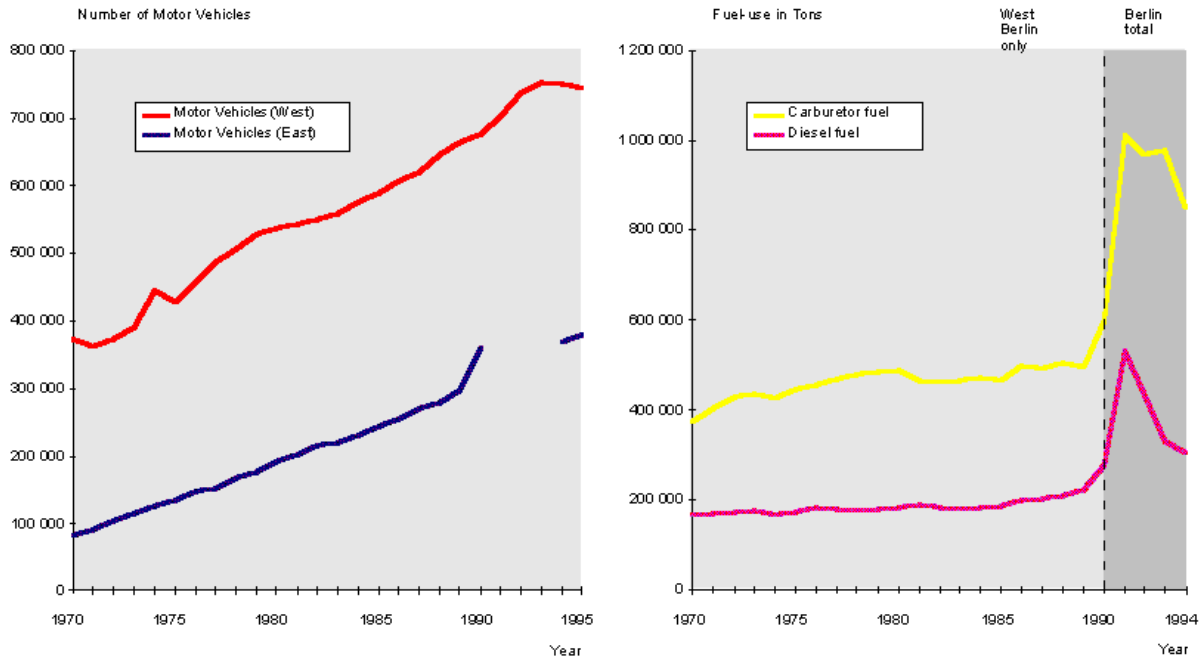
Overview

Development of Traffic Volumes

With the rise in traffic volumes during the past decades, motor vehicle (MV) traffic has caused increasingly serious problems and pollution. Due to its high spatial demands, the water pollution it causes, its cutting effect on urban space and its heavy utilization of the public road space, motor vehicle traffic decreases the quality of life and of visiting, especially in urban residential areas. With the growth in traffic volume, the numbers of traffic accidents, and with it, the number of traffic fatalities and injuries, has climbed. The near-ground air pollutant emissions pose a considerable threat to health, especially in the inner-city area. In addition, growing traffic noise is damaging to physical, psychological and social well-being.

In the foreseeable future, no reduction in traffic volume is to be expected. With the opening of the inner-German border, the gradual development of a common living and economic area, as well as the strengthening ties with eastern Europe, the traffic volume on the streets in Berlin and the surrounding countryside has grown appreciably. According to investigations by the German Institute for Economic Research (DIW), Berlin must calculate, even over the long term, with a further increase in motorized individual traffic.

Figure 1 shows a continuously upward development in the stock of cars for both halves of the city, with the eastern part of the city in addition showing an especially steep upward trend in the first year of reunification. Even in the years 1970 - 1980, the amount of **all motor vehicles registered** increased by around 87% in East Berlin, from about 139,000 to 261,000; in West Berlin, by contrast, the gain was only around 46%, from 411,000 to 661,000. Here, the increased motorization of the population had already begun in the '60s, so that the further increase was slighter during the following years. Between 1980 and 1995, the motor vehicle stock increased in the eastern part of the city by some 59%, in the western part, during the same period, by around 45%. Thus, the number of motor vehicles in East Berlin tripled to 415,000 (plus 197%) over a period of 25 years, while in West Berlin, for the reasons stated, it still doubled to 873,000 (plus 112%).



Due to the license-plate replacement for all vehicles in East Berlin during the period 1991-'93, no statement can be made regarding the development of the automobile stock there during that time.

Fig. 1: Automobile Stock and Fuel Use Berlin, 1970 - 1995 (according to information from the Berlin State Resident Registration Agency, the State Statistical Agency, and the Berlin Department of Economy)

Of the total of almost 1.3 million registered motor vehicle on Berlin's streets, the **number of cars** must be especially considered, because they decisively determine the volume of motorized individual traffic. Their number increased in East Berlin by around 350%, from 84,000 to 380,000, between 1970 and 1995. In West Berlin the number of cars doubled during that period (1970 to 1995) from 373,000 to 745,000.

Gasoline consumption has risen very much less steeply than the number of vehicles themselves. The relatively steep rise after 1989 can be explained by the fact that, after the political transformation in East Germany, the number of cars in East Berlin and in the countryside surrounding Berlin rose abruptly, while the number of gasoline stations increased only over the course of the last years. Therefore, during the first years, many East Berliners and Brandenburgers drove to West Berlin to fill up, while today, the trend is in the opposite direction, due to the lower-priced gasoline available in the countryside surrounding Berlin.

Motorization Level

The **motorization level**, i.e., the ratio of cars to the number of inhabitants, was also different for East and West Berlin in 1970. Thus, there were 77.5 cars per 1,000 inhabitants in East Berlin in 1970, compared to 175.4 in the western part of the city – a difference of almost 100 vehicles per 1,000 inhabitants. In 1995, partially due to reunification, the numbers are clearly closer together: In East Berlin, 1,000 inhabitants now have 302 cars at their disposal, compared to 346 in West Berlin (cf. Fig. 2). In comparison with other cities, Berlin thus still has a favorable level: Munich, with 570 cars/1,000 inh., and Hamburg with about 500 car/1,000 inh., show far higher values.

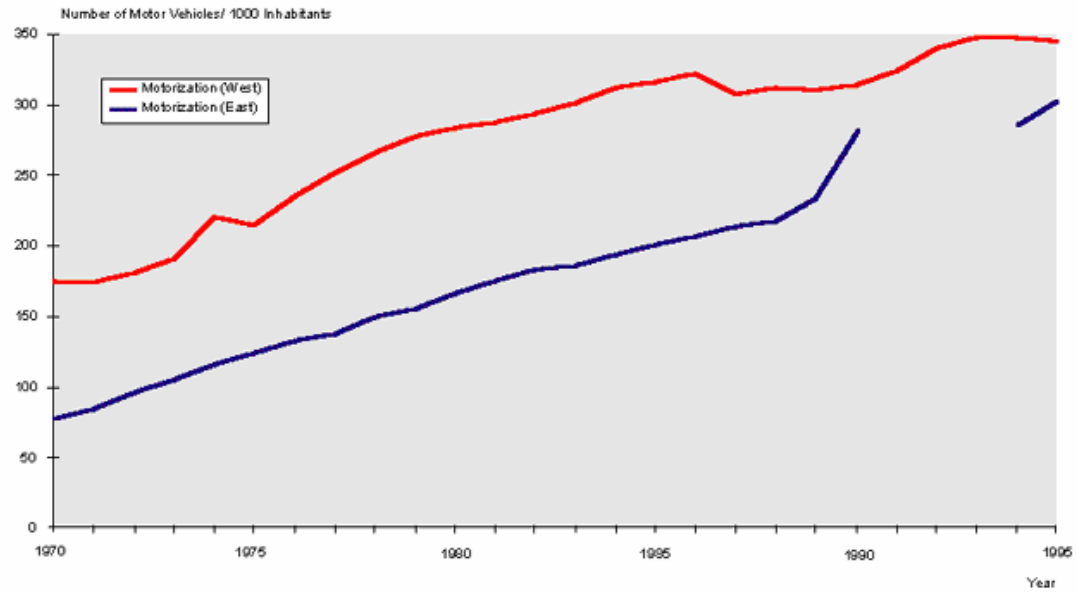


Fig. 2: Motorization Level in Berlin, 1970 - 1995 (according to information from the Berlin State Resident Registration Agency, the State Statistical Agency, and the Berlin Department of Economy)

The **area-related motorization** in East Berlin totaled about 1,000 motor vehicles per square kilometers (MV/km^2) in 1995; in West Berlin, because of the higher settlement density, it was clearly higher, about 1,800 MV/km^2.

Aside from the constant increase in the number of motor vehicles and of the total kilometers driven, the **spatial distribution** of traffic changed due to new and changed flows of traffic. If before reunification Berliners traveling from the eastern part of the city toward Potsdam or Brandenburg tended to be concentrated, on the beltway around West Berlin, this flow has now been shifted to a large extent to inner-city highways and city streets. Due to travel by employees and visitors between East and West

Berlin, a new traffic flow has emerged between the formerly separated boroughs. Major traffic corridors into the surrounding countryside, which were formerly hardly used at all in West Berlin, are today loaded with commuter and weekend traffic very much more than before.

Statistical Base

For the traffic conditions shown on the map, **average traffic volume** was considered. Fundamentally, two different mean values are to be distinguished: On the one hand, the average daily traffic volume (**DTV**) is the mean value of the traffic levels of all days of a year. Thus it is a mean value covering all motor vehicles (cars, motorcycles and trucks) which pass through a given street segment within 24 hours in both directions. The second mean value, the average weekday traffic (**DTV-Wt**), refers to the traffic levels of all workdays (Mondays through Fridays) in a year. The values shown on the map refer to the mean daily motor vehicle traffic (DTV).

The evaluations of the 1993 Berlin Department of Traffic and Utilities (SenVuB) street traffic counts are based on motor vehicle counts carried out in 1992 and 1993. For the countryside surrounding Berlin, the traffic count data were collected by the Brandenburg State Agency for Traffic and Road Construction, and refer to 1993. Altogether, over 1,900 count cross-sections were available in Berlin, with which about 1,200 km of street could be covered. The measurements were taken on Mondays and Thursdays between March and November, except during the school vacation period. The counts were undertaken continuously on all weekdays at the long-term measurement points.

Methodology

Fluctuation in Motor-vehicle Traffic

Traffic counts occur on freeways and federal highways nationwide at the behest of the Federal Minister of Traffic, according to a uniform method and for comparable periods. They are undertaken by the respective state authorities, in Brandenburg by the Brandenburg State Office for Traffic and Road Construction, in Berlin by the Department of Traffic and Utilities, which is also responsible for the supplemental elevations in the remaining major street network.

As stated above, the seasonal, weekly and daily **fluctuation in motor-vehicle traffic** are of essential significance for the evaluation and projection of traffic counts. Thus, for example, in the winter months (January, February), at the sudden onset of winter (end of November and December), as well as in the summer vacation (July), the traffic volume recedes significantly (cf. Fig. 3).

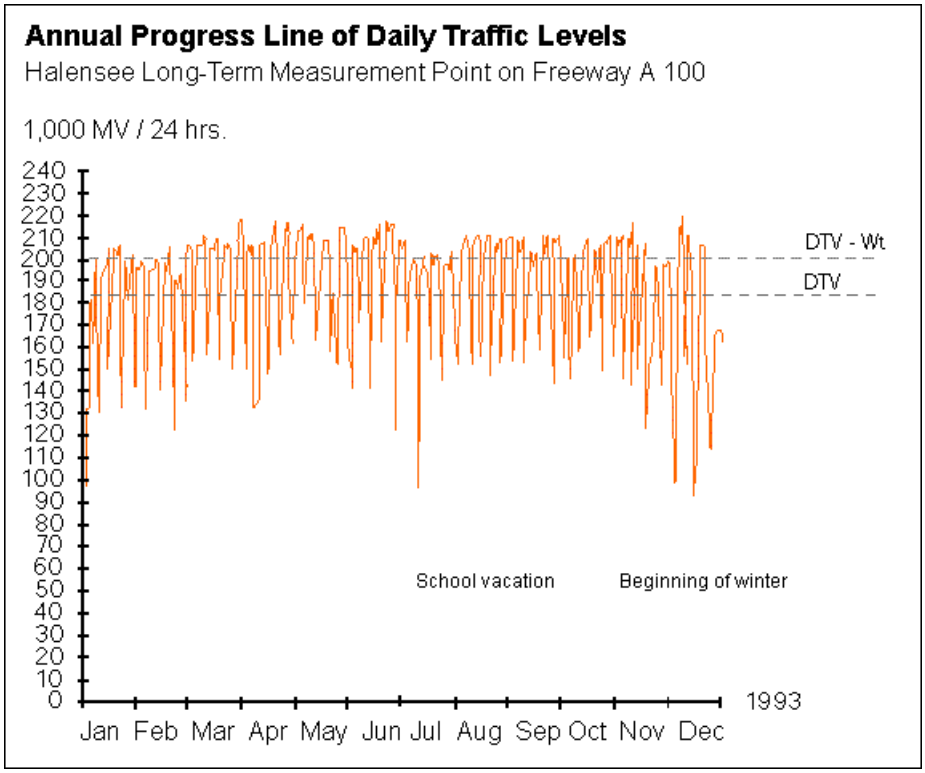


Fig. 3: Annual Progress Line of the Daily Traffic Levels at the Halensee Long-term Measurement Point on Freeway A 100, 1993 (Berlin Department of Traffic and Utilities - SenVuB 1995)

The traffic levels are also subject to **fluctuation within the week**, which depends on the respective weekday. The most constant traffic conditions in motor vehicle traffic are encountered Mondays through Thursdays.

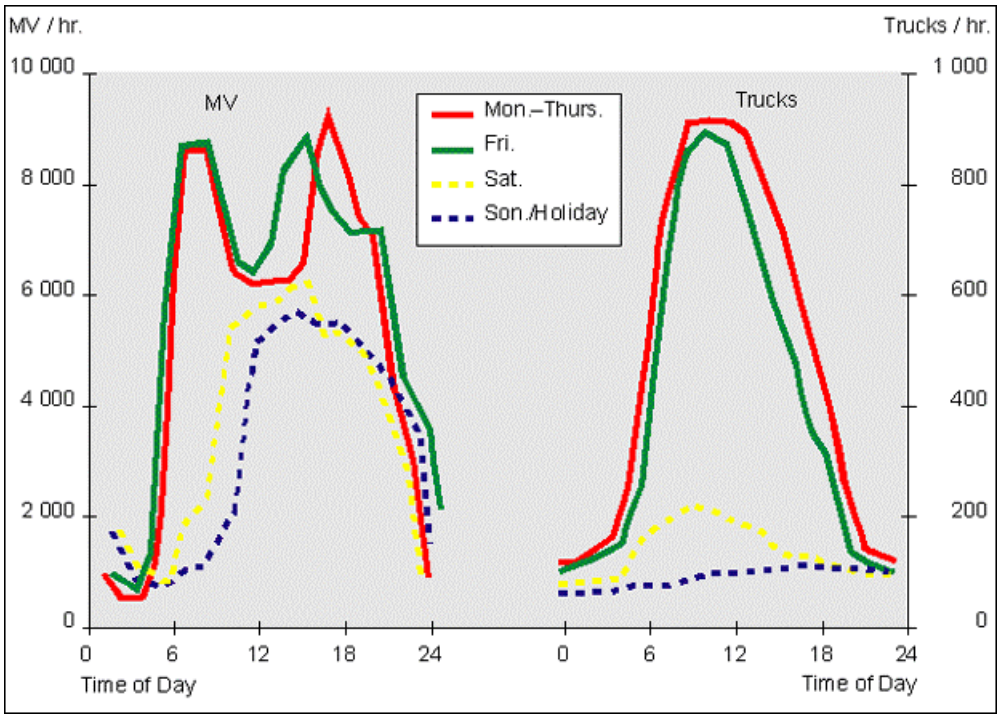


Fig. 4: Average Hourly Traffic Levels per Weekday in 1994, at the South Reinickendorf Long-term Measurement Point, Freeway A 111 (SenVuB 1995)

The patterns of the day-time progress lines of these workdays is almost identical. Clearly visible in Figure 4 are the morning and afternoon commuting peaks for the workdays. The Friday progress line likewise proceeds analogously to the remaining workdays for the morning peak, while the afternoon peak appears about 2 hours earlier. The progress lines for truck traffic shows a bell-like pattern. They are approximately congruent Mondays through Thursdays, and reach peak levels usually between 9 AM and 12 noon. Here, too, as with private motor vehicles, afternoon traffic on Friday starts about two hours earlier than on the remaining workdays. On weekends, truck traffic is of only slight significance.

Daily Fluctuation of Traffic Volumes

The **daily fluctuation** can be elucidated exemplarily by the day-time progress lines of a distance within the center of town, and of a distance leading radially to the center of town (cf. Fig. 5 and Fig. 6). The progress line type proceeds relatively steadily in the city center area; between 6 AM and 7 PM the directional loads move within only slightly fluctuating bands, so that peak loads are hardly recognizable. By contrast, the rush-hour traffic peaks on the major corridors are more clearly distinctive.

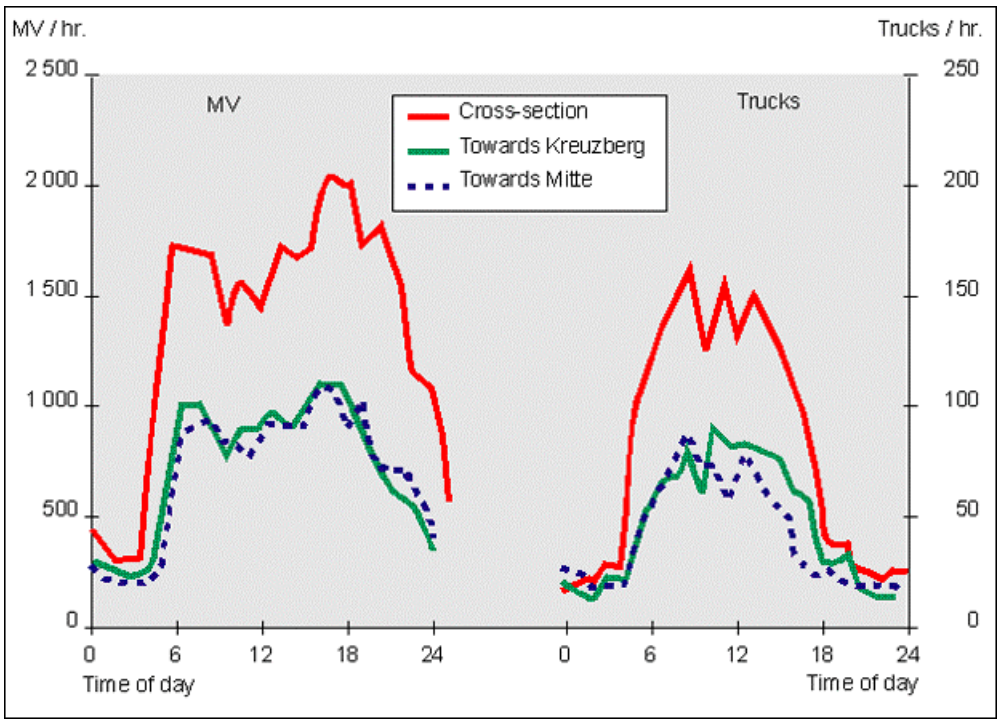


Fig. 5: Daily Progress Line at Brückenstrasse, Borough of Mitte, 17 Jan. 1995 (SenVuB 1995)

The representation on the map is based on figures mathematically prepared from the average daily traffic volume (DTV) results, which cannot show these seasonal, weekday and/or time-of-day-related fluctuations.

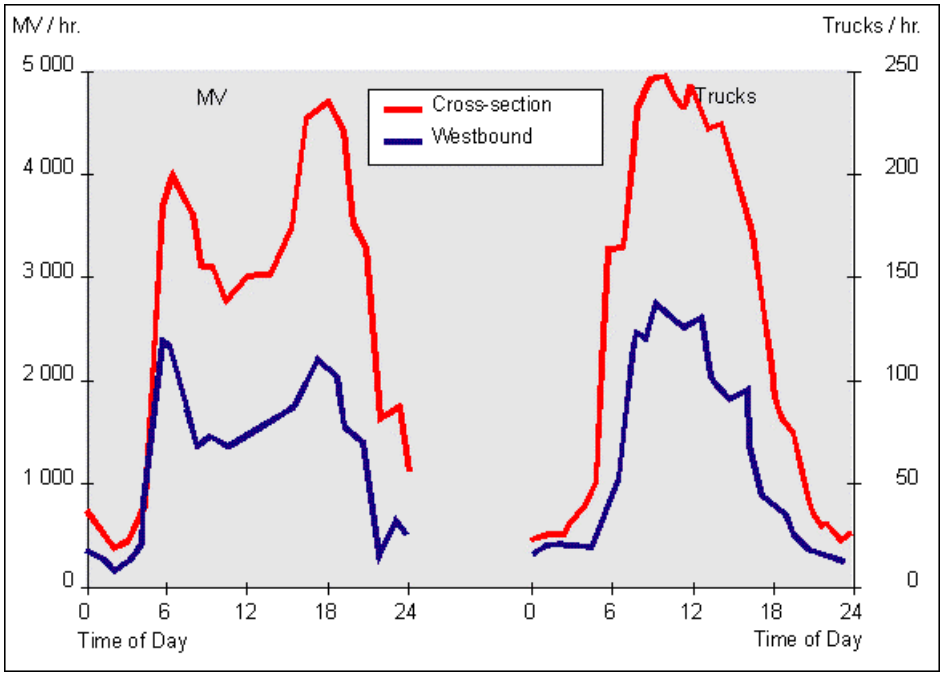


Fig. 6: Daily Progress Line at Frankfurter Allee, Borough of Friedrichshain, 21 Oct. 1993 (SenVuB 1995)

Short-term (four-hour) counts were undertaken at approx. 360 measurement points. Because of the hourly fluctuations of the traffic flow for a day, a separate projection factor was to be determined for each distance from available 12-hours counts at continuously registering long-term measurement points, with which the count data could then be projected to the 12-hours traffic level (7 AM to 7 PM).

To also account, over and above this, for the seasonal fluctuation in motor-vehicle traffic through the effects of weather and vacation periods, the 12-hour data were subsequently multiplied by week factors, which were likewise ascertained at the automatic long-term measurement points.

As the last step, the projection to 24-hours values, separately by DTV-Wt and by DTV, was then still necessary.

Construction point situations are not specially marked. Particularly in the eastern boroughs, various construction points and detours existed during the counts. Since the counts were carried out over several years, the traffic volume was adjusted to a uniform traffic-network situation.

A clear increase in traffic volume can be ascertained in comparison with the 1985 *Umweltatla*s. The differentiation into traffic-volume categories therefore had to be reduced in the lower range. The inner-city highways provide clear examples for increased traffic volumes.

On some road segments, the directional lanes are spatially separate. This is the case, for example, for the freeway segment near the International Congress Center (ICC), and for the canal-shoreline roads in Kreuzberg. On the map, the different directional lanes may be shown in different colors for these segments than would be the case if, as with other streets, they were shown as the sum of both directional lanes.

Map Description

Points of Highest Pollution

Altogether in 1993, 111 km of roadway in the Berlin urban area had workday traffic loads of over 50,000 MV/24 hrs. Of these, 35 km had traffic loads greater than 75,000 MVs/24 hrs.

The **top traffic levels** occurred on the freeways A 100 (the City Ring) and A 111 (the Hamburg spur). The segment of the A 100 between the *Funkturm* freeway exit and Rathenau Platz showed the absolute weekday peak load, with about 200,000 MVs/24 hrs. This is thus the most heavily-traveled road segment in Germany.

In terms of **truck traffic,** too, the peak loads occur predominantly on the freeways, the freeway interchanges and feeder roads, as well as on the traffic corridors radial to the city center (cf. Tab. 4).

The mean **truck share** on the freeways in the urban area is 7%. On the city streets of the count network, the mean share is 5.5%.

Tab. 1: Projection Factors, DTV-Wt and DTV for the 1993 Traffic Count (SenVuB 1995)

Projection		Factor	
from	to	Motor Vehicle	Truck
12-hrs. Traffic Level (7 AM – 7 PM)	24-hrs. Traffic Level (workdays, DTV-Wt)	1.4	1.24
12-hrs.- Traffic Level (7 AM – 7 PM)	DTV (average daily traffic volume)	1.3	0.93
24-hrs. Traffic Level (DTV-Wt)	DTV (average daily traffic volume)	0.93	0.75

Tab. 1: Projection Factors, DTV-Wt and DTV for the 1993 Traffic Count (SenVuB 1995)

The segments with the highest weekday truck shares of motor-vehicle traffic are in the boroughs of Spandau (in 1993, 23.6% at Freiheit between Pichelswerder Strasse and Klärwerkstrasse), Charlottenburg (12% at Spandauer Damm between Reichstrasse and Bolivar Allee), Tiergarten (13.1% at Siemensstrasse between Beusselstrasse and Stromstrasse) and Tempelhof (12.1% at Gottlieb-Dunkel-Strasse between Ordensmeisterstrasse and Industriestrasse). All segments named are near industrial plants and/or utilities points (the fruit yard, sanitation department). The mean value for all city street measurement points was 5.5% in 1993 (cf. SenVuB 1995).

Annual Distance Traveled and Traffic Volume

The **annual distance traveled** indicates the sum of kilometers which all motor vehicles in Berlin have traveled in a year.

In Table 5 the distances traveled are shown by load categories. From this, it is obvious that about 80% of the entire distance traveled in Berlin is produced on approx. 24% of the Berlin road network. This traffic concentration becomes especially clear when the load categories over 50,000 MVs/24 hrs. are considered. The segment share of these categories altogether totals only 1.7% of the entire road network; however, 18.4% of all distance traveled is produced on these streets.

The total annual distance traveled in 1993 in Berlin totaled approx. 13 billion km. In West Berlin alone, it increased from 6.1 to 7.8 billion kilometers per year during the period between 1980 and 1992. According to the results of traffic research, the share of the free-time traffic now exceeds the distance traveled for business and commuter purposes.

Because of the available data, longer-term statements on **traffic volume development** can be made only for the western boroughs of Berlin. A comparison of the traffic volumes from the traffic counts of the years 1971, 1980, 1985 and 1993 yields a 74% increase in the 1993 traffic level over that of 1971.

Tab. 2: Segment Length per Load Category, 1993, DTV-Wt (SenVuB 1995)

Motor Vehicles			Trucks		
Load Category		Road Length	Load Category		Road Length
from (MV/24 hrs.)	to (MV/24 hrs.)	(km)	from (Trucks/24 hrs.)	to (Trucks/24 hrs.)	(km)
	< 10,000	186		< 1,000	589
10,000	< 25,000	596	1,000	< 2,000	340
25,000	< 50,000	335	2,000	< 4,000	221
50,000	< 75,000	76		>= 4,000	78
75,000	< 100,000	23			
	>= 100,000	12			
	total	1,228		total	1,228

Tab. 2: Segment Length per Load Category, 1993, DTV-Wt (SenVuB 1995)

Tab. 3: Segments with Highest Truck Cross-Section Load, 1993 (DTV-Wt > 65,000 MV/24 hrs.) (SenVuB 1995)

Borough	Street	Segment		DTV-Wt Peak (MV / 24 hrs.)	Max. hrly. Load per Direction
		from	to		
Freeways					
Wilmersdorf	A 100	Funkturm interchange	Rathenauplatz	197,300	7,200
Charlottenburg	A 111 (Hamburg spur) 1)	Charlottenburg interchange	Heckerdamm	147,100	6,400
Wilmersdorf	A 115 (AVUS)	Hüttenweg	Funkturm interchange	80,500	3,000
Wilmersdorf	A 104 (Steglitz spur)	Wilmersdorf interchange	Mecklenburg. Str.	73,600	3,300
City Streets					
Schöneberg	Sachsendamm	A 100 eastbound		95,200	3,900
Kreuzberg	Reichpietsch-/ Schönebg. Ufer	Flottwellstraße	Schöneberger Str.	88,900	3,100
Lichtenberg	Frankfurter Allee	Alfredstraße	Atzpodienstraße	88,800	3,300
Mitte	Grunerstraße 2)	Alexanderplatz	Alexanderstraße	88,800	3,700
Tiergarten	Seestraße	Beusselstraße	Dohnagestell	87,100	3,700
Schöneberg	Schillstraße	Einemstraße	Lützowufer	83,900	3,700
Schöneberg	Lietzenburger Str.	Martin-Luther-Str.	Kleiststraße	79,500	3,100
Lichtenberg	Landsberger Allee	Weißenseer Weg	Siegfriedstraße	79,000	3,400
Mitte	Mühlendamm	Breitestraße	Stralauer Straße	71,300	3,100
Charlottenburg	Spandauer Damm	Reichsstraße	Wiesendamm	71,100	2,400
Charlottenburg	Str. des 17. Juni	Müller-Breslau-Str.	Bachstraße	68,600	2,700
Wilmersdorf	Hohenzollerndamm	AS A 100	Berliner Straße	67,800	2,400
Spandau	Klosterstraße	Seegefelder Str.	Brunsbütt. Damm	67,100	2,600
Spandau	Ruhlebener Str.	Klosterstraße	Schulenburgstr.	66,800	3,600
Charlottenburg	Kaiserdamm/ Bismarckstraße	Sophie-Charl.-Str.	Kaiser-Friedr.-Str.	65,400	2,600

If several segments in one road have > 65,000 MV/24 hrs, the highest-load segment is shown

1) incl. Kurt-Schumacher-Damm ramps; 2) incl. tunnel load, Grunerstrasse

Tab. 3: Segments with Highest Truck Cross-Section Load, 1993 (DTV-Wt > 65,000 MV/24 hrs.) (SenVuB 1995)

Tab. 4: Road Segments with Highest Truck Cross-Section Load, 1993 (DTV > 4,500 Trucks/24 hrs.) (SenVuB 1995)

Borough	Street	Segment		DTV (Trucks / 24 hrs.) (absolute)	Truck Share in %
		from	to		
Freeways					
Charlottenburg	A 100	Knobelsdorffstr.	Funkturm interchange	15,620	7.9
Reinickendorf	A 111 (Hamburg spur)	K.-Schumacher-Damm	Saatwinkler Damm	10,970	9.0
Wilmersdorf	A 115 (AVUS)	Hüttenweg	Funkturm interchange	7,070	8.8
Pankow	A 10 (Berlin beltway)	East of Pankow interchange		7,070	17.9
City Streets					
Schöneberg	Sachsendamm	A 100 eastbound		8,180	8.6
Charlottenburg	Spandauer Damm	Reichsstraße	Wiesendamm	7,190	10.1
Tiergarten	Seestraße	Beusselstraße	Dohnagestell	6,360	7.3
Spandau	Nonnendammallee	Gartenfelder Str.	Paulsternstraße	6,000	10.6
Tiergarten	Beusselstraße	Seestraße	Sickingenstraße	5,580	10.9
Charlottenburg	Königin-Elisabeth-Straße	Spandauer Damm	Knobelsdorffstraße	5,480	9.5
Kreuzberg	Reichpietsch-/ Schönebg. Ufer	Flottwellstraße	Schönebg. Straße	5,330	6.2
Lichtenberg	Landsberger Allee	Arendweg	Rhinstraße	5,210	7.5
Treptow	Grünauer Straße	Fennstraße	Schönew. station	4,870	9.0
Pankow	Prenzlauer Promenade	AS Pasewalker Str.	Granitzstraße	4,770	9.8
Tempelhof	Großbeerenstraße	Alt-Mariendorf	Lankwitzer Straße	4,710	11.5
Neukölln	Gradestraße	A 100 eastbound		4,670	8.8

If several segments in one street have > 4,500 trucks /24 hrs., the highest-load segment is shown.

Tab. 4: Road Segments with Highest Truck Cross-Section Load, 1993 (DTV > 4,500 Trucks/24 hrs.) (SenVuB 1995)

Tab. 5: Street Length and Annual Distance Traveled, by Load Category (MV) 1993 (SenVuB 1995)

Load Category		Street Length (km)	Share in %	Annual Distance Traveled (millions of vehicle-km)	Share in %
from (MV/24 hrs.)	to (MV/24 hrs.)				
	< 10,000	219	4.3	548	4.2
10,000	< 25,000	604	11.8	3,614	27.6
25,000	< 50,000	314	6.1	3,942	30.1
50,000	< 75,000	74	1.4	1,643	12.5
75,000	< 100,000	6	0.1	183	1.4
	>= 100,000	11	0.2	584	4.5
Count network total		1,228	23.9	10,514	80.3
not ascertained, approx.		3,910	76.1	2,600	19.7
Berlin total		5,138	100.0	13,114	100.0

Tab. 5: Street Length and Annual Distance Traveled, by Load Category (Motor Vehicles) 1993 (SenVuB 1995)

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