

## 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-
<b>Sacramento, CA</b>	<b>H</b>	<b>H+</b>	<b>H</b>	<b>0</b>	<b>F+</b>
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
<b>2005 Values</b> 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
<b>1982 to 2005 Trends</b> Delay per Traveler - Total Delay -	5 Hours 5 Hours x Average Population	3 Hours 3 Hours x Average Population

### The Mobility Data for Sacramento, CA

<b>Inventory Measures</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>	<b>2001</b>	<b>2000</b>
<b>Urban Area Information</b>						
Population (1000s)	1,750	1,690	1,655	1,560	1,470	1,425
Rank	24	25	26	27	28	28
Urban Area (square miles)	435	435	430	420	415	410
Popn Density (persons/sq mile)	4,023	3,885	3,849	3,714	3,542	3,476
Peak Travelers (1000s)	966	928	904	839	778	742
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	15,415	14,600	13,900	13,225	12,650	12,170
Lane Miles	785	750	725	705	690	685
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	14,305	13,525	12,310	12,035	11,725	11,510
Lane Miles	2,345	2,235	2,190	2,140	2,120	2,050
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	142	142	140	137	147	147
Annual Unlinked Psgr Trips (millions)	33	32	31	29	30	30
<b>Cost Components</b>						
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)	2.62	2.28	1.78	1.66	1.93	1.72
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	79	79	78	75	74	71
<b>Congested System</b> (% of lane-miles)	60	60	60	56	56	55
<b>Congested Time</b> (number of "Rush Hours")	8.0	8.0	7.8	7.8	7.6	7.6
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	145	127	92	76	43	55
Transit Riders or Carpoolers (millions)	48	42	29	23	13	16
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	29,244	27,673	24,721	21,898	20,362	18,569
Rank	22	22	23	24	25	25
Fuel per Peak Traveler (gallons)	30	30	27	26	26	25
Rank	21	18	24	25	20	24
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	39,577	37,028	32,842	29,156	27,366	25,507
Rank	23	23	24	24	24	25
Delay per Peak Traveler (person-hrs)	41	40	36	35	35	34
Rank	27	26	30	28	25	27
Delay due to Incidents (percent)	51	51	51	51	51	52
<b>Travel Time Index</b>						
Rank	1.32	1.32	1.31	1.28	1.27	1.25
Rank	14	9	10	14	16	18
<b>Congestion Cost</b>						
Total Cost (\$ millions)	729	653	557	483	454	407
Rank	23	23	24	24	25	26
Cost per Peak Traveler (\$)	755	704	616	576	584	548
Rank	27	29	30	33	25	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 Sacramento, CA, Continued**

<b>Inventory Measures</b>	<b>1999</b>	<b>1998</b>	<b>1997</b>	<b>1996</b>	<b>1995</b>	<b>1994</b>
<b>Urban Area Information</b>						
Population (1000s)	1,390	1,360	1,295	1,260	1,240	1,220
Rank	28	29	29	30	30	30
Urban Area (square miles)	405	400	395	395	395	390
Popn Density (persons/sq mile)	3,432	3,400	3,278	3,190	3,139	3,128
Peak Travelers (1000s)	712	685	642	615	595	577
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	11,490	11,140	10,470	10,755	10,550	10,645
Lane Miles	680	680	680	680	680	700
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	11,350	11,295	11,680	11,845	10,910	10,675
Lane Miles	2,010	1,945	1,920	1,900	1,875	1,845
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	145	132	120	117	108	103
Annual Unlinked Psgr Trips (millions)	30	29	26	26	24	24
<b>Cost Components</b>						
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)	1.59	1.27	1.40	1.21	1.27	1.16
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	70	67	64	64	64	63
<b>Congested System</b> (% of lane-miles)	55	54	51	53	53	51
<b>Congested Time</b> (number of "Rush Hours")	7.4	7.4	7.2	7.4	7.2	7.2
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	37	40	26	39	20	23
Transit Riders or Carpoolers (millions)	11	12	8	12	6	7
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	17,533	16,296	15,060	15,850	14,037	14,097
Rank	25	26	26	26	25	24
Fuel per Peak Traveler (gallons)	25	24	23	26	24	24
Rank	24	23	24	12	16	11
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	24,832	23,549	22,529	23,847	20,748	20,832
Rank	26	27	25	24	24	24
Delay per Peak Traveler (person-hrs)	35	34	35	39	35	36
Rank	30	29	26	13	18	13
Delay due to Incidents (percent)	52	52	52	52	52	52
<b>Travel Time Index</b>						
Rank	21	20	22	18	18	16
<b>Congestion Cost</b>						
Total Cost (\$ millions)	379	346	327	335	285	277
Rank	27	27	26	24	24	24
Cost per Peak Traveler (\$)	532	505	509	544	478	479
Rank	29	31	29	18	22	13

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 Sacramento, CA, Continued**

<b>Inventory Measures</b>	<b>1993</b>	<b>1992</b>	<b>1991</b>	<b>1990</b>	<b>1989</b>	<b>1988</b>
<b>Urban Area Information</b>						
Population (1000s)	1,205	1,190	1,165	1,100	1,065	1,050
Rank	30	30	30	31	32	33
Urban Area (square miles)	390	383	365	360	355	350
Popn Density (persons/sq mile)	3,090	3,107	3,192	3,056	3,000	3,000
Peak Travelers (1000s)	560	545	524	487	469	458
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	10,280	10,115	9,640	9,265	9,300	8,880
Lane Miles	700	700	670	650	650	650
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	10,505	10,965	11,325	11,350	11,065	10,805
Lane Miles	1,820	1,800	1,795	1,755	1,735	1,730
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	97	103	106	98	85	82
Annual Unlinked Psgr Trips (millions)	22	23	23	20	18	17
<b>Cost Components</b>						
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)	1.23	1.28	1.11	1.14	1.14	1.05
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	59	58	56	54	54	48
<b>Congested System</b> (% of lane-miles)	50	45	45	44	40	40
<b>Congested Time</b> (number of "Rush Hours")	6.8	7.0	7.0	7.2	7.0	6.6
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	28	75	107	123	143	155
Transit Riders or Carpoolers (millions)	8	22	32	37	42	45
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	12,437	12,478	12,867	12,425	11,969	9,809
Rank	25	23	21	19	19	20
Fuel per Peak Traveler (gallons)	22	23	25	25	26	21
Rank	14	14	10	10	10	11
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	18,630	18,877	20,144	19,797	19,033	15,978
Rank	25	22	20	19	19	20
Delay per Peak Traveler (person-hrs)	33	35	38	41	41	35
Rank	15	14	9	8	8	11
Delay due to Incidents (percent)	52	52	52	52	52	52
<b>Travel Time Index</b>						
	1.19	1.19	1.19	1.19	1.19	1.16
Rank	19	19	14	14	15	19
<b>Congestion Cost</b>						
Total Cost (\$ millions)	240	238	244	234	209	166
Rank	25	23	20	19	19	20
Cost per Peak Traveler (\$)	429	436	466	480	447	364
Rank	17	15	10	10	10	12

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 Sacramento, CA, Continued**

<b>Inventory Measures</b>	<b>1987</b>	<b>1986</b>	<b>1985</b>	<b>1984</b>	<b>1983</b>	<b>1982</b>
<b>Urban Area Information</b>						
Population (1000s)	995	955	910	830	830	830
Rank	34	34	34	36	36	36
Urban Area (square miles)	340	330	320	280	280	280
Popn Density (persons/sq mile)	2,926	2,894	2,844	2,964	2,964	2,964
Peak Travelers (1000s)	431	410	388	351	349	344
<b>Freeway</b>						
Daily Vehicle-Miles of Travel (1000s)	8,245	7,700	7,250	6,825	6,140	5,725
Lane Miles	650	640	630	630	630	630
<b>Arterial Streets</b>						
Daily Vehicle-Miles of Travel (1000s)	9,915	9,235	8,825	8,410	8,215	8,130
Lane Miles	1,725	1,720	1,715	1,715	1,690	1,690
<b>Public Transportation</b>						
Annual Psgr-Miles of Travel (millions)	85	88	99	97	97	97
Annual Unlinked Psgr Trips (millions)	14	16	17	17	17	17
<b>Cost Components</b>						
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)	1.05	1.03	1.35	1.36	1.39	1.46
<b>System Performance</b>						
<b>Congested Travel</b> (% of peak VMT)	39	35	29	27	23	21
<b>Congested System</b> (% of lane-miles)	35	30	29	29	27	27
<b>Congested Time</b> (number of "Rush Hours")	5.8	5.4	4.8	4.2	3.6	3.2
<b>Annual Increase Needed To Maintain Constant Congestion Level:</b>						
Lane-Miles	132	--	--	--	--	--
Transit Riders or Carpoolers (millions)	35	--	--	--	--	--
<b>Annual Excess Fuel Consumed</b>						
Total Fuel (1000 gallons)	7,143	5,633	4,497	3,806	3,297	2,883
Rank	22	24	26	27	28	27
Fuel per Peak Traveler (gallons)	17	14	12	11	9	8
Rank	15	16	23	20	24	22
<b>Annual Delay</b>						
Total Delay (1000s of person-hours)	11,711	9,067	7,398	6,301	5,510	4,908
Rank	21	24	27	27	29	27
Delay per Peak Traveler (person-hrs)	27	22	19	18	16	14
Rank	13	17	22	19	21	23
Delay due to Incidents (percent)	52	52	52	52	52	52
<b>Travel Time Index</b>						
Rank	1.12	1.10	1.08	1.07	1.07	1.06
Rank	22	29	35	34	36	38
<b>Congestion Cost</b>						
Total Cost (\$ millions)	118	88	72	59	50	44
Rank	22	26	27	27	30	28
Cost per Peak Traveler (\$)	273	215	185	169	144	126
Rank	15	21	25	22	25	23

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

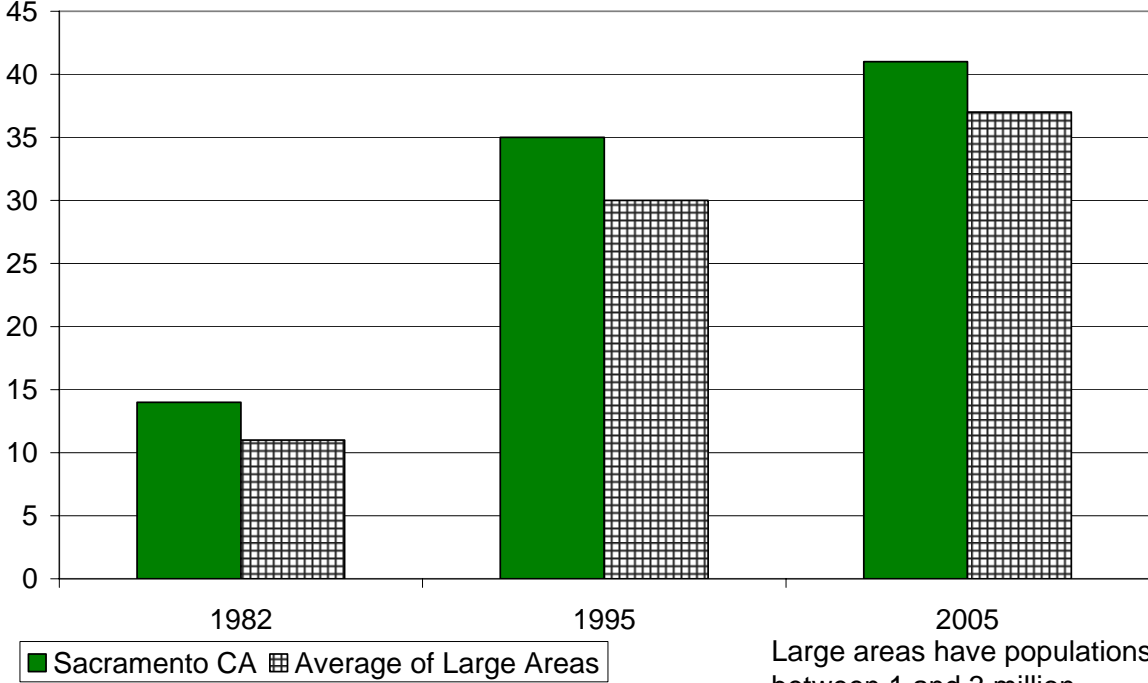
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**Benefits From Public Transportation Service and Operations Strategies for Sacramento, CA**

<b>Operations Strategies</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>	<b>2001</b>	<b>2000</b>
<b>Freeway Ramp Metering</b>						
Percent of Roadway Miles	78	82	85	87	87	86
Annual Delay Reduction (1000 hours)	690	654	522	503	459	379
<b>Freeway Incident Management</b>						
<b>Cameras</b>						
Percent of Roadway Miles	52	57	58	--	--	--
<b>Service Patrols</b>						
Percent of Roadway Miles	100	100	100	100	97	88
Annual Delay Reduction (1000 hours)	1,534	1,471	1,265	1,063	900	689
<b>Arterial Signal Coordination</b>						
Percent of Roadway Miles	80	84	84	86	89	89
Annual Delay Reduction (1000 hours)	238	242	203	191	207	203
<b>Arterial Access Management</b>						
Percent of Roadway Miles	21	22	22	23	23	24
Annual Delay Reduction (1000 hours)	440	600	520	401	408	401
<b>HOV Lanes</b>						
Daily Passenger-miles of Travel (1000s)	426	438	400	343	226	230
HOV User Delay Savings	579	608	544	434	246	211
<b>Total Effect of Operations Treatments</b>						
Annual Delay Reduction (1000 hours)	3,482	3,575	3,054	2,592	2,220	1,882
Annual Delay Saved per Peak Traveler (hours)	4	4	3	3	3	3
Annual Congestion Cost Savings (\$million)	65.2	63.8	52.6	43.7	37.4	30.5
Travel Time Index with Strategies	1.321	1.321	1.306	1.279	1.269	1.251
Travel Time Index (Base)	1.353	1.354	1.337	1.306	1.293	1.271
<b>Public Transportation Service</b>						
<b>Existing Service</b>						
Annual Passenger-miles of Travel (million)	142	142	140	137	147	147
Unlinked Passenger Trips (million)	33	32	31	29	30	30
Travel Time Index (combined road and transit)	1.313	1.313	1.298	1.272	1.262	1.243
<b>Condition if Public Transportation Service were Discontinued</b>						
Travel Time Index	1.359	1.361	1.344	1.314	1.304	1.281
Annual Delay Increase (1000 hours)	2,089	2,114	1,919	1,838	1,851	1,737
Annual Delay Increase per Peak Traveler (hours)	2	2	2	2	2	2
Annual Congestion Cost Increase (\$million)	37.6	36.5	32.5	30.5	30.6	27.5

### Growth in Delay per Peak Traveler

Hours of Delay



Annual Hours of Delay (million)

### Growth in Total Delay

