

# ANALYSIS OF TRAFFIC VOLUME FROM MADDILAPALEM TO POTHINAMALLAYAPALEM

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**Abstract** - This study analysis traffic flow patterns between Maddilapalem and Pothinamallayapalem, a vital urban corridor experiencing increasing vehicular congestion. Data was collected through vehicle counts, speed monitoring, and GPS-based surveys during peak and off-peak hours. The primary focus was to identify traffic volume, peak hours, and factors contributing to delays. After analyzing the traffic flow and the capacity of NH-16 from maddilapalem to Pothinamallayapalem some of the important improvements are required which will suggested in my research which will help to control the traffic volume and the capacity of NH-16. In this I will also estimate the fuel cost which are waste due to traffic signals.

**Key Words:** traffic volume, PCU, (passenger car unit) Average daily traffic, delay, fuel consumption

## 1. INTRODUCTION

The findings will help in estimating the Level of Service (LOS) and identifying potential bottlenecks or congestion points. Based on the analysis, recommendations can be made for improving traffic management, optimizing signal timing, and proposing future infrastructural upgrades. The study plays a vital role in enhancing road safety, reducing travel time, and improving the overall efficiency of the transportation system in the region. Traffic flow studies are accompanied to determine the number, movement and type of vehicles at a given location. Traffic flow analysis helps to improve the capacity of flow. Traffic flow concepts to also describe in the mathematically way the vehicles between and driver.

## 2. LITERATURE REVIEW

L B Zala et al. (2014) in this the author calculated the different type of traffic parameters of a selected area on the concept of previous parameters of that area which the author selects. Author conducted different type of analysis like traffic volume, speed etc. also find the capacity of the road.

## 3. STUDY LOCATION

Total area of Visakhapatnam district is 530013 and the coordinates of Visakhapatnam maddilapalem is 17.7386 ° N, 83.3166 17. ° pm palem 17.7856° N 83.3451° E total area of Visakhapatnam district is 11161 Sk

The study location chosen for the present study satisfy the following criteria:

- Traffic flow
- Delay
- Fuel consumption

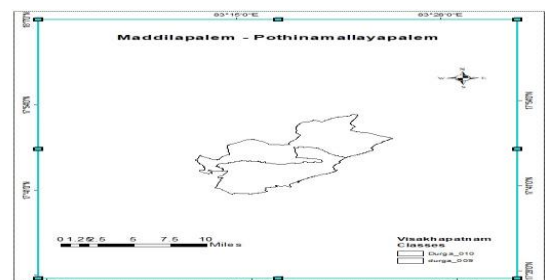


Figure -1 study location maddilapalem to pothinamallayapalem

## 4. METHODOLOGY

### 4.1 VOLUME COUNT

Traffic volume are conducted to determine the number of vehicles and there movement according to class of vehicles at a selected locations. Two methods are used for conduction traffic volume count.

#### A . MANUAL DATA COLLECTION

Manual counts are used when automated equipment is not available. Interval used for manual counting is 15, 30 & 60 minutes. This method is rarely use.

### 5. DATA COLLECTION

(Traffic data of Saturday (22/02/2025))

the following are graphs which shows the daily hour wise traffic volume data in PUC

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	898	160	800	119	554	118	3601.4
09 - 10	889	152	802	140	526	68	3531.6
10 - 11	868	147	720	129	507	63	3602
11 - 12	889	80	400	119	498	53	2931.1
12 - 01	786	107	407	115	495	44	2879.9
01 - 02	729	80	400	121	461	48	2708
02 - 03	678	89	400	127	434	38	2616
03 - 04	698	167	400	125	409	82	2605.5
04 - 05	785	253	400	131	465	119	2934.4
05 - 06	968	97	520	138	425	116	2937.3
06 - 07	889	172	802	140	526	68	3546.7
					<b>Total</b>		33893.9

(Traffic data of Sunday (23/02/2025))

Table 3.2.2

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	802	138	800	115	548	47	3491.8
09 - 10	891	154	800	128	464	66	3287.5
10 - 11	858	128	720	119	471	63	3174.3
11 - 12	817	102	400	123	479	51	2847.7
12 - 01	757	80	400	113	468	43	2737.1
01 - 02	727	88	400	117	456	40	2695.3
02 - 03	693	132	400	113	470	48	2755.3
03 - 04	795	115	400	119	413	80	2612.3
04 - 05	855	92	500	127	437	112	2832.4
05 - 06	955	145	525	135	407	84	2856.8
06 - 07	727	93	400	117	456	40	2699.3
					<b>Total</b>		31980.8

(Traffic data of Monday (24/02/2025))

Table 3.2.3

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	968	210	1000	117	507	99	3881.9
09 - 10	907	183	1050	140	585	68	4018.5
10 - 11	893	112	950	129	545	53	3688
11 - 12	858	97	600	123	491	55	3106.8
12 - 01	769	115	575	107	472	38	2946.5
01 - 02	731	110	550	119	466	40	2939.5
02 - 03	711	82	525	127	434	49	2754.3
03 - 04	805	63	500	125	409	78	3675
04 - 05	875	123	700	131	465	84	4795.9
05 - 06	965	149	1002	137	425	119	3425
06 - 07	769	102	575	107	472	38	2936.1
					<b>Total</b>		38167.5

(Traffic data of Tuesday (25/02/2025))

Table 3.2.4

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	908	200	1000	128	547	119	3928.4
09 - 10	898	222	1030	127	515	69	3798.9
10 - 11	768	190	950	116	493	61	3289.9
11 - 12	698	120	600	118	491	49	3179.6
12 - 01	691	115	575	128	472	47	2955
01 - 02	678	88	528	119	466	42	3472.2
02 - 03	669	127	522	96	434	39	2696.1
03 - 04	657	144	500	113	413	87	2654.8
04 - 05	721	138	700	126	465	95	3264.6
05 - 06	958	150	1000	113	425	119	3358
06 - 07	898	89	1030	127	515	69	3645.9
					<b>Total</b>		36243.3

Traffic data of Wednesday (26/02/2025)

Table 3.2.5

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	629	150	1000	76	403	78	3027.3
09 - 10	713	143	1050	98	498	95	3498.5
10 - 11	856	127	950	131	531	73	3640.9
11 - 12	768	102	600	125	511	62	3145.5
12 - 01	665	79	575	124	498	43	3001.1
01 - 02	637	72	528	126	472	46	2842
02 - 03	511	83	522	117	463	39	2764.7
03 - 04	597	128	500	127	435	37	2703.54
04 - 05	627	93	700	117	417	49	3395.4
05 - 06	668	116	1000	119	486	29	2814.6
06 - 07	856	76	950	131	531	73	3600.1
					<b>Total</b>		34433.64

(Traffic data of Thursday (27/02/2025))

Table 3.2.6

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	759	210	1000	129	519	78	3663.4
09 - 10	717	190	1012	98	488	52	3458.1
10 - 11	698	190	950	95	485	36	3364.7
11 - 12	656	120	600	84	481	30	2898.3
12 - 01	466	115	575	78	472	32	2730
01 - 02	476	92	550	77	463	40	2631.9
02 - 03	488	57	137	71	445	48	2449.9
03 - 04	463	117	500	68	427	80	2485.4
04 - 05	498	72	700	53	467	112	2780.1
05 - 06	512	124	1000	48	471	84	2787.1
06 - 07	476	117	550	77	463	40	2679.2
					<b>Total</b>		31928.1

(Traffic data of Friday (28/02/2025))

Table 3.2.7

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	802	228	900	119	585	95	3813.7
09 - 10	782	146	1052	137	585	73	3309.8
10 - 11	745	137	950	126	545	62	3629.2
11 - 12	618	94	600	118	491	43	2971.1
12 - 01	638	63	575	128	472	37	2885.4
01 - 02	693	91	503	119	466	39	2882.9
02 - 03	793	118	525	128	434	37	2823.5
03 - 04	855	124	500	121	437	49	2832.2
04 - 05	955	76	700	126	465	33	3829.9
05 - 06	825	65	1000	134	498	115	3525.3
06 - 07	793	93	537	128	434	37	2819.4
					<b>Total</b>		32490.2

(Traffic data of Saturday (01/03/2025))

Table 3.2.8

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	875	119	767	119	554	118	3524.1
09 - 10	584	91	800	140	526	68	3327.4
10 - 11	640	112	720	129	507	63	3200.5
11 - 12	601	97	368	119	498	53	2761.5
12 - 01	586	86	404	115	495	44	2760.1
01 - 02	624	82	550	119	585	95	3256.9
02 - 03	592	63	400	137	585	73	3110.9
03 - 04	528	79	365	126	545	62	2889.3
04 - 05	628	91	400	118	491	43	2773.5
05 - 06	746	168	503	128	472	37	2951.4
06 - 07	601	97	368	119	498	53	2761.1
					<b>Total</b>		33316.7

(Traffic data of Sunday (02/03/2025))

Table 3.2.9

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	682	126	800	115	548	47	3422.2
09 - 10	665	83	652	128	464	66	2969.7
10 - 11	577	66	720	119	471	63	2984.2
11 - 12	638	99	400	123	479	51	2755.5
12 - 01	667	146	376	113	468	43	2721.5
01 - 02	1123	152	409	126	465	33	3003.4
02 - 03	1057	136	344	134	498	115	3042.1
03 - 04	796	125	400	128	457	112	2801.5
04 - 05	599	116	388	101	449	46	2583.2
05 - 06	624	194	500	95	407	31	2606.9
06 - 07	638	99	400	123	479	51	2755.5
					<b>Total</b>		31645.7

(Traffic data of Monday (03/03/2025))

Table 3.2.10

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	502	184	1000	117	507	99	3450.9
09 - 10	856	236	900	140	585	68	3886.9
10 - 11	773	158	967	129	545	53	3682.8
11 - 12	908	135	600	123	491	55	3162.1
12 - 01	483	94	565	107	472	38	2776.7
01 - 02	456	108	542	84	481	30	2730.7
02 - 03	538	96	592	78	472	32	2767.8
03 - 04	412	85	500	77	463	40	2571.9
04 - 05	652	124	700	71	445	48	2848.5
05 - 06	343	72	1000	68	427	80	2889.2
06 - 07	412	85	500	77	463	40	2571.9
					<b>Total</b>		33339.4

(Traffic data of Tuesday (04/03/2025))

Table 3.2.11

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	348	83	967	128	547	119	3427.3
09 - 10	58	86	1050	127	515	69	3243.5
10 - 11	529	91	950	116	493	61	3280.2
11 - 12	516	118	600	118	491	49	2940.3
12 - 01	623	121	588	128	472	47	2939.3
01 - 02	329	93	550	61	421	40	2404.6
02 - 03	648	116	532	95	407	31	2588.5
03 - 04	652	107	500	76	403	78	2505.5
04 - 05	598	128	700	98	498	95	3079.0
05 - 06	433	98	1000	131	531	73	3456.2
06 - 07	648	116	532	95	407	31	2588.5
					<b>Total</b>		32452.9

(Traffic data of Wednesday (05/03/2025))

Table 3.2.12

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	623	118	1000	76	403	78	2999.2
09 - 10	329	69	700	98	498	95	2897.3
10 - 11	970	253	500	131	531	73	3349.7
11 - 12	1007	167	532	125	511	62	3245.0
12 - 01	730	141	550	124	498	43	3082.2
01 - 02	549	135	588	117	463	39	2856.2
02 - 03	572	108	600	127	435	37	2781.7
03 - 04	413	97	950	117	417	49	2961.8
04 - 05	359	85	1050	119	486	29	3266.1
05 - 06	453	128	967	128	498	115	3343.5
06 - 07	549	135	588	117	463	39	2925.9
					<b>Total</b>		33708.6

(Traffic data of Thursday (06/03/2025))

Table 3.2.13

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	680	127	500	129	519	78	3057.5
09 - 10	550	102	388	98	488	52	2678.6
10 - 11	634	138	400	95	485	36	2741.1
11 - 12	591	112	344	84	481	30	2603.4
12 - 01	447	88	409	78	472	32	2533.9
01 - 02	376	63	376	127	515	69	2700.1
02 - 03	563	144	400	116	493	61	2789.6
03 - 04	668	150	720	118	491	49	3162.9
04 - 05	600	143	652	128	472	47	3009.4
05 - 06	567	127	800	119	466	42	3086.3
06 - 07	623	118	1000	76	403	78	2834.5
					<b>Total</b>		31197.3

(Traffic data of Friday (07/03/2025))

Table 3.2.14

Time	2W	3W	Car	LCV	HMV	Non-motorised Vehicles	PCUs/hr
08 - 09	410	83	409	119	585	95	3008.7
09 - 10	536	128	720	137	585	73	3453.9
10 - 11	644	93	376	126	545	62	2969.5
11 - 12	695	124	344	118	491	43	2777.5
12 - 01	675	111	388	128	472	37	2755.3
01 - 02	587	101	400	113	425	119	2534.2
02 - 03	395	115	652	128	409	94	2673.4
03 - 04	405	119	558	107	411	48	2539.2
04 - 05	549	92	503	101	398	46	2475.5
05 - 06	525	57	368	128	547	119	2896.0
06 - 07	567	127	800	119	466	42	3085.8
					<b>Total</b>		28668.9

## 6. DELAY ANALYSIS

Traffic delay refers to the extra time spent by vehicles traveling on a road compared to the time it would take under free-flow conditions. It occurs due to factors such as congestion, traffic signals, accidents, road maintenance, or poor road conditions.

Delay Vehicle per minute

Delay Vehicle per minute value as per IRC for different vehicle which is shown in Fig.No.13 delay time for vehicles for non-motorised, 2W, 3W, Car, LCV, HMV are 32.5, 5.9, 29.3, 5.6, 23.5.

Traffic Volume Distribution by Vehicle Type

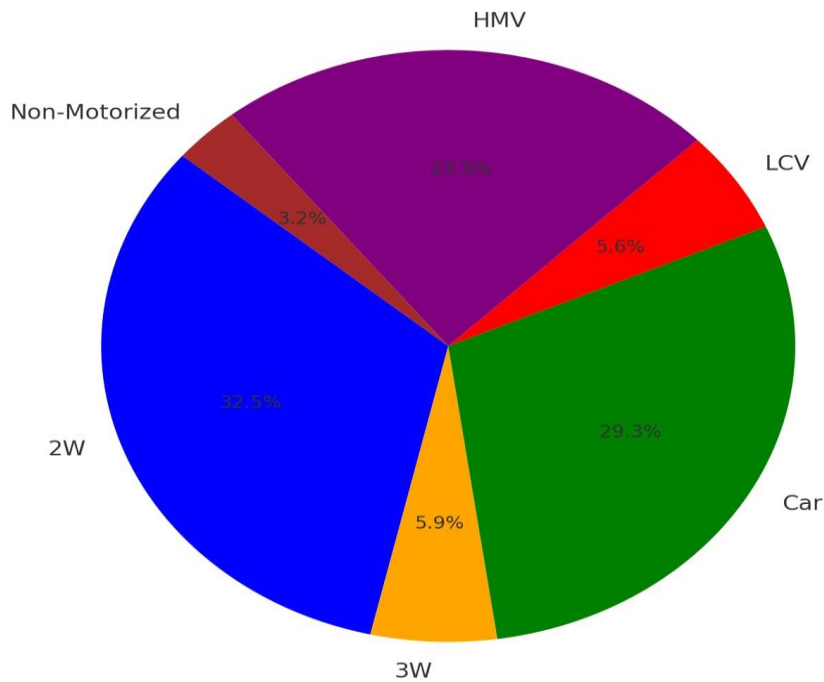


Table 5.3.2 Delay in vehicle per hour (day-1)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	7788	326	586.8	15.3
3W	1332	111	266.4	30.4
CAR	5249	442	618.8	30.7
LCV	1264	159	222.6	45.1
HMV	4774	1203	76992	92.0
NON-MOTORISED	749	30	-	-
TOTAL	21156	2527	78686.6	214.3

Table 5.3.3 Delay in vehicle per hour (day-2)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	8877	478	860.4	19.6
3W	1267	109	261.6	31.4
CAR	5545	596	834.4	39.2
LCV	1326	314	439.6	86.2
HMV	5169	1221	18.144	86.2
NON-MOTORISED	674	14	-	-
TOTAL	22858	2732	80144	262.8

Table 5.3.4 Delay in vehicle per hour (day-3)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	8251	433	779.4	19.2
3W	134	114	273.6	30.9
CAR	8027	842	1178.8	38.3
LCV	1262	292	408.8	84.4
HMV	4871	1125	72000	84.2
NON-MOTORISED	721	15		
TOTAL	24478	2923	74640.6	2569

Table 5.3.5 Delay in vehicle per hour (day-4)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	8304	430	774	18.9
3W	1583	132	316.8	30.4
CAR	8435	874	1223.6	378
LCV	1311	297	415.8	82.7
HMV	5236	1192	76288	83.1
NON-MOTORISED	796	18	-	-
TOTAL	24665	2944	79081.2	252.9

Table 5.3.6 Delay in vehicle per hour (day-5)

Type of vehicle	No of vehicles	Delays in terms of PCU/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	7137	386	694.8	19.7
3W	1169	101	242.4	31.5
CAR	8375	968	1271.2	39.6
LCV	1289	368	431.2	87.2
HMV	5245	1249	79936	86.9
NON-MOTORISED	624	15	-	-
TOTAL	24839	2967	82575.6	264.9

Table 5.3.7 Delay in vehicle per hour (day-6)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	5209	272	489.6	19.1
3W	1344	112	268.8	30.4
CAR	7574	796	1114.4	38.4
LCV	878	202	282.8	84.0
HMV	5191	1199	76.736	84.3
NON-MOTORISED	532	10	-	-
TOTAL	27728	2595	78891.6	256.2



Table 5.3.8 Delay in vehicle per hour (day-7)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	8499	468	842.21	20.1
3W	1235	108	259.2	31.9
CAR	7792	856	1201.2	402
LCV	1384	335	469	88.3
HMV	5412	1314	84096	88.6
NON-MOTORISED	619	12	-	-
TOTAL	25941	3098	86867.8	269.1

Table 5.3.9 Delay in vehicle per hour (day-8)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	7005	366	658.8	19.1
3W	1025	86	206.4	30.6
CAR	5645	589	824.6	38.1
LCV	1369	315	441	84.0
HMV	5756	1320	84480	83.7
NON-MOTORISED	709	13	-	-
TOTAL	22509	2689	86610.8	255.5

Table 5.3.10 Delay in vehicle per hour (day-9)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	8066	423	761.4	19.1
3W	1342	114	273.6	31.0
CAR	4989	524	733.6	38.3
LCV	1285	297	415.8	84.3
HMV	5257	6213	77632	84.02
NON-MOTORISED	658	13	-	-
TOTAL	21527	2580	79816.4	257.0

Table 5.3.11 Delay in vehicle per hour (day-10)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	6335	322	579.6	18.6
3W	1377	121	2664.4	29.4
CAR	6866	696	974.4	37.0
LCV	1071	240	336	81.8
HMV	5351	1196	76554	81.6
NON-MOTORISED	583	13	-	-
TOTAL	21583	2577	78700.4	248.4

Table 5.3.12 Delay in vehicle per hour (day-11)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	5382	291	523.8	19.7
3W	1160	100	240	31.5
CAR	6969	757	1059.8	39.7
LCV	1173	281	393.4	87.5
HMV	5185	1239	79.296	87.1
NON-MOTORISED	693	15	-	-
TOTAL	21562	2575	81513	265.5

Table 5.3.13 Delay in vehicle per hour (day-12)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	6555	336	604.8	18.7
3W	1436	116	278.4	29.5
CAR	7025	720	1008	37.4
LCV	1279	288	403.2	82.1
HMV	5203	1172	75008	82.1
NON-MOTORISED	651	13	-	-
TOTAL	22157	2646	773024	249.8

Table 5.3.14 Delay in vehicle per hour (day-13)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	6299	318	572.4	18.4
3W	1312	106	254.4	29.5
CAR	5989	601	841.4	36.6
LCV	1168	259	3626	81.0
HMV	5285	1170	74880	80.8
NON-MOTORISED	574	12	-	-
TOTAL	20627	2664	76910.8	246.3

Table 5.3.15 Delay in vehicle per hour (day-14)

Type of vehicle	No of vehicles	Delays in terms of pcu/hr	Delays in hours of passenger	Delay in hours per passenger per year
2W	5988	4080	7344	248.7
3W	1250	1360	3264	397.0
CAR	5718	7758	10861.2	495.0
LCV	1404	4212	5896.8	1094.7
HMV	5196	15558	995712	1092.6
NON-MOTORISED	778	199	-	-
TOTAL	20334	311689	1022078	33270

## 7. FUEL CONSUMPTION

Fuel	Litres/year	Rs / litre	Amount in rupees per year
Petrol	21,602.8	105	10,369,235.1
Diesel	4,020.6	95	1,746,241.55
Total			12,115,476.6/year

## 8. RESULTS

- **Traffic Volume Assessment:** The investigation determined that the corridor from Maddilapalem to Pothinamallayapalem along NH-16 exhibits a substantial traffic volume, with a peak Passenger Car Unit (PCU) value of 4795.9 PCU/hr recorded during the study period.
- **Temporal Distribution of Peak Flows:** Data analysis revealed distinct peak traffic periods, predominantly occurring between 08:00–09:00 and 16:00–17:00 across the surveyed days from 22 February to 7 March 2025. The maximum traffic intensity was observed on 24 February 2025 (Monday) at 04:00–05:00, reflecting variability influenced by daily activity patterns.
- **Delay Quantification:** The study quantified vehicular delays attributable to traffic signals and congestion, with an average delay of 1556.202 PCU/hr for heavy motor vehicles (HMTVs) and a cumulative passenger delay of 99,596.92 hours per day for HMTVs alone. Annualized delay estimates indicate an average of 214.3 hours per passenger per year, highlighting significant time losses in the transport network.
- **Fuel Consumption and Economic Impact:** Results indicate an annual idle fuel consumption of 98,757.62 liters of petrol and 18,381.49 liters of diesel due to congestion-induced idling. This translates to an economic cost of approximately INR 12,115,476.6, calculated at prevailing fuel rates (INR 105/liter for petrol and INR 95/liter for diesel), emphasizing the fiscal burden of inefficient traffic flow.

## 9. CONCLUSION

**High Traffic Congestion Identified:** The study reveals significant traffic congestion along the urban corridor from Maddilapalem to Pothinamallayapalem, a critical stretch on NH-16 in Visakhapatnam.

**Peak Hours Established:** The analysis identifies peak traffic hours as varying slightly day-to-day but predominantly occurring between 8:00 AM to 9:00 AM and 4:00 PM to 5:00 PM, with the highest recorded Passenger Car Unit (PCU) value reaching 4795.9 PCU/hr.

**Significant Delays Due to Signals:** Traffic signals contribute substantially to delays, with vehicles experiencing extra travel time compared to free-flow conditions. The study quantifies this delay, noting an average delay of 214.3 hours per passenger per year on certain days.

**Fuel Wastage Quantified:** Congestion leads to considerable fuel wastage, estimated at 98,757.62 liters of petrol and 18,381.49 liters of diesel annually. This translates to an economic loss of approximately 12.1 million INR per year, calculated using fuel prices of 105 INR per liter for petrol and 95 INR per liter for diesel as of 2025.

**Proposed Improvements:** The study suggests improvements such as optimizing signal timing, enhancing traffic management strategies, and potential infrastructural upgrades (e.g., overbridges at crossings) to reduce congestion, save fuel, and decrease travel delays. These measures aim to improve the Level of Service (LOS) and overall transportation efficiency.

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