

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 Medium Group – 500,000 to 1 million population urban areas

Urban Area	Delay per Traveler	Travel Time Index	Total Delay	1982 to 2005	
				Delay per Traveler	Total Delay
Jacksonville, FL	H+	H+	H+	F	F+
Nashville-Davidson, TN	H+	0	H+	0	F+
Salt Lake City, UT	0	H	H	0	F+
Raleigh-Durham, NC	H+	H	H+	F+	F+
Richmond, VA	L-	L-	0	S-	S
Louisville, KY-IN	H+	H+	H+	F+	F+
Hartford, CT	L-	L-	L	S	S-
Bridgeport-Stamford, CT-NY	H	H+	H+	F	F+
Charlotte, NC-SC	H+	H+	H+	F+	F+
Austin, TX	H+	H+	H+	F+	F+
Oklahoma City, OK	L-	L-	L	S	S-
Tulsa, OK	L-	L-	L	S-	S-
Tucson, AZ	H+	H+	H+	0	F+
Dayton, OH	L-	L-	L-	S-	S-
Honolulu, HI	L	H+	L	S-	S-
Birmingham, AL	H+	0	H	F+	F+
El Paso, TX-NM	L	0	L	F	S-
Rochester, NY	L-	L-	L-	S-	S-
Springfield, MA-CT	L-	L-	L-	S-	S-
Omaha, NE-IA	L	0	L	0	S-
Sarasota-Bradenton, FL	L	H	L	S-	S-
Allentown-Bethlehem, PA-NJ	L-	L	L-	S-	S-
Akron, OH	L-	L-	L-	S-	S-
Fresno, CA	L-	L	L-	S-	S-
Grand Rapids, MI	L	L-	L-	0	S-
Oxnard-Ventura, CA	H+	H+	0	F+	F+
Albuquerque, NM	H+	0	0	F	S
New Haven, CT	L-	L-	L-	S-	S-
Albany-Schenectady, NY	L-	L-	L-	S-	S-
Toledo, OH-MI	L-	L-	L-	S-	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 Salt Lake City, UT

Inventory Measures	2005	2004	2003	2002	2001	2000
Urban Area Information						
Population (1000s)	970	945	930	925	920	900
Rank	42	42	41	40	40	40
Urban Area (square miles)	400	400	400	400	395	395
Popn Density (persons/sq mile)	2,425	2,363	2,325	2,313	2,329	2,278
Peak Travelers (1000s)	527	510	499	491	482	465
Freeway						
Daily Vehicle-Miles of Travel (1000s)	7,570	7,540	7,300	7,200	7,100	7,000
Lane Miles	540	530	510	505	505	500
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	7,945	7,850	7,790	7,690	7,610	7,555
Lane Miles	1,295	1,290	1,285	1,280	1,280	1,275
Public Transportation						
Annual Psgr-Miles of Travel (millions)	206	171	185	155	147	137
Annual Unlinked Psgr Trips (millions)	38	27	32	28	26	25
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)	2.32	1.98	1.61	1.41	1.60	1.54
System Performance						
Congested Travel (% of peak VMT)	54	57	61	61	60	60
Congested System (% of lane-miles)	51	52	57	57	57	56
Congested Time (number of "Rush Hours")	6.8	6.8	6.8	6.8	6.6	6.6
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	24	37	31	24	15	19
Transit Riders or Carpoolers (millions)	7	11	9	7	5	5
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	9,327	9,939	11,371	10,864	10,184	9,377
Rank	42	42	38	39	37	41
Fuel per Peak Traveler (gallons)	18	19	23	22	21	20
Rank	44	42	34	34	33	34
Annual Delay						
Total Delay (1000s of person-hours)	14,236	15,026	16,836	16,257	15,189	14,243
Rank	44	43	38	39	38	41
Delay per Peak Traveler (person-hrs)	27	29	34	33	32	31
Rank	45	42	33	36	34	33
Delay due to Incidents (percent)	53	53	53	53	54	53
Travel Time Index						
Rank	1.19	1.21	1.24	1.24	1.22	1.21
Rank	36	34	25	26	27	29
Congestion Cost						
Total Cost (\$ millions)	250	253	274	256	237	215
Rank	45	43	39	39	40	41
Cost per Peak Traveler (\$)	475	497	548	521	492	462
Rank	47	44	37	38	40	41

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 Salt Lake City, UT, Continued

Inventory Measures	1999	1998	1997	1996	1995	1994
Urban Area Information						
Population (1000s)	895	890	875	855	835	825
Rank	40	40	40	40	41	41
Urban Area (square miles)	390	390	385	385	385	380
Popn Density (persons/sq mile)	2,295	2,282	2,273	2,221	2,169	2,171
Peak Travelers (1000s)	457	449	436	421	406	396
Freeway						
Daily Vehicle-Miles of Travel (1000s)	6,470	6,500	6,630	6,900	6,710	6,440
Lane Miles	495	490	485	480	475	475
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	7,460	7,385	7,300	7,180	7,090	6,980
Lane Miles	1,270	1,270	1,235	1,205	1,150	1,120
Public Transportation						
Annual Psgr-Miles of Travel (millions)	107	113	114	115	127	118
Annual Unlinked Psgr Trips (millions)	24	25	25	24	25	25
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)	1.26	1.14	1.31	1.29	1.15	1.11
System Performance						
Congested Travel (% of peak VMT)	57	53	55	55	52	49
Congested System (% of lane-miles)	56	56	52	52	51	46
Congested Time (number of "Rush Hours")	6.2	6.2	6.4	6.8	6.8	6.6
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	14	35	50	74	82	87
Transit Riders or Carpoolers (millions)	4	10	14	21	24	25
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	8,644	7,858	8,261	8,486	8,477	7,757
Rank	41	40	39	37	36	34
Fuel per Peak Traveler (gallons)	19	17	19	20	21	20
Rank	40	43	38	31	29	29
Annual Delay						
Total Delay (1000s of person-hours)	13,106	12,008	12,407	12,614	12,987	12,096
Rank	41	40	40	37	36	34
Delay per Peak Traveler (person-hrs)	29	27	28	30	32	31
Rank	42	43	39	33	27	25
Delay due to Incidents (percent)	53	53	53	53	53	53
Travel Time Index						
Rank	32	35	32	28	24	23
Congestion Cost						
Total Cost (\$ millions)	189	169	175	174	173	156
Rank	41	42	40	38	36	35
Cost per Peak Traveler (\$)	413	376	401	414	427	394
Rank	43	44	39	34	31	28

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 Salt Lake City, UT, Continued

Inventory Measures	1993	1992	1991	1990	1989	1988
Urban Area Information						
Population (1000s)	810	810	805	800	785	785
Rank	42	41	41	41	41	40
Urban Area (square miles)	380	380	380	380	375	375
Popn Density (persons/sq mile)	2,132	2,132	2,118	2,105	2,093	2,093
Peak Travelers (1000s)	384	379	372	365	355	352
Freeway						
Daily Vehicle-Miles of Travel (1000s)	6,010	5,775	5,685	5,330	5,080	4,740
Lane Miles	475	475	475	475	470	470
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	6,570	6,270	5,675	5,465	5,210	5,205
Lane Miles	1,095	1,085	1,045	1,010	1,005	980
Public Transportation						
Annual Psgr-Miles of Travel (millions)	125	135	116	151	110	121
Annual Unlinked Psgr Trips (millions)	25	27	25	24	21	21
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)	1.15	1.16	1.15	1.05	1.20	1.11
System Performance						
Congested Travel (% of peak VMT)	44	40	36	34	28	27
Congested System (% of lane-miles)	44	44	39	39	34	34
Congested Time (number of "Rush Hours")	6.0	5.6	5.2	4.8	4.4	4.0
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	76	72	68	69	72	70
Transit Riders or Carpoolers (millions)	21	19	18	18	18	17
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	6,488	5,505	4,561	3,908	3,186	2,956
Rank	35	36	38	40	43	39
Fuel per Peak Traveler (gallons)	17	15	12	11	9	8
Rank	28	37	40	45	47	44
Annual Delay						
Total Delay (1000s of person-hours)	10,206	8,649	7,216	6,229	5,080	4,746
Rank	35	36	37	39	43	39
Delay per Peak Traveler (person-hrs)	27	23	19	17	14	13
Rank	28	35	39	44	47	47
Delay due to Incidents (percent)	53	54	54	54	54	54
Travel Time Index						
Rank	29	33	36	36	41	40
Congestion Cost						
Total Cost (\$ millions)	128	106	86	72	55	49
Rank	37	36	38	41	43	40
Cost per Peak Traveler (\$)	333	279	232	197	155	139
Rank	32	35	40	47	49	47

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

The Mobility Data for Salt Lake City, UT, Continued

Inventory Measures	1987	1986	1985	1984	1983	1982
Urban Area Information						
Population (1000s)	765	760	750	720	700	680
Rank	40	40	40	40	41	41
Urban Area (square miles)	375	370	370	360	360	360
Popn Density (persons/sq mile)	2,040	2,054	2,027	2,000	1,944	1,889
Peak Travelers (1000s)	340	336	329	313	302	290
Freeway						
Daily Vehicle-Miles of Travel (1000s)	4,460	4,090	3,890	3,575	3,550	3,390
Lane Miles	470	445	425	420	420	400
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	5,135	5,035	4,695	4,525	4,300	4,050
Lane Miles	975	960	900	885	880	830
Public Transportation						
Annual Psgr-Miles of Travel (millions)	103	85	87	78	78	78
Annual Unlinked Psgr Trips (millions)	20	17	17	16	16	16
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)	1.11	1.08	1.42	1.43	1.47	1.53
System Performance						
Congested Travel (% of peak VMT)	24	24	23	19	16	16
Congested System (% of lane-miles)	32	32	32	27	24	23
Congested Time (number of "Rush Hours")	3.6	3.4	3.4	3.0	2.9	2.9
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	76	--	--	--	--	--
Transit Riders or Carpoolers (millions)	17	--	--	--	--	--
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	2,594	2,381	2,193	1,708	1,432	1,325
Rank	39	39	40	42	43	41
Fuel per Peak Traveler (gallons)	8	7	7	5	5	5
Rank	45	46	45	49	49	46
Annual Delay						
Total Delay (1000s of person-hours)	4,288	3,979	3,657	2,910	2,492	2,293
Rank	38	39	39	43	41	38
Delay per Peak Traveler (person-hrs)	13	12	11	9	8	8
Rank	45	47	44	48	48	46
Delay due to Incidents (percent)	54	54	54	53	53	53
Travel Time Index						
Rank	40	38	37	44	43	43
Congestion Cost						
Total Cost (\$ millions)	42	38	35	27	22	20
Rank	39	40	40	43	41	38
Cost per Peak Traveler (\$)	125	113	106	86	73	68
Rank	46	49	48	50	50	48

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

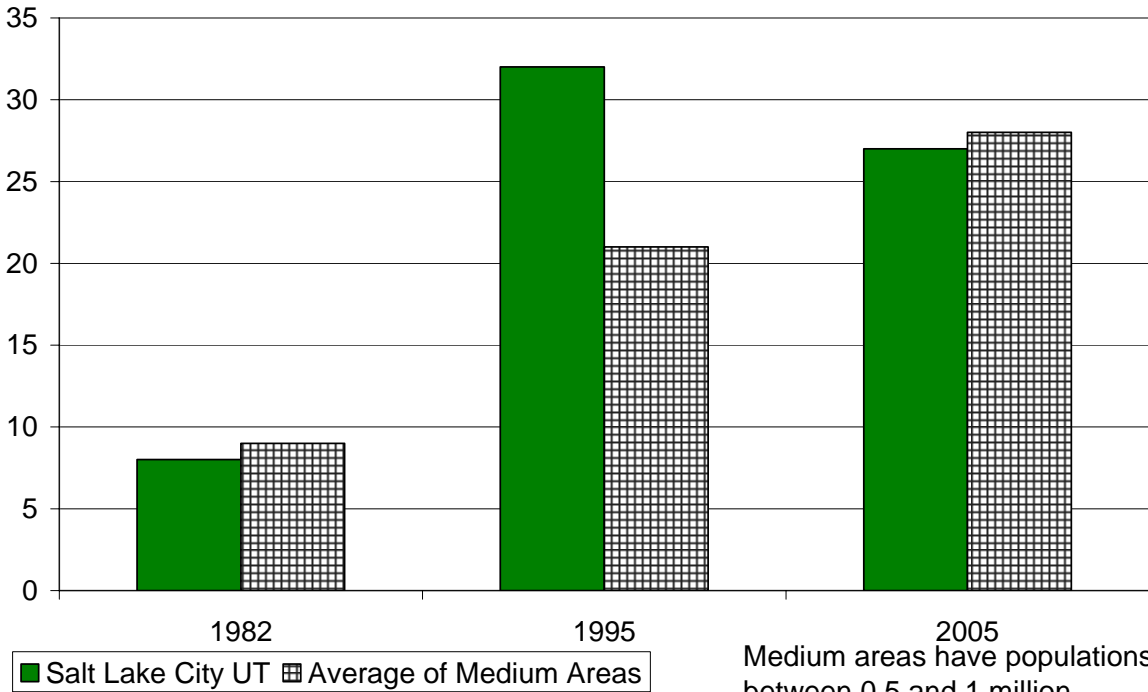
Note: Zeroes in the table reflect values less than 0.5.

Benefits From Public Transportation Service and Operations Strategies for Salt Lake City, UT

Operations Strategies	2005	2004	2003	2002	2001	2000
Freeway Ramp Metering						
Percent of Roadway Miles	34	35	28	28	20	10
Annual Delay Reduction (1000 hours)	65	78	66	61	56	25
Freeway Incident Management						
Cameras						
Percent of Roadway Miles	100	100	100	100	100	100
Service Patrols						
Percent of Roadway Miles	100	100	100	100	100	100
Annual Delay Reduction (1000 hours)	330	425	506	490	464	285
Arterial Signal Coordination						
Percent of Roadway Miles	42	43	43	43	43	43
Annual Delay Reduction (1000 hours)	31	30	34	32	33	55
Arterial Access Management						
Percent of Roadway Miles	32	32	32	32	32	27
Annual Delay Reduction (1000 hours)	186	182	217	206	170	232
HOV Lanes						
Daily Passenger-miles of Travel (1000s)	--	--	--	--	--	--
HOV User Delay Savings	--	--	--	--	--	--
Total Effect of Operations Treatments						
Annual Delay Reduction (1000 hours)	611	714	823	788	722	596
Annual Delay Saved per Peak Traveler (hours)	1	1	2	2	1	1
Annual Congestion Cost Savings (\$million)	11.0	12.3	13.6	12.7	11.5	9.2
Travel Time Index with Strategies	1.191	1.207	1.244	1.236	1.223	1.208
Travel Time Index (Base)	1.200	1.216	1.256	1.247	1.233	1.216
Public Transportation Service						
Existing Service						
Annual Passenger-miles of Travel (million)	206	171	185	155	147	137
Unlinked Passenger Trips (million)	38	27	32	28	26	25
Travel Time Index (combined road and transit)	1.181	1.197	1.232	1.226	1.214	1.199
Condition if Public Transportation Service were Discontinued						
Travel Time Index	1.222	1.236	1.284	1.271	1.257	1.233
Annual Delay Increase (1000 hours)	2,152	1,828	2,402	2,107	2,009	1,462
Annual Delay Increase per Peak Traveler (hours)	4	4	5	4	4	3
Annual Congestion Cost Increase (\$million)	38.3	31.2	39.6	33.7	31.8	22.3

Growth in Delay per Peak Traveler

Hours of Delay



Annual Hours of Delay (million)

Growth in Total Delay

