

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 Orlando, FL

Inventory Measures	2005	2004	2003	2002	2001	2000
Urban Area Information						
Population (1000s)	1,360	1,320	1,290	1,260	1,230	1,185
Rank	32	33	33	33	33	34
Urban Area (square miles)	715	715	680	680	670	650
Popn Density (persons/sq mile)	1,902	1,846	1,897	1,853	1,836	1,823
Peak Travelers (1000s)	751	725	704	678	651	617
Freeway						
Daily Vehicle-Miles of Travel (1000s)	12,470	11,765	10,570	10,000	9,950	9,400
Lane Miles	895	840	805	775	745	730
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	16,770	16,530	17,000	17,000	16,970	15,855
Lane Miles	2,070	2,060	2,060	2,060	2,050	2,050
Public Transportation						
Annual Psgr-Miles of Travel (millions)	160	144	147	144	131	140
Annual Unlinked Psgr Trips (millions)	25	23	23	21	22	22
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)	2.34	1.99	1.53	1.41	1.51	1.54
System Performance						
Congested Travel (% of peak VMT)	69	68	69	71	71	70
Congested System (% of lane-miles)	66	65	65	67	67	63
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	89	97	106	112	145	136
Transit Riders or Carpoolers (millions)	30	33	35	37	48	43
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	26,049	25,797	25,658	26,095	26,625	24,256
Rank	23	23	22	21	20	21
Fuel per Peak Traveler (gallons)	35	36	36	38	41	39
Rank	10	8	9	6	3	4
Annual Delay						
Total Delay (1000s of person-hours)	40,595	40,522	40,837	41,040	42,046	38,695
Rank	22	22	21	21	20	20
Delay per Peak Traveler (person-hrs)	54	56	58	61	65	63
Rank	8	5	4	3	3	3
Delay due to Incidents (percent)	53	53	53	53	53	53
Travel Time Index						
Rank	1.30	1.30	1.31	1.32	1.33	1.32
Rank	18	15	10	8	7	7
Congestion Cost						
Total Cost (\$ millions)	738	703	677	665	675	603
Rank	22	22	21	21	21	21
Cost per Peak Traveler (\$)	983	970	961	981	1,038	976
Rank	9	7	5	3	3	3

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 Orlando, FL, Continued

Inventory Measures	1999	1998	1997	1996	1995	1994
Urban Area Information						
Population (1000s)	1,140	1,120	1,105	1,065	1,035	995
Rank	34	34	33	35	35	35
Urban Area (square miles)	630	600	560	525	480	430
Popn Density (persons/sq mile)	1,810	1,867	1,973	2,029	2,156	2,314
Peak Travelers (1000s)	584	564	548	520	497	471
Freeway						
Daily Vehicle-Miles of Travel (1000s)	8,725	8,565	8,205	7,695	7,280	7,360
Lane Miles	705	685	680	680	670	670
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	15,290	14,440	14,040	13,215	12,625	11,760
Lane Miles	2,040	2,010	1,980	1,900	1,850	1,775
Public Transportation						
Annual Psgr-Miles of Travel (millions)	128	118	113	103	102	75
Annual Unlinked Psgr Trips (millions)	21	19	18	16	14	12
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	1.07	1.17	1.30	1.20	1.08
System Performance						
Congested Travel (% of peak VMT)	69	68	66	63	61	59
Congested System (% of lane-miles)	64	60	60	60	60	60
Congested Time (number of "Rush Hours")	7.2	7.0	6.8	6.4	6.2	6.0
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	128	150	145	139	152	167
Transit Riders or Carpoolers (millions)	39	44	42	39	42	45
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	23,333	22,304	20,684	18,208	16,519	15,130
Rank	22	21	22	22	22	23
Fuel per Peak Traveler (gallons)	40	40	38	35	33	32
Rank	4	4	5	6	8	9
Annual Delay						
Total Delay (1000s of person-hours)	37,147	35,643	33,233	29,657	26,849	24,853
Rank	21	21	22	22	22	22
Delay per Peak Traveler (person-hrs)	64	63	61	57	54	53
Rank	3	3	3	4	4	3
Delay due to Incidents (percent)	53	53	53	53	53	53
Travel Time Index						
Rank	5	5	6	7	7	8
Congestion Cost						
Total Cost (\$ millions)	549	518	479	420	369	331
Rank	22	22	22	22	23	23
Cost per Peak Traveler (\$)	940	917	873	808	744	703
Rank	3	3	4	5	6	6

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 Orlando, FL, Continued

Inventory Measures	1993	1992	1991	1990	1989	1988
Urban Area Information						
Population (1000s)	965	935	910	860	805	785
Rank	36	37	37	37	39	40
Urban Area (square miles)	420	415	410	410	400	400
Popn Density (persons/sq mile)	2,298	2,253	2,220	2,098	2,013	1,963
Peak Travelers (1000s)	449	428	410	381	354	342
Freeway						
Daily Vehicle-Miles of Travel (1000s)	6,700	6,250	5,800	5,350	5,000	4,500
Lane Miles	620	575	520	480	435	395
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	10,860	10,790	10,280	9,500	8,745	8,050
Lane Miles	1,700	1,650	1,600	1,550	1,510	1,480
Public Transportation						
Annual Psgr-Miles of Travel (millions)	59	53	60	91	84	72
Annual Unlinked Psgr Trips (millions)	11	10	12	19	18	15
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)	1.13	1.12	1.10	1.05	1.08	1.00
System Performance						
Congested Travel (% of peak VMT)	59	61	61	59	58	51
Congested System (% of lane-miles)	61	61	61	61	62	56
Congested Time (number of "Rush Hours")	5.6	5.8	6.0	5.8	5.6	5.4
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	161	201	207	180	159	146
Transit Riders or Carpoolers (millions)	42	53	55	46	39	34
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	13,878	13,804	13,270	11,256	10,010	8,232
Rank	23	21	20	22	21	22
Fuel per Peak Traveler (gallons)	31	32	32	30	28	24
Rank	8	8	5	6	7	8
Annual Delay						
Total Delay (1000s of person-hours)	22,863	22,893	22,033	18,511	16,358	13,723
Rank	22	20	19	20	20	21
Delay per Peak Traveler (person-hrs)	51	53	54	49	46	40
Rank	6	4	4	4	4	6
Delay due to Incidents (percent)	53	53	53	53	53	53
Travel Time Index						
Rank	8	8	7	8	8	10
Congestion Cost						
Total Cost (\$ millions)	296	289	272	222	183	146
Rank	22	20	19	21	21	21
Cost per Peak Traveler (\$)	660	676	663	583	518	428
Rank	7	5	3	6	5	8

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 Orlando, FL, Continued

Inventory Measures	1987	1986	1985	1984	1983	1982
Urban Area Information						
Population (1000s)	760	690	675	650	630	610
Rank	41	42	42	42	43	45
Urban Area (square miles)	395	395	390	390	380	380
Popn Density (persons/sq mile)	1,924	1,747	1,731	1,667	1,658	1,605
Peak Travelers (1000s)	329	296	288	275	265	253
Freeway						
Daily Vehicle-Miles of Travel (1000s)	4,100	3,815	3,435	3,150	3,010	2,750
Lane Miles	360	330	315	315	305	300
Arterial Streets						
Daily Vehicle-Miles of Travel (1000s)	6,955	6,270	6,275	6,130	5,635	5,250
Lane Miles	1,430	1,400	1,380	1,350	1,320	1,300
Public Transportation						
Annual Psgr-Miles of Travel (millions)	74	85	73	61	61	61
Annual Unlinked Psgr Trips (millions)	18	20	17	15	15	15
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)	1.00	0.98	1.28	1.29	1.32	1.38
System Performance						
Congested Travel (% of peak VMT)	45	40	39	36	34	29
Congested System (% of lane-miles)	55	51	51	51	50	49
Congested Time (number of "Rush Hours")	4.8	4.4	4.2	3.6	3.2	2.9
Annual Increase Needed To Maintain Constant Congestion Level:						
Lane-Miles	120	--	--	--	--	--
Transit Riders or Carpoolers (millions)	26	--	--	--	--	--
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	6,384	5,052	4,796	4,042	3,310	2,621
Rank	23	27	25	25	27	30
Fuel per Peak Traveler (gallons)	19	17	17	15	13	10
Rank	10	10	9	10	10	14
Annual Delay						
Total Delay (1000s of person-hours)	10,739	8,333	8,138	6,839	5,631	4,508
Rank	23	27	25	26	27	29
Delay per Peak Traveler (person-hrs)	33	28	28	25	21	18
Rank	8	10	8	9	10	13
Delay due to Incidents (percent)	53	53	53	53	53	53
Travel Time Index						
Rank	1.18	1.16	1.15	1.13	1.12	1.10
Rank	10	11	9	12	14	19
Congestion Cost						
Total Cost (\$ millions)	111	83	81	66	52	41
Rank	23	27	26	26	27	29
Cost per Peak Traveler (\$)	336	281	281	240	198	162
Rank	10	10	8	11	10	13

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

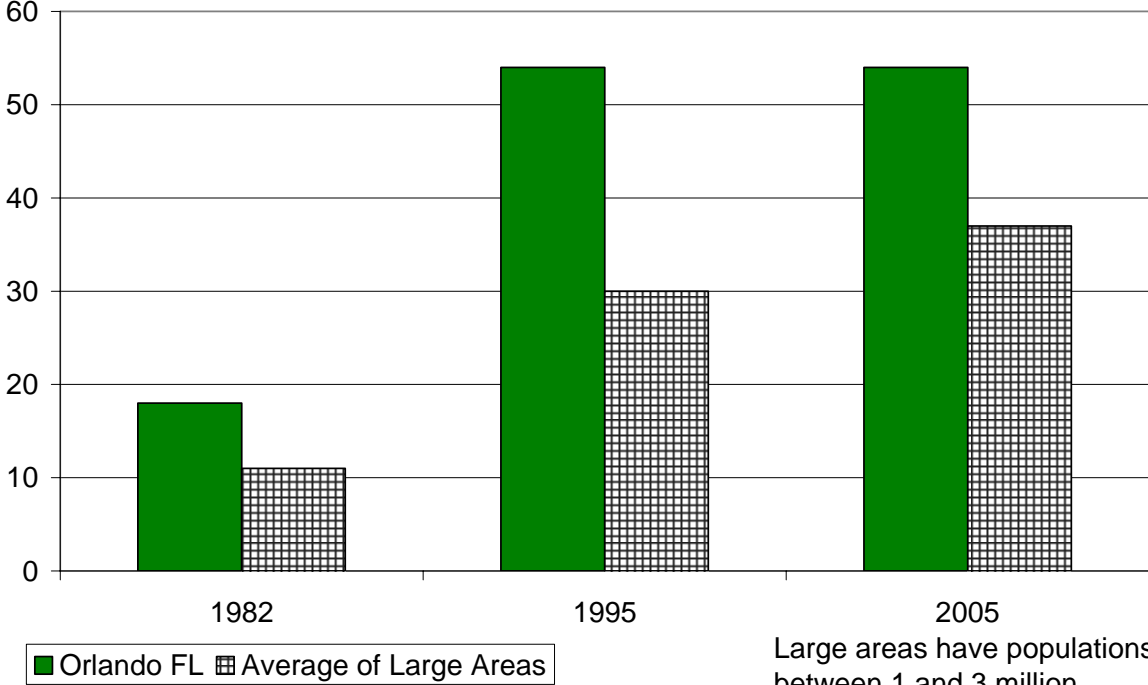
Note: Zeroes in the table reflect values less than 0.5.

Benefits From Public Transportation Service and Operations Strategies for Orlando, FL

Operations Strategies	2005	2004	2003	2002	2001	2000
Freeway Ramp Metering						
Percent of Roadway Miles	--	--	--	--	--	--
Annual Delay Reduction (1000 hours)	--	--	--	--	--	--
Freeway Incident Management						
Cameras						
Percent of Roadway Miles	38	34	34	35	36	36
Service Patrols						
Percent of Roadway Miles	57	54	40	39	29	24
Annual Delay Reduction (1000 hours)	609	500	353	359	307	254
Arterial Signal Coordination						
Percent of Roadway Miles	77	78	78	78	78	78
Annual Delay Reduction (1000 hours)	189	189	199	207	210	203
Arterial Access Management						
Percent of Roadway Miles	48	48	46	44	44	37
Annual Delay Reduction (1000 hours)	1,131	1,063	959	777	964	771
HOV Lanes						
Daily Passenger-miles of Travel (1000s)	--	--	--	--	--	--
HOV User Delay Savings	--	--	--	--	--	--
Total Effect of Operations Treatments						
Annual Delay Reduction (1000 hours)	1,929	1,751	1,511	1,344	1,480	1,228
Annual Delay Saved per Peak Traveler (hours)	3	2	2	2	2	2
Annual Congestion Cost Savings (\$million)	34.9	30.3	25.0	21.8	23.7	19.1
Travel Time Index with Strategies	1.296	1.304	1.311	1.323	1.331	1.320
Travel Time Index (Base)	1.309	1.316	1.321	1.333	1.342	1.330
Public Transportation Service						
Existing Service						
Annual Passenger-miles of Travel (million)	160	144	147	144	131	140
Unlinked Passenger Trips (million)	25	23	23	21	22	22
Travel Time Index (combined road and transit)	1.287	1.295	1.301	1.313	1.321	1.310
Condition if Public Transportation Service were Discontinued						
Travel Time Index	1.317	1.323	1.328	1.341	1.350	1.338
Annual Delay Increase (1000 hours)	1,909	1,718	1,672	1,744	1,750	1,725
Annual Delay Increase per Peak Traveler (hours)	3	2	2	3	3	3
Annual Congestion Cost Increase (\$million)	34.5	29.7	27.7	28.2	28.0	26.7

Growth in Delay per Peak Traveler

Hours of Delay



Growth in Total Delay

Annual Hours of Delay (million)

