Performance Measure Summary - Denver-Aurora CO

There are several inventory and performance measures listed in the pages of this Urban Area Report for the years from 1982 to 2020. There is no single performance measure that experts agree "says it all". A few key points should be recognized by users of the Urban Mobility Scorecard data.

Use the trends - The multi-year performance measures are better indicators, in most cases, than any single year. 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. (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 atop several 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.)

Performance Measures and Definition of Terms

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

Planning Time Index - A travel time reliability measure that represents the total travel time that should be planned for a trip. Computed with the 95th percentile travel time it represents the amount of time that should be planned for a commute trip to be late for only 1 day a month. If it is computed with the 80th percentile travel time it represents the amount of time that should be planned for a trip to be late for only 1 day a week. A PTI of 2.00 means that for a 20-minute trip in light traffic, 40 minutes should be planned.

Peak Commuters - Number of travelers who begin a trip during the morning or evening peak travel periods (6 to 10 a.m. and 3 to 7 p.m.). "Commuters" are private vehicle users unless specifically noted.

Annual Delay per Commuter - A yearly sum of all the per-trip delays for those persons who travel in the peak period (6 to 10 a.m. and 3 to 7 p.m.). This measure illustrates the effect of traffic slowdowns as well as the length of each trip.

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 - These values are derived from time periods with lighter traffic volumes in the INRIX speed database. They are used as the national comparison thresholds. Other speed thresholds may be appropriate for urban project evaluations or sub-region studies.

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

Congestion Cost - Value of travel delay for 2020 (estimated at \$20.17 per hour of person travel and \$55.24 per hour of truck time) and excess fuel consumption estimated using state average cost per gallon.

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), so increases include both new growth and development that was previously in areas designated as rural.

Number of Rush Hours -Time when the road system might have congestion.

Annual Greenhouse Gases (CO2) Produced -Tons of CO2 produced from all vehicle travel.

Excess Greenhouse Gases (CO2) Produced due to Congestion-Tons of CO2 produced due to congested portion of travel. The excess CO2 is a subset of the total CO2 produced.

Inventory Measures	2020	2019	2018	2017	2016	2015
Urban Area Information						
Population (1000s)	2,710	2,710	2,700	2,675	2,660	2,630
Rank	18	18	18	17	17	17
Commuters (1000s)	1,358	1,358	1,353	1,340	1,331	1,315
Daily Vehicle-Miles of Travel (1000s)						
Freeway	23,863	27,910	27,516	26,961	26,302	25,453
Arterial Streets	20,162	23,581	23,445	23,413	22,972	22,474
Cost Components						
Value of Time (\$/hour)	20.17	19.14	18.71	18.12	17.91	17.69
Commercial Cost (\$/hour)	55.24	49.49	54.71	52.14	50.20	46.87
Gasoline (\$/gallon)	2.28	2.66	2.87	2.34	2.15	2.47
Diesel (\$/gallon)	2.63	2.84	3.16	2.42	2.18	2.43
System Performance	2020	2019	2018	2017	2016	2015
Congested Travel (% of peak VMT)				33.7		
Congested System (% of lane-miles)				19.3		
Congested Time (number of "Rush Hours")				4.7		
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	18,644	44,960	44,569	44,449	44,345	44,115
Rank	17	15	15	15	15	15
Fuel per Peak Auto Commuter (gallons)	10	25	25	25	25	24
Rank	59	21	20	20	16	20
Annual Delay						
Total Delay (1000s of person-hours)	46,181	111,366	108,752	107,463	105,664	103,318
Rank	21	17	17	17	17	17
Delay per Auto Commuter (pers-hrs)	26	62	61	61	59	58
Rank	47	21	20	20	21	20
Travel Time Index	1.09	1.32	1.32	1.31	1.31	1.31
Rank	40	15	15	16	15	15
Commuter Stress Index	1.10	1.37	1.34	1.32		
Rank	40	16	17	20		
Freeway Planning Time Index (95th Pctile)		1.85	1.88	1.83		
Rank		23	18	23		
Congestion Cost						
Total Cost (\$ millions)	1,034	2,394	2,369	2,296	2,219	2,150
Rank	21	17	17	17	17	17
Cost per Auto Commuter (\$)	545	1,263	1,254	1,227	1,214	1,180
Rank	50	24	23	23	23	23
Truck Congestion						
Annual Person-Hours of Delay (000)	2,066	4,637	4,581	4,513	4,438	4,339
Rank	23	17	17	17	17	17
Annual Gallons of Wasted Fuel (000)	4,552	10,216	9,728	9,423	9,401	9,352
Rank	15	15	15	16	15	15
Annual Congestion Cost (\$ million)	112	233	258	242	228	212
Rank	22	19	17	17	17	17
Annual Greenhouse Gases (CO2) Produced						
Excess Due to Congestion (tons)	186,811	450,499				
Rank	17	15				
Due to All Travel (tons)	3,350,954	8,080,901				
1 1		23				
Rank	28	23				
Rank Truck Annual Greenhouse Gases (CO2) Produced	28	23				
	50,116	112,486				
Truck Annual Greenhouse Gases (CO2) Produced				 	 	
Truck Annual Greenhouse Gases (CO2) Produced Excess Due to Truck Congestion (tons)	50,116	112,486		 		

^{*} Note: Zeroes in the table reflect values less than 0.5.

Inventory Measures	2014	2013	2012	2011	2010	2009
Urban Area Information						
Population (1000s)	2,615	2,550	2,475	2,425	2,360	2,290
Rank	17	18	18	19	19	19
Commuters (1000s)	1,307	1,297	1,301	1,315	1,276	1,236
Daily Vehicle-Miles of Travel (1000s)						
Freeway	24,412	21,242	20,980	22,205	21,817	21,000
Arterial Streets	21,868	20,356	20,600	21,575	21,193	21,538
Cost Components						
Value of Time (\$/hour)	17.67	17.39	17.14	16.79	16.28	16.01
Commercial Cost (\$/hour)	44.82	41.23	39.66	44.62	42.50	41.83
Gasoline (\$/gallon)	3.33	3.54	3.28	3.27	2.62	2.17
Diesel (\$/gallon)	3.59	3.80	3.85	3.67	2.90	2.48
System Performance	2014	2013	2012	2011	2010	2009
Congested Travel (% of peak VMT)						
Congested System (% of lane-miles)						
Congested Time (number of "Rush Hours")						
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	44,005	43,608	42,279	40,469	40,202	39,179
Rank	15	15	15	15	15	15
Fuel per Peak Auto Commuter (gallons)	24	25	24	22	23	21
Rank	17	15	16	18	14	15
Annual Delay						
Total Delay (1000s of person-hours)	101,271	99,468	95,576	89,836	87,604	83,780
Rank	17	17	17	18	17	17
Delay per Auto Commuter (pers-hrs)	55	55	53	50	50	49
Rank	20	19	19	21	17	15
Travel Time Index	1.30	1.30	1.30	1.28	1.29	1.29
Rank	16	16	16	17	13	12
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost	2 1 42	2.072	1.054	1 000	1.700	1.504
Total Cost (\$ millions)	2,142	2,073	1,954	1,823	1,700	1,584
Rank Cost per Auto Commuter (\$)	17 1,151	17 1,141	17 1,111	18 1,078	17 1,083	17 1,055
Rank	23	22	21	23	21	1,033
Truck Congestion	23	22	21	23	21	17
Annual Person-Hours of Delay (000)	4,253	4,178	4,014	3,773	3,679	3,519
Rank	17	17	17	18	18	18
Annual Gallons of Wasted Fuel (000)	9,329	9,245	8,963	8,579	8,523	8,306
Rank	15	15	15	15	15	15
Annual Congestion Cost (\$ million)	212	196	184	189	171	158
Rank	17	17	17	18	18	18
Annual Greenhouse Gases (CO2) Produced						
Excess Due to Congestion (tons)						
Rank						
Due to All Travel (tons)						
Due to All Travel (tons) Rank			 	 	 	
Rank						
Rank Truck Annual Greenhouse Gases (CO2) Produced				 		
Rank Truck Annual Greenhouse Gases (CO2) Produced Excess Due to Truck Congestion (tons)				 		

^{*} Note: Zeroes in the table reflect values less than 0.5.

Inventory Measures	2008	2007	2006	2005	2004	2003
Urban Area Information						
Population (1000s)	2,250	2,200	2,145	2,090	2,065	2,050
Rank	19	19	20	21	21	20
Commuters (1000s)	1,210	1,181	1,150	1,115	1,096	1,083
Daily Vehicle-Miles of Travel (1000s)						
Freeway	20,120	20,395	19,935	19,900	18,815	17,960
Arterial Streets	22,000	22,925	23,555	23,380	22,820	21,790
Cost Components	,	,	,		,	
Value of Time (\$/hour)	16.07	15.47	15.06	14.58	14.10	13.73
Commercial Cost (\$/hour)	40.77	39.30	37.88	36.51	35.19	33.92
Gasoline (\$/gallon)	3.39	3.20	2.60	2.32	1.94	1.51
Diesel (\$/gallon)	4.10	3.68	2.88	2.56	2.04	1.55
System Performance	2008	2007	2006	2005	2004	2003
Congested Travel (% of peak VMT)						
Congested System (% of lane-miles)						
Congested Time (number of "Rush Hours")						
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	39,597	39,762	39,479	38,740	37,308	35,195
Rank	15	15	15	15	15	15
Fuel per Peak Auto Commuter (gallons)	22	22	22	22	21	20
Rank	19	19	18	15	14	17
Annual Delay						
Total Delay (1000s of person-hours)	80,641	80,977	80,402	78,897	75,979	71,676
Rank	18	17	17	17	17	17
Delay per Auto Commuter (pers-hrs)	49	50	51	52	50	48
Rank	18	17	17	12	13	14
Travel Time Index	1.30	1.31	1.31	1.32	1.31	1.30
Rank	12	11	12	8	9	10
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	1,585	1,528	1,453	1,371	1,264	1,145
Rank	17	17	17	16	16	17
Cost per Auto Commuter (\$)	1,005	1,048	1,072	1,085	1,081	1,048
Rank	24	20	18	19	19	21
Truck Congestion	2 207	2 401	2 277	2 214	2 101	2.010
Annual Person-Hours of Delay (000)	3,387	3,401	3,377	3,314	3,191	3,010
Rank Annual Gallons of Wasted Fuel (000)	8,395	18 8,429	17 8,370	17 8,213	16 7,909	17 7,461
Rank	15	8,429	8,370	8,213	15	15
Annual Congestion Cost (\$ million)	15	156	15	134	13	107
Rank	18	17	17	16	16	16
Annual Greenhouse Gases (CO2) Produced	10	1 /	1 /	10	10	10
Excess Due to Congestion (tons)						_
Rank				<u></u>		
Due to All Travel (tons)						
Rank						
Truck Annual Greenhouse Gases (CO2) Produced						
Excess Due to Truck Congestion (tons)						
Rank						
Due to Truck Travel (tons)		 				
Rank				<u></u>		
						_

^{*} Note: Zeroes in the table reflect values less than 0.5.

Inventory Measures	2002	2001	2000	1999	1998	1997
Urban Area Information						
Population (1000s)	2,030	2,025	1,910	1,860	1,830	1,800
Rank	20	20	21	21	21	21
Commuters (1000s)	1,046	1,019	938	891	857	822
Daily Vehicle-Miles of Travel (1000s)						
Freeway	17,400	17,250	16,905	16,500	16,120	15,700
Arterial Streets	20,925	20,520	20,185	19,520	17,990	16,850
Cost Components	,			,		
Value of Time (\$/hour)	13.43	13.22	12.85	12.43	12.17	11.98
Commercial Cost (\$/hour)	32.69	31.51	30.38	29.28	28.89	28.50
Gasoline (\$/gallon)	1.39	1.70	1.55	1.16	1.10	1.24
Diesel (\$/gallon)	1.40	1.68	1.51	1.18	1.22	1.33
System Performance	2002	2001	2000	1999	1998	1997
Congested Travel (% of peak VMT)						
Congested System (% of lane-miles)						
Congested Time (number of "Rush Hours")						
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	33,968	31,329	28,510	26,126	23,820	21,520
Rank	15	15	15	15	15	17
Fuel per Peak Auto Commuter (gallons)	21	19	17	15	14	14
Rank	12	13	24	32	31	26
Annual Delay						
Total Delay (1000s of person-hours)	69,178	63,803	58,062	53,208	48,510	43,827
Rank	17	17	18	18	19	19
Delay per Auto Commuter (pers-hrs)	48	45	44	42	40	37
Rank	13	17	16	17	19	22
Travel Time Index	1.29	1.28	1.27	1.26	1.24	1.23
Rank	10	10	10	9	12	13
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	1,077	987	869	761	679	608
Rank	17	17	18	18	19	19
Cost per Auto Commuter (\$)	1,034	966	903	858	800	733
Rank	20	21	25	26	29	32
Truck Congestion						
Annual Person-Hours of Delay (000)	2,905	2,680	2,439	2,235	2,037	1,841
Rank	17	19	19	19	21	21
Annual Gallons of Wasted Fuel (000)	7,201	6,642	6,044	5,539	5,050	4,562
Rank	15	15	15	15	15	17
Annual Congestion Cost (\$ million)	99	90	78	67	61	55
Rank	16	17	19	19	20	21
Annual Greenhouse Gases (CO2) Produced						
Excess Due to Congestion (tons)						
Rank						
Due to All Travel (tons)						
Rank						
Truck Annual Greenhouse Gases (CO2) Produced						
Truck Annual Greenhouse Gases (CO2) Produced Excess Due to Truck Congestion (tons)						
Excess Due to Truck Congestion (tons) Rank	 	 		 	 	
Excess Due to Truck Congestion (tons)		 		 	 	

^{*} Note: Zeroes in the table reflect values less than 0.5.

Inventory Measures	1996	1995	1994	1993	1992	1991
Urban Area Information						
Population (1000s)	1,770	1,730	1,675	1,610	1,600	1,580
Rank	23	23	23	23	23	23
Commuters (1000s)	789	753	712	668	647	624
Daily Vehicle-Miles of Travel (1000s)						
Freeway	15,100	14,285	13,475	12,950	12,430	11,425
Arterial Streets	16,410	16,170	15,685	15,170	13,900	13,240
Cost Components						
Value of Time (\$/hour)	11.71	11.37	11.06	10.78	10.47	10.17
Commercial Cost (\$/hour)	28.12	27.75	27.38	27.02	26.66	26.30
Gasoline (\$/gallon)	1.36	1.22	1.16	1.21	1.23	1.19
Diesel (\$/gallon)	1.41	1.26	1.20	1.25	1.23	1.28
System Performance	1996	1995	1994	1993	1992	1991
Congested Travel (% of peak VMT)						
Congested System (% of lane-miles)						
Congested Time (number of "Rush Hours")						
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	19,019	16,784	14,927	12,863	11,583	10,813
Rank	18	21	22	23	23	23
Fuel per Peak Auto Commuter (gallons)	11	10	9	8	6	6
Rank	49	52	56	58	69	67
Annual Delay						
Total Delay (1000s of person-hours)	38,733	34,181	30,401	26,195	23,590	22,022
Rank	22	23	23	24	24	24
Delay per Auto Commuter (pers-hrs)	34	31	29	26	24	23
Rank	33	41	42	49	53	49
Travel Time Index	1.21	1.19	1.18	1.16	1.15	1.15
Rank	19	23	23	26	27	24
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	528	451	391	329	289	263
Rank	22	23	24	24	24	24
Cost per Auto Commuter (\$)	662	603	552	488	453	436
Rank	38	49	49	60	60	59
Truck Congestion						**-
Annual Person-Hours of Delay (000)	1,627	1,436	1,277	1,100	991	925
Rank	24	24	24	24	25	25
Annual Gallons of Wasted Fuel (000)	4,032	3,558	3,165	2,727	2,456	2,292
Rank Appeal Congection Cost (\$ million)	19	22 42	23 36	24 31	24 28	24 26
Annual Congestion Cost (\$ million) Rank	48 23	24	24	24	28 24	26
	23	24	24	24	24	24
Annual Greenhouse Gases (CO2) Produced				ı	I	
Excess Due to Congestion (tons) Rank						
Nank Due to All Travel (tons)						
Rank						 -
Truck Annual Greenhouse Gases (CO2) Produced				ı	I	
Excess Due to Truck Congestion (tons) Rank						
Nank Due to Truck Travel (tons)						
Rank				 	 	
IValik						

^{*} Note: Zeroes in the table reflect values less than 0.5.

Inventory Measures	1990	1989	1988	1987	1986	1985
Urban Area Information						
Population (1000s)	1,580	1,565	1,550	1,510	1,500	1,485
Rank	23	23	23	23	23	23
Commuters (1000s)	609	598	587	566	557	547
Daily Vehicle-Miles of Travel (1000s)						
Freeway	11,205	10,500	10,315	10,135	9,765	9,510
Arterial Streets	12,365	12,170	12,120	12,115	12,100	12,195
Cost Components						
Value of Time (\$/hour)	9.75	9.25	8.83	8.48	8.18	8.03
Commercial Cost (\$/hour)	25.95	25.60	25.26	24.93	24.60	24.27
Gasoline (\$/gallon)	1.11	1.15	1.06	1.06	1.04	1.36
Diesel (\$/gallon)	1.15	1.14	1.05	1.05	1.03	1.35
System Performance	1990	1989	1988	1987	1986	1985
Congested Travel (% of peak VMT)						
Congested System (% of lane-miles)						
Congested Time (number of "Rush Hours")						
Annual Excess Fuel Consumed						
Total Fuel (1000 gallons)	10,366	9,992	9,075	8,737	8,878	8,790
Rank	22	21	21	20	20	19
Fuel per Peak Auto Commuter (gallons)	6	6	5	5	5	5
Rank	60	53	58	48	40	32
Annual Delay						
Total Delay (1000s of person-hours)	21,111	20,349	18,483	17,793	18,080	17,902
Rank	23	23	23	23	21	21
Delay per Auto Commuter (pers-hrs)	23	22	21	21	21	21
Rank	44	40	38	31	26	23
Travel Time Index	1.14	1.14	1.13	1.13	1.13	1.13
Rank	26	23	23	22	20	19
Commuter Stress Index						
Rank						
Freeway Planning Time Index (95th Pctile)						
Rank						
Congestion Cost						
Total Cost (\$ millions)	242	223	193	179	176	175
Rank	23	23	23	23	21	21
Cost per Auto Commuter (\$)	437	445	425	427	451	454
Rank	55	50	51	41	34	30
Truck Congestion	005	0.55		5.45	7.50	7.50
Annual Person-Hours of Delay (000)	887	855	776	747	759	752
Rank	23	23	23	23	21	1 264
Annual Gallons of Wasted Fuel (000)	2,198	2,118	1,924	1,852	1,882	1,864
Rank Appeal Congection Cost (\$ million)	23 24	21 23	21 20	21 19	20 19	19 20
Annual Congestion Cost (\$ million) Rank	24 23	23	20 23	22	21	20
	23	23	23	22	۷1	21
Annual Greenhouse Gases (CO2) Produced				1	I	
Excess Due to Congestion (tons) Rank						
Nank Due to All Travel (tons)	 					
Rank	 		 			 -
Truck Annual Greenhouse Gases (CO2) Produced				1	I	
Excess Due to Truck Congestion (tons)						
Rank Due to Truck Travel (tons)						
Due to Truck Travel (tons)						
Rank						

^{*} Note: Zeroes in the table reflect values less than 0.5.

Inventory Measures	1984	1983	1982
Urban Area Information			
Population (1000s)	1,460	1,375	1,350
Rank	23	23	23
Commuters (1000s)	532	498	484
Daily Vehicle-Miles of Travel (1000s)			
Freeway	9,865	9,180	8,900
Arterial Streets	12,215	11,665	11,530
Cost Components			
Value of Time (\$/hour)	7.75	7.43	7.20
Commercial Cost (\$/hour)	23.94	23.63	23.31
Gasoline (\$/gallon)	1.37	1.41	1.47
Diesel (\$/gallon)	1.36	1.39	1.46
System Performance	1984	1983	1982
Congested Travel (% of peak VMT)			
Congested System (% of lane-miles)			
Congested Time (number of "Rush Hours")			
Annual Excess Fuel Consumed			
Total Fuel (1000 gallons)	8,244	6,851	6,057
Rank	19	20	20
Fuel per Peak Auto Commuter (gallons)	5	5	3
Rank	27	22	34
Annual Delay			
Total Delay (1000s of person-hours)	16,789	13,952	12,336
Rank	21	21	22
Delay per Auto Commuter (pers-hrs)	21	18	17
Rank	19	25	24
Travel Time Index	1.13	1.11	1.10
Rank	17	18	20
Commuter Stress Index			
Rank			
Freeway Planning Time Index (95th Pctile)			
Rank			
Congestion Cost			
Total Cost (\$ millions)	159	128	110
Rank	21	21	21
Cost per Auto Commuter (\$)	442	383	351
Rank	30	33	37
Truck Congestion			
Annual Person-Hours of Delay (000)	705	586	518
Rank	21	21	23
Annual Gallons of Wasted Fuel (000)	1,748	1,452	1,284
Rank	18	19	19
Annual Congestion Cost (\$ million)	18	15	13
Rank	21	21	21
Annual Greenhouse Gases (CO2) Produced			
Excess Due to Congestion (tons)			
Rank			
Due to All Travel (tons)			
Rank			
Truck Annual Greenhouse Gases (CO2) Produced			
Excess Due to Truck Congestion (tons)			
Rank			
Due to Truck Travel (tons)			
Rank			

^{*} Note: Zeroes in the table reflect values less than 0.5.