

Performance Measure Summary

There are several inventory and performance measures listed in the pages of this Urban Area Report for the years from 1982 to 2005. There is no single performance measure that experts agree “says it all.” The best comparison of congestion levels and trends is done between regions of similar size, over several years, and with a few measures of congestion aspects. Examining a few measures over many years reduces the chance that data variations or the estimating procedures may have caused a “spike” in any single year. A few key points should be recognized by users of the Urban Mobility Report data.

Use the Trends – The multi-year performance measures are better indicators, in most cases, than any single year. *(5 years is 5 times better than 1 year).*

Use several measures – Each performance measure illustrates a different element of congestion. *(The view is more interesting from the top of a few measures).*

Compare to similar regions – Congestion analyses that compare areas with similar characteristics (for example population, growth rate, road and public transportation system design) are usually more insightful than comparisons of different regions. *(Los Angeles is not Peoria).*

Compare ranking changes and performance measure values – In some performance measures a small change in the value may cause a significant change in rank from one year to the next. This is the case when there are several regions with nearly the same value. *(15 hours is only 1 hour more than 14 hours).*

Consider the scope of improvement options – Any improvement project in a corridor within most of the regions will only have a modest effect on the regional congestion level. *(To have an effect on areawide congestion, there must be significant change in the system or service).*

Comparison of Several Key Mobility Performance Measures Large Group – 1 million to 3 million population urban areas

Urban Area	Delay per Traveler	Travel Time Index	Total Delay	1982 to 2005	
				Delay per Traveler	Total Delay
San Diego, CA	H+	H+	H+	F+	F+
Minneapolis-St. Paul, MN	H	0	H+	F+	F+
Baltimore, MD	H	H	H+	F	F+
Tampa-St. Petersburg, FL	H+	H	H+	S	F+
St. Louis, MO-IL	L	L-	0	S	0
Denver-Aurora, CO	H+	H+	H+	F+	F+
Pittsburgh, PA	L-	L-	L-	S-	S-
Riverside-San Bernardino, CA	H+	H+	H+	F+	F+
Cleveland, OH	L-	L-	L-	S-	S-
Sacramento, CA	H	H+	H	0	F+
Portland, OR-WA	0	H	0	0	0
San Jose, CA	H+	H+	H+	F	F+
Cincinnati, OH-KY-IN	L-	L	L	S	S-
Virginia Beach, VA	L	L	L	S-	S-
Kansas City, MO-KS	L-	L-	L-	S-	S-
Milwaukee, WI	L-	L-	L-	S-	S-
Las Vegas, NV	0	H	L	F	0
Orlando, FL	H+	H	H	F+	F+
San Antonio, TX	0	0	L	F	S
Providence, RI-MA	L-	L-	L-	0	S-
Columbus, OH	L	L	L	F	S-
Buffalo, NY	L-	L-	L-	S-	S-
New Orleans, LA	L-	L-	L-	S-	S-
Indianapolis, IN	H	0	L	0	S-
Memphis, TN-MS-AR	L	L-	L-	0	S-

0 – Average congestion levels or average congestion growth

H Higher congestion; H+ Much higher congestion; F Faster congestion growth; F+ Much faster growth

L Lower congestion; L- Much lower congestion; S Slower congestion growth; S- Much slower growth

Performance Measures and Definition of Terms

Travel Time Index – A measure of congestion that focuses on each trip and each mile of travel. The ratio of travel time in the peak period to travel time in free-flow. A value of 1.30 indicates a 20-minute free-flow trip takes 26 minutes in the peak.

Peak Travelers – Number of travelers (using any travel mode) who begin a trip during the morning or evening peak travel periods (6 to 9 a.m. and 4 to 7 p.m.).

Annual Delay per Traveler – A yearly sum of all the per-trip delays. This measure illustrates the effect of the per-mile congestion as well as the length of each trip. The extra time required to travel in the peak period is divided by the number of travelers who begin a trip during the peak period (6 to 9 a.m. and 4 to 7 p.m.).

Total Delay – The overall size of the congestion problem. Measured by the total travel time above that needed to complete a trip at free-flow speeds. The ranking of total delay usually follows the population ranking (larger regions usually have more delay).

Free-Flow Speeds (60 mph on freeways and 35 mph on arterials) – These values are used as the national comparison thresholds. Other speed values may be appropriate for urban areas or sub-regions.

Excess Fuel Consumed – Increased fuel consumption due to travel in congested conditions rather than free-flow conditions.

Public Transportation – Regular route service from all public transportation providers in an urban area.

Operations Treatments – Freeway incident management, freeway ramp metering, arterial street signal coordination and arterial street access management.

Congestion Cost – Value of travel delay for 2005 (estimated at \$14.60 per hour of person travel and \$77.10 per hour of truck time) and excess fuel consumption (estimated using state average cost per gallon).

Annual Increase Needed to Maintain Constant Congestion Level – Number of lane-miles that must be added to the road system each year – or – the number of new transit riders or carpoolers that must be added to keep congestion levels the same as the previous year.

Urban Area – The developed area (population density more than 1,000 persons per square mile) within a metropolitan region. The urban area boundaries change frequently (every year for most growing areas). The annual change in miles traveled, therefore, includes both new travel due to growth and travel that previously occurred in areas designated as rural.

Number of Rush Hours – Time when system might have congestion

Key Mobility Performance Measure Labels

Note: Designation of an urban area congestion problem as “Much higher”, “Much faster growth”, etc. is determined using a general indicator of the accuracy of the congestion estimates. For regions with the same indicator label, there may be no difference in congestion levels. Different values are used for the indicators in regions over 1 million population and below 1 million population.

Measures	Differences Within These Values May Not Indicate a Difference in Congestion Level	
	Above 1M Population	Below 1M Population
2005 Values Delay per Traveler - Travel Time Index - Total Delay -	5 Hours 5 Index Points 5 Hours x Average Population	3 Hours 3 Index Points 3 Hours x Average Population
1982 to 2005 Trends Delay per Traveler - Total Delay -	5 Hours 5 Hours x Average Population	3 Hours 3 Hours x Average Population

The Mobility Data for Minneapolis-St. Paul, MN

Inventory Measures	2005	2004	2003	2002	2001	2000
Urban Area Information						
Population (1000s)	2,520	2,490	2,475	2,440	2,430	2,390
Rank	16	16	16	16	16	16
Urban Area (square miles)	1,250	1,250	1,245	1,240	1,240	1,235
Popn Density (persons/sq mile)	2,016	1,992	1,988	1,968	1,960	1,935
Peak Travelers (1000s)	1,391	1,367	1,351	1,313	1,285	1,245
Freeway						
Daily Vehicle-Miles of Travel (1000s)	28,140	27,400	27,580	27,300	28,185	27,095
Lane Miles	1,630	1,600	1,590	1,590	1,600	1,580
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	23,830	23,535	23,205	23,105	22,450	21,825
Lane Miles	5,005	4,850	4,800	4,785	4,785	4,780
Public Transportation						
Annual Psgr-Miles of Travel (millions)	393	319	331	329	358	360
Annual Unlinked Psgr Trips (millions)	81	67	73	75	78	79
Cost Components						
Value of Time (\$/hour)	14.60	14.10	13.75	13.45	13.25	12.85
Commercial Cost (\$/hour)	77.10	74.60	72.65	71.05	69.95	68.00
Fuel Cost (\$/gallon)	2.19	1.84	1.51	1.34	1.43	1.54
System Performance						
Congested Travel (% of peak VMT)	61	61	61	61	61	61
Congested System (% of lane-miles)	41	41	41	41	41	41
Congested Time (number of "Rush Hours")	7.4	7.4	7.4	7.4	7.4	7.2
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	81	88	121	144	229	216
Transit Riders or Carpoolers (millions)	22	24	33	39	63	58
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	41,820	38,443	38,374	37,872	40,083	36,775
Rank	17	17	17	16	16	16
Fuel per Peak Traveler (gallons)	30	28	28	29	31	30
Rank	21	25	21	15	11	13
Annual Delay						
Total Delay (1000s of person-hours)	59,746	54,544	53,262	52,515	56,585	50,710
Rank	17	19	18	17	16	17
Delay per Peak Traveler (person-hrs)	43	40	39	40	44	41
Rank	23	26	25	19	14	15
Delay due to Incidents (percent)	56	55	56	56	55	56
Travel Time Index						
Rank	1.26	1.24	1.24	1.24	1.26	1.24
Rank	26	27	25	26	20	20
Congestion Cost						
Total Cost (\$ millions)	1,099	964	906	867	928	813
Rank	18	18	18	17	16	16
Cost per Peak Traveler (\$)	790	705	670	661	722	653
Rank	26	28	26	23	16	19

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Minneapolis-St. Paul, MN, Continued

Inventory Measures	1999	1998	1997	1996	1995	1994
Urban Area Information						
Population (1000s)	2,370	2,320	2,290	2,250	2,220	2,175
Rank	16	16	16	16	15	15
Urban Area (square miles)	1,225	1,220	1,215	1,210	1,210	1,200
Popn Density (persons/sq mile)	1,935	1,902	1,885	1,860	1,835	1,813
Peak Travelers (1000s)	1,213	1,169	1,136	1,098	1,066	1,029
Freeway						
Daily Vehicle-Miles of Travel (1000s)	26,165	25,505	24,485	22,930	22,385	21,785
Lane Miles	1,550	1,540	1,530	1,510	1,500	1,500
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	21,445	20,735	20,610	19,520	19,010	18,745
Lane Miles	4,775	4,735	4,670	4,660	4,400	4,330
Public Transportation						
Annual Psgr-Miles of Travel (millions)	333	251	266	250	253	263
Annual Unlinked Psgr Trips (millions)	78	66	62	62	61	66
Cost Components						
Value of Time (\$/hour)	12.40	12.15	12.00	11.70	11.40	11.05
Commercial Cost (\$/hour)	65.80	64.35	63.40	61.95	60.20	58.50
Fuel Cost (\$/gallon)	1.14	1.09	1.19	1.35	1.16	1.12
System Performance						
Congested Travel (% of peak VMT)	58	57	53	48	47	44
Congested System (% of lane-miles)	40	40	39	37	34	33
Congested Time (number of "Rush Hours")	7.2	7.2	7.0	6.4	6.2	6.0
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	207	215	246	258	283	316
Transit Riders or Carpoolers (millions)	54	55	62	62	69	76
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	37,113	34,514	31,553	24,773	23,738	21,473
Rank	15	15	15	17	17	17
Fuel per Peak Traveler (gallons)	31	30	28	23	22	21
Rank	13	10	13	25	21	24
Annual Delay						
Total Delay (1000s of person-hours)	53,960	50,114	46,888	37,156	35,869	32,561
Rank	15	15	15	18	18	18
Delay per Peak Traveler (person-hrs)	44	43	41	34	34	32
Rank	13	11	12	25	21	23
Delay due to Incidents (percent)	57	56	56	56	57	56
Travel Time Index						
Rank	1.25	1.24	1.22	1.18	1.18	1.17
Rank	19	18	20	31	27	30
Congestion Cost						
Total Cost (\$ millions)	818	744	690	539	503	443
Rank	16	16	16	17	19	18
Cost per Peak Traveler (\$)	674	636	607	491	472	430
Rank	14	11	12	25	23	24

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Minneapolis-St. Paul, MN, Continued

Inventory Measures	1993	1992	1991	1990	1989	1988
Urban Area Information						
Population (1000s)	2,115	2,110	2,055	2,010	1,970	1,925
Rank	15	15	15	15	15	15
Urban Area (square miles)	1,195	1,190	1,100	1,040	1,015	1,015
Popn Density (persons/sq mile)	1,770	1,773	1,868	1,933	1,941	1,897
Peak Travelers (1000s)	983	966	925	890	867	839
Freeway						
Daily Vehicle-Miles of Travel (1000s)	20,860	19,490	18,600	17,790	16,860	16,420
Lane Miles	1,555	1,530	1,495	1,455	1,435	1,420
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	18,235	17,645	16,000	14,960	14,265	14,570
Lane Miles	4,315	4,145	4,000	3,920	3,825	3,710
Public Transportation						
Annual Psgr-Miles of Travel (millions)	287	286	254	263	268	248
Annual Unlinked Psgr Trips (millions)	67	66	65	70	71	71
Cost Components						
Value of Time (\$/hour)	10.75	10.50	10.25	10.00	9.25	8.80
Commercial Cost (\$/hour)	57.05	55.40	53.80	51.60	48.95	46.70
Fuel Cost (\$/gallon)	1.14	1.13	1.14	1.12	1.16	1.07
System Performance						
Congested Travel (% of peak VMT)	38	33	29	30	28	28
Congested System (% of lane-miles)	33	31	30	34	34	34
Congested Time (number of "Rush Hours")	5.4	5.0	4.6	4.4	4.0	4.0
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	279	259	231	239	243	283
Transit Riders or Carpoolers (millions)	65	59	50	51	50	59
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	17,711	14,550	11,908	11,489	9,970	10,054
Rank	19	20	22	21	22	19
Fuel per Peak Traveler (gallons)	18	15	13	13	12	12
Rank	26	33	38	37	37	32
Annual Delay						
Total Delay (1000s of person-hours)	27,829	22,995	18,756	18,387	15,953	16,194
Rank	19	19	21	21	21	19
Delay per Peak Traveler (person-hrs)	28	24	20	21	18	19
Rank	27	34	37	36	37	31
Delay due to Incidents (percent)	56	56	56	56	56	56
Travel Time Index						
Rank	34	39	41	40	40	38
Congestion Cost						
Total Cost (\$ millions)	369	297	237	226	184	177
Rank	19	19	21	20	20	19
Cost per Peak Traveler (\$)	375	307	256	254	212	211
Rank	25	34	37	37	37	31

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

Note: Zeroes in the table reflect values less than 0.5.

The Mobility Data for Minneapolis-St. Paul, MN, Continued

Inventory Measures	1987	1986	1985	1984	1983	1982
Urban Area Information						
Population (1000s)	1,885	1,845	1,800	1,750	1,750	1,750
Rank	15	16	16	17	16	16
Urban Area (square miles)	995	960	930	880	850	830
Popn Density (persons/sq mile)	1,894	1,922	1,935	1,989	2,059	2,108
Peak Travelers (1000s)	816	792	767	740	735	726
Freeway						
Daily Vehicle-Miles of Travel (1000s)	15,620	14,560	13,685	13,000	12,165	11,200
Lane Miles	1,385	1,350	1,340	1,290	1,270	1,260
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	14,110	13,605	12,670	11,820	11,515	10,830
Lane Miles	3,605	3,535	3,420	3,315	3,205	3,050
Public Transportation						
Annual Psgr-Miles of Travel (millions)	263	272	342	288	288	288
Annual Unlinked Psgr Trips (millions)	71	73	74	75	75	75
Cost Components						
Value of Time (\$/hour)	8.50	8.20	8.00	7.75	7.45	7.20
Commercial Cost (\$/hour)	44.85	43.30	42.50	41.05	39.35	38.10
Fuel Cost (\$/gallon)	1.07	1.05	1.37	1.38	1.42	1.48
System Performance						
Congested Travel (% of peak VMT)	27	22	18	18	16	13
Congested System (% of lane-miles)	34	29	24	24	24	19
Congested Time (number of "Rush Hours")	3.8	3.4	3.0	2.9	2.9	2.7
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	309	--	--	--	--	--
Transit Riders or Carpoolers (millions)	64	--	--	--	--	--
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	9,055	7,003	5,214	4,722	3,728	2,720
Rank	19	21	23	23	25	28
Fuel per Peak Traveler (gallons)	11	9	7	6	5	4
Rank	34	38	44	42	47	54
Annual Delay						
Total Delay (1000s of person-hours)	14,514	11,308	8,282	7,511	5,837	4,296
Rank	19	21	24	24	25	31
Delay per Peak Traveler (person-hrs)	18	14	11	10	8	6
Rank	31	40	47	46	50	57
Delay due to Incidents (percent)	56	55	55	55	55	54
Travel Time Index						
Rank	37	42	46	45	47	55
Congestion Cost						
Total Cost (\$ millions)	153	115	84	74	56	40
Rank	19	21	23	24	25	30
Cost per Peak Traveler (\$)	188	146	110	100	76	55
Rank	32	39	47	46	48	55

Note: System Performance statistics for 2000 through 2005 data reflect the effects of operational treatments.

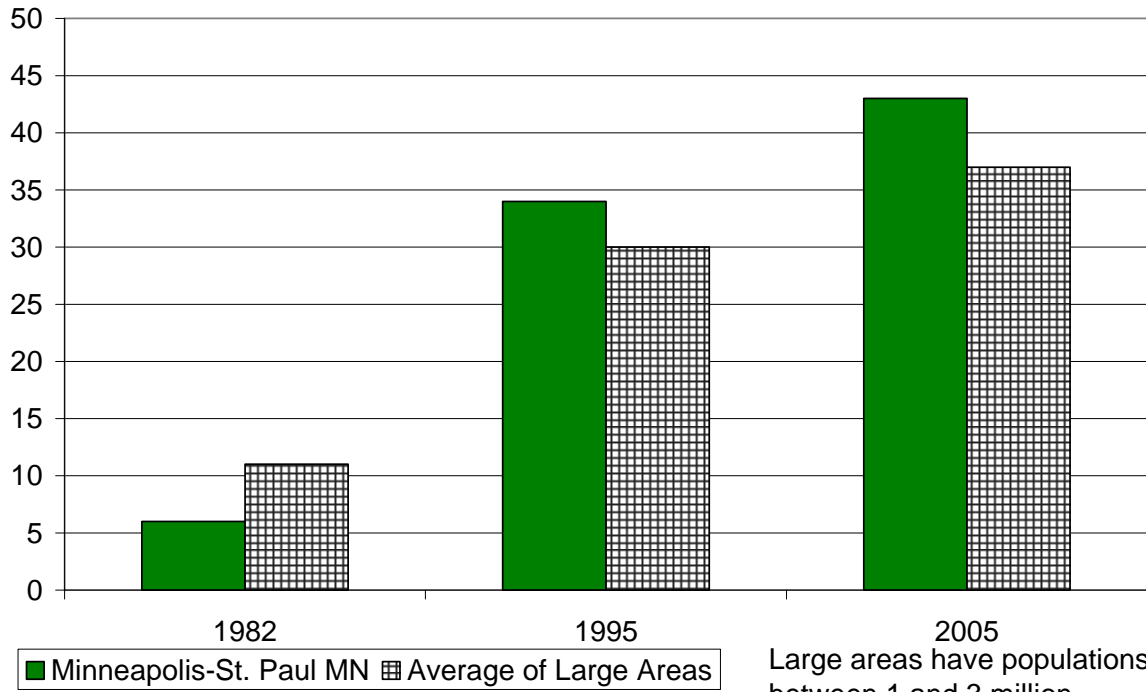
Note: Zeroes in the table reflect values less than 0.5.

Benefits From Public Transportation Service and Operations Strategies for Minneapolis-St. Paul, MN

Operations Strategies	2005	2004	2003	2002	2001	2000
Freeway Ramp Metering						
Percent of Roadway Miles	86	84	85	85	86	88
Annual Delay Reduction (1000 hours)	1,499	1,289	1,581	1,617	1,545	1,600
Freeway Incident Management						
Cameras						
Percent of Roadway Miles	80	80	80	80	80	80
Service Patrols						
Percent of Roadway Miles	80	80	80	80	80	80
Annual Delay Reduction (1000 hours)	2,843	2,396	2,373	2,344	2,485	2,318
Arterial Signal Coordination						
Percent of Roadway Miles	50	52	52	52	52	52
Annual Delay Reduction (1000 hours)	135	215	275	145	150	165
Arterial Access Management						
Percent of Roadway Miles	23	24	24	23	21	20
Annual Delay Reduction (1000 hours)	575	592	617	526	547	370
HOV Lanes						
Daily Passenger-miles of Travel (1000s)	227	221	215	210	204	199
HOV User Delay Savings	315	274	262	256	245	225
Total Effect of Operations Treatments						
Annual Delay Reduction (1000 hours)	5,367	4,766	5,108	4,888	4,972	4,677
Annual Delay Saved per Peak Traveler (hours)	4	3	4	4	4	4
Annual Congestion Cost Savings (\$million)	95.6	82.0	84.6	78.9	79.5	73.0
Travel Time Index with Strategies	1.261	1.243	1.244	1.242	1.256	1.242
Travel Time Index (Base)	1.282	1.263	1.265	1.263	1.278	1.264
Public Transportation Service						
Existing Service						
Annual Passenger-miles of Travel (million)	393	319	331	329	358	360
Unlinked Passenger Trips (million)	81	67	73	75	78	79
Travel Time Index (combined road and transit)	1.254	1.237	1.237	1.236	1.249	1.236
Condition if Public Transportation Service were Discontinued						
Travel Time Index	1.299	1.276	1.281	1.279	1.296	1.283
Annual Delay Increase (1000 hours)	5,337	3,980	4,901	4,903	5,649	5,508
Annual Delay Increase per Peak Traveler (hours)	4	3	4	4	4	4
Annual Congestion Cost Increase (\$million)	95.9	68.8	80.6	78.7	90.0	85.5

Growth in Delay per Peak Traveler

Hours of Delay



Annual Hours of Delay (million)

Growth in Total Delay

