

NATIONAL TRANSPORT RESEARCH CENTRE

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MULTI AXLE VEHICLE SURVEY

NTRC NO-63

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DEPUTY CHIEF

OCTOBER, 1982

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## I. INTRODUCTION

All traffic statistics in Pakistan classify goods vehicles in one category, viz trucks. There is no information about the type and size of trucks particularly distribution according to number of axles. Such information is essential for highway planning, design and maintenance policies. In fact, pavement designs are based on 18 Kip equivalent standard axle passes over the life of the road. For this purpose, mere volume counts are not sufficient. Additional information on axle loads and number and type of axles (single, tandem is also needed.

Information on axle loads of different types of goods vehicles has been collected by a country wide survey. Information regarding proportions of multi axle vehicles in the traffic stream was further needed.

Besides, the information on the proportion of multi axle vehicles was urgently required for the National Transport Plan Study being carried out by the JICA.

Accordingly, a small survey of multi axle vehicles was carried out by National Transport Research Centre. Primary tabulations were provided to the JICA Study Team immediately after the survey for their use for the National Transport Plan Study. The results of the survey are now presented in this report which, it is hoped, will be found useful by agencies concerned with highway planning, design and maintenance.

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## II. THE SURVEY

### Location

Three main points were selected on the main trunk route, viz. Jhelum Bridge in the North, Sadiqabad in the middle of the country where long distance traffic between Punjab and Sind passes and Karachi Super Highway in the South which is the busiest of all roads carrying port traffic.

### Time and Duration

The survey was carried out during May and June 1982. As the proportion of multi axle vehicles is very small, a relatively longer period of observation was called for for obtaining consistent results. Accordingly, 7 day continuous counts were taken at the selected places as follows:

### Time and Duration

S. No.	Location	Survey Dates	
		From	To
1.	Jhelum Bridge	15-5-82	21-5-82
2.	Sadiqabad (Kot Sabzal)	23-5-82	29-5-82
3.	Karachi Super Highway	31-5-82	7-6-82

### Vehicle Classification

Besides usual classification, goods vehicles were classified according to number of axle ranging from 2 to 5, 3 axle vehicles were further sub-divided into single and tandem and 4 axle vehicles into semi trailer and full trailer. Wagons and pickup were also separately classified.

The Pickups included medium size goods carrying vehicles and light commercial vehicles, (Suzuki Vans) the proportion of which has increased considerably in the recent past.

The full classification is given in Table 1 which gives 7 day average traffic volume at selected places. In other tabulations, trucks are combined into one category, wagons and Picks and Agricultural tractor and other vehicles are also combined together to simplify the data.

### Data Collection and Tabulation Method

The data was collected manually by means of tally sheets, maintaining hourly intervals. Thus in addition to the main data on proportion of multi axle vehicles, information has become available on hourly and weekly variations as well.

The data has been compiled manually. Tables are supplemented by graphs where they provide more clear vision.

### III. THE RESULTS

The results of the survey are contained in tables 1 to 11 and accompanying graphs which are given in the statistical appendix. A brief analysis of the data follows.

#### A. D. T.

7 day Average Daily Traffic was about 7 thousand vehicles at Jhelum Bridge, 3.1 thousand at Sadiqabad and 7.5 thousand at Karachi Super Highway. In terms of PUC's the volume at Jhelum, Sadiqabad and Karachi Super Highway was about 13, 9 and 20 thousands. Details according to type of vehicle may be seen in Table 1.

#### Traffic Composition

The proportion of trucks was 36.6% at Jhelum, 84.1% at Sadiqabad and 71.8% at Karachi Super Highway; average for the three places combined being 60%.

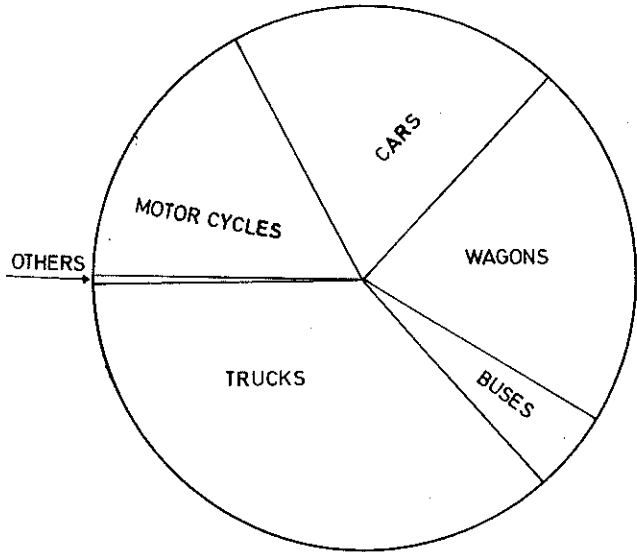
The lower proportion of trucks at Jhelum seems due to larger number of M/Cycles and Cars, which are 38% of total as compared to 5.5% at Sadiqabad and 14% at Karachi Super Highway. The larger proportion of M/Cycles and Cars at Jhelum is due to the existence of much local traffic at the survey point and proximity of other towns like Kharian, Lala musa etc.

Apart from Jhelum Bridge, Sadiqabad and Karachi Super Highway are dominated by truck traffic. Buses are only 4.7% at Jhelum Bridge, 6.5% at Sadiqabad 7.6% at Karachi Super Highway.

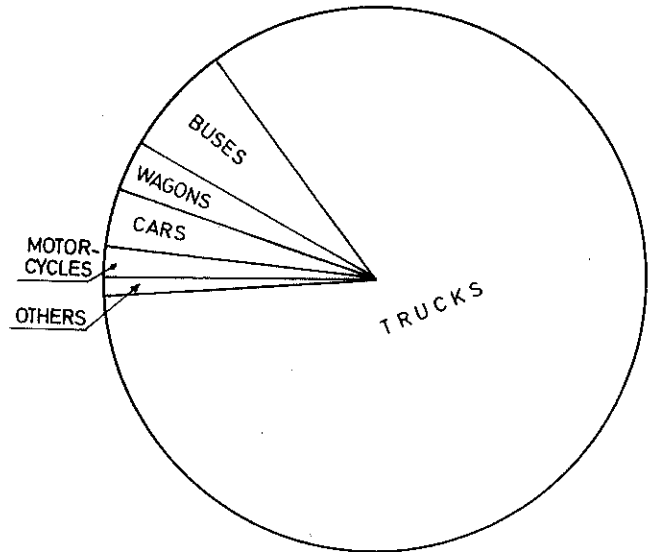


# COMPOSITION OF TRAFFIC

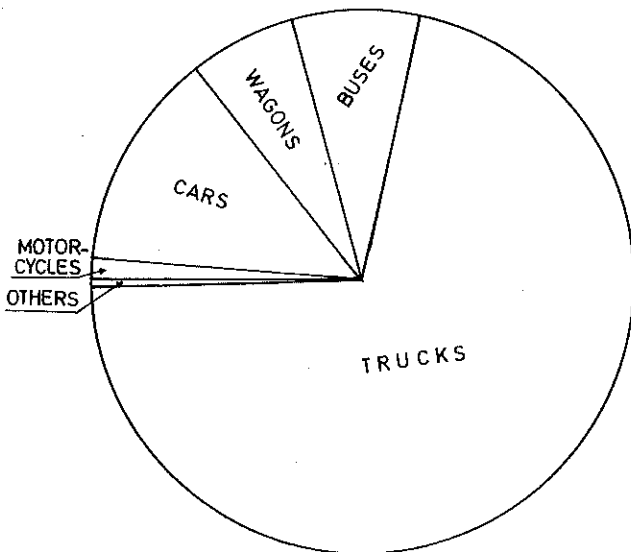
JHELUM



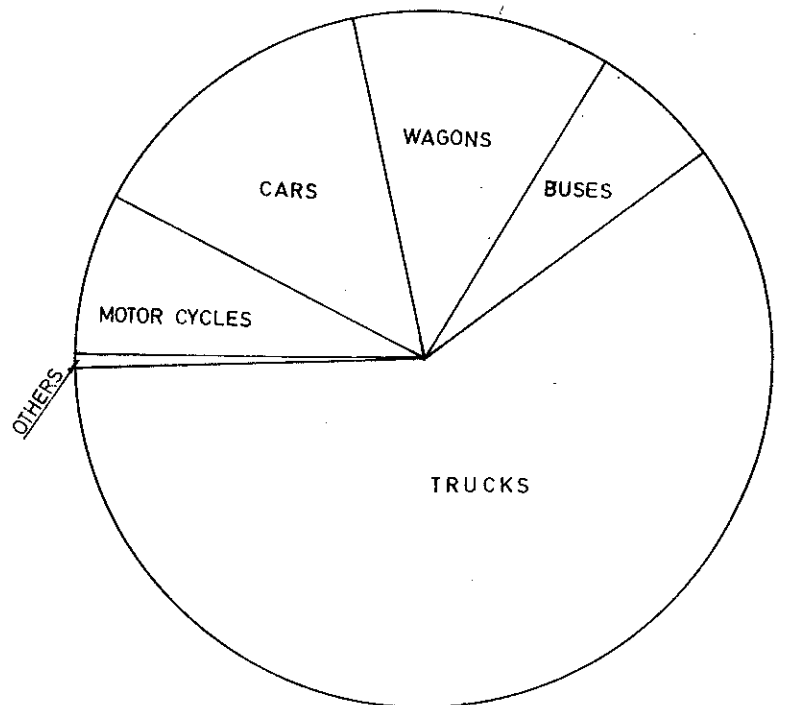
SADIQABAD



KARACHI



TOTAL





Further details may be seen in Table 2.

### Proportion of Multi Axle Vehicles

The distribution of Trucks according to number of axles is shown in Table 3. It would be seen therefrom that 2 Axle conventional trucks are 96% of the total. Of the remaining 4%, 3 Axle 1%, 4 Axle 2.8% and 5 Axle 0.2%. In 3 Axle category, 95% vehicles have single axles and only 5% have tandem axles. In the 4 Axle category, about 60% are semi trailer with tandem axles and 40% Truck Trailers with single axles. The tandem axles have nearly half the damaging effect of a single axle for a comparable load.

### Daily Variations

Variations according to days of the week are not much significant. All daily variations in vehicle types and three places are within  $\pm 10\%$  of average with only one exception for trucks which are 72% of average at Karachi on Friday and 73% at Sadiqabad on Saturday. The variations in passenger vehicles are similar to other vehicles at each place although the pattern at Sadiqabad is different from Jhelum and Karachi where passenger vehicles are less than average in the middle of the week on Monday, Tuesday and Wednesday and more than average on Thursday and Fridays. At Sadiqabad, buses are very close to average on all week days. However, the number of cars moves up and down and is higher than average on Sunday, Tuesday and Wednesday and

lower than average on Friday, Saturday and Monday. This is nearly opposite to variations at other places.

Variations in goods vehicles are opposite to passenger vehicles at both Jhelum and Karachi. The number of trucks is higher than average in the middle of the week when the number of passenger vehicles is less than average. On the other hand the number of trucks is lower on Fridays and Saturday when the passenger vehicles are higher than average. There are however, differences between places. The number of trucks is lowest at Karachi and Jhelum on Friday and at Sadiqabad on Saturday. It appears that variations at Karachi are realized at Sadiqabad with one days time lag.

Further details of week day variations for each vehicles type and location may be seen in Table 4,5 and graph 1.

#### Hourly Variations:

In general, passenger traffic is high at day time and low at night. Particularly, at mid-night, the number of passenger vehicles falls down to less than 20% of average at all places with one exception i.e. the number of buses at Jhelum bridge which are not as low as other passenger vehicles at the same place and all passenger vehicles at other places.

Cars have a bimodal peak at Karachi and Sadiqabad and one Peak at Jhelum. At Karachi Peak hours are 6 to 18 when the volume is more than 200% of the average. The second



Peak is in the morning at 7-9 hours when the traffic is 170% to 180% of the average. At Sadiqabad Peak hours are 11 to 15 in order of magnitude and at Jhelum 15 to 17. In the case of buses, variations during day time are not as much as for cars, although the pattern is similar.

In the case of trucks, variations are opposite to passenger traffic at Jhelum and Karachi but not at Sadiqabad where variations in trucks are similar to passenger traffic. The contrast between passenger and goods traffic is more clear and pronounced at Jhelum than at Karachi. At Jhelum, the lowest number of trucks is between 40 and 50% of average from 6 to 13 hours and continuously increases to 195% of average at 24 hours. Perhaps, vehicles intend to arrive early moving at the next destination, Rawalpindi. At Karachi the variations are within  $\pm 30\%$ . However, at Sadiqabad the pattern of goods traffic is similar to passenger traffic. The number of trucks are relatively higher during day and lower at night.

Details of Hourly traffic at three places in absolute numbers and percentage terms are contained in Tables 6 to 11. Graphs 2 to 4 give a more clear view of hourly variations for cars, buses and trucks at the three locations.

IV. CONCLUSION

The obvious conclusion to be drawn is that traffic composition and patterns can vary at different places and therefore each place needs to be looked into for its composition and patterns.

The proportion of goods vehicles was 36.6% at Jhelum, 71.8% at Karachi and 84.1% at Sadiqabad. Multi Axle Vehicles are 2.7%, 3.4% and 5% of Trucks at Jhelum, Sadiqabad and Karachi respectively.

Variations over week days are not pronounced and are within  $\pm 15\%$  of average with one exception i.e. trucks which are 72% average at Karachi on Friday and at Sadiqabad on Saturday.

Hourly variations in passenger traffic are different from goods traffic. Passenger traffic is higher at day time and low at night. Particularly after mid-night number of passenger vehicles falls down to less than 20% of average. Variations in goods traffic are opposite to passenger traffic at both Karachi and Jhelum but similar to passenger traffic at Sadiqabad. The contrast between passenger and goods traffic is pronounced at Jhelum where the number of trucks is 40 to 50% average during day time increasing to 195% above average at mid night. At Karachi the variations are within  $\pm 30\%$  of average.

V. STATISTICAL APPENDIX

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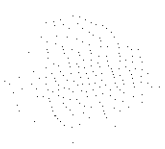


Table 1

7 DAY AVERAGE TRAFFIC VOLUME  
AT SELECTED POINTS

<u>S.No.</u>	<u>Type of Vehicle</u>	<u>Jhelum</u>	<u>Sadiqabad</u>	<u>Karachi</u>	<u>Total</u>	<u>PUC's</u>
1.	Motor Cycles	1194	55	78	1327	663
2.	Cars, Jeeps, Taxi	1355	118	974	2447	2447
3.	Wagons, Mini bus	540	21	85	646	969
4.	Pickup	989	68	405	1462	2193
5.	Bus	326	206	565	1097	3291
6.	<u>TRUCKS</u>	<u>2556</u>	<u>2649</u>	<u>5374</u>	<u>10579</u>	<u>31737</u>
	i) 2 Axle	(2486)	(2560)	(5106)	(10152)	(30456)
	ii) <u>3 Axle</u>					
	(a) Single	(44)	(26)	(31)	(101)	(303)
	(b) Tandem	(3)	(1)	(2)	(6)	(8)
	iii) <u>4 Axle</u>					
	(a) Semi Trailer	(18)	(52)	(136)	(206)	(618)
	(b) Full Trailer	(1)	(1)	(93)	(95)	(285)
	iv) 5 Axle	(5)	(9)	(6)	(20)	(60)
7.	Agricultural Tractor	19	17	2	38	114
8.	Other	2	14	8	24	72
	TOTAL:	6982	3148	7491	17621	41487
	PUC's	12954	8937	19595	41486	



Table 3

DISTRIBUTION OF TRUCKS ACCORDING TO NUMBER OF AXLES AT SELECTED PLACES

S. No.	Axle Type	Jhelum		Sadiqabad		Karachi		Total	
		Nos.	%	Nos.	%	Nos.	%	Nos.	%
1.	2 Axle	2486	97.3	2560	96.6	5106	95.0	10152	96.0
2.	3 Axle	47	1.8	27	1.0	33	0.6	107	1.0
	i) Single	44	1.7	26	1.0	31	0.6	101	1.0
	ii) Tandem	3	0.1	1	..	2	..	6	..
3.	4 Axle	19	0.7	53	2.0	229	4.3	301	2.8
	i) Semi Trailer	18	0.7	52	2.0	136	2.5	206	1.9
	ii) Full Trailer	1	..	1	..	93	1.7	95	0.9
4.	5 Axle	5	0.2	9	0.3	6	0.1	20	0.2
TOTAL:		2556	100	2649	100.0	5374	100	10579	100

Tab. 4: VARIATIONS ACCORDING TO DAY OF THE WEEK

Location	Day	M/Cycle/ Scooter	Cars	Wagons	Buses	Trucks	Other	Total
Jhelum Bridge	Saturday	1307	1324	884	978	2414	26	6933
	Sunday	1238	1389	959	1059	2521	24	7190
	Monday	1147	1245	930	984	2729	22	7057
	Tuesday	1076	1254	754	901	2628	17	6630
	Wednesday	1184	1278	802	945	2589	25	6823
	Thursday	1301	1531	875	1044	2520	21	7292
	Friday	1106	1464	866	1010	2488	13	6947
	Average	1194	1355	867	989	2556	21	6982
Sadiq- abad	Saturday	48	109	104	199	1901	15	2376
	Sunday	48	127	95	209	2845	35	3359
	Monday	50	108	90	212	2827	28	3315
	Tuesday	59	126	78	207	2659	70	3199
	Wednesday	56	125	82	207	2744	19	3233
	Thursday	62	116	78	204	2634	23	3117
	Friday	64	115	96	205	2932	20	3432
	Average	55	118	89	206	2649	30	3147
Karachi Super Highway	Saturday	64	1045	463	584	5638	6	7850
	Sunday	60	988	485	568	5528	6	7635
	Monday	53	849	465	523	6075	13	7978
	Tuesday	49	856	488	538	5861	7	7799
	Wednesday	73	886	497	560	5274	20	7310
	Thursday	79	1127	553	599	5270	17	7645
	Friday	167	1066	478	580	3924	3	6218
	Average	78	974	490	565	5374	10	7491
Average	Saturday	473	826	484	587	3334	16	5720
	Sunday	449	835	513	612	3631	22	6061
	Monday	417	734	495	573	3877	21	6117
	Tuesday	395	745	440	549	3716	31	5876
	Wednesday	438	763	460	571	3536	21	5789
	Thursday	480	925	502	616	3475	20	6018
	Friday	446	882	480	598	3115	12	5532
	Average	442	816	482	587	3526	20	5873





Table 6

HOURLY VOLUME OF TRAFFIC JHELUM BRIDGE  
(7 DAYS AVERAGE)

<u>Time</u>	<u>M/Cycle (1)</u>	<u>Car (2)</u>	<u>Wagons (3)</u>	<u>Busés</u>	<u>Trucks</u>	<u>Other</u>	<u>Total</u>
0100	10	102	151	273	1087	3	1626
0200	3	73	130	238	878	1	1323
0300	5	73	119	203	474	1	1184
0400	17	67	78	144	640	1	947
0500	102	185	114	175	511	4	1091
0600	284	319	211	235	516	2	1567
0700	624	486	227	307	454	6	2104
0800	679	520	231	378	418	7	2233
0900	648	510	305	396	379	11	2249
1000	622	563	295	383	325	8	2196
1100	573	555	293	436	313	7	2177
1200	614	559	352	388	341	8	2262
1300	490	530	377	408	395	14	2214
1400	448	507	339	384	515	3	2196
1500	453	565	332	366	574	11	2301
1600	543	756	392	404	695	10	2800
1700	539	760	404	344	763	10	2820
1800	595	656	418	292	858	17	2836
1900	540	482	355	207	1044	9	2637
2000	281	451	267	203	1096	4	2302
2100	153	288	246	175	1164	1	2027
2200	85	228	172	164	1339	4	1992
2300	28	135	135	179	1388	4	1869
2400	23	115	127	239	1449	2	1955
<b>Total:</b>	<b>8359</b>	<b>9485</b>	<b>6070</b>	<b>6920</b>	<b>17889</b>	<b>148</b>	<b>48872</b>

(1) Including Scooters & Rickshaws.

(2) Including Jeeps, Taxis.

(3) Including Mini buses & Pickups.

Table 7

HOURLY VOLUME OF TRAFFIC AT SADIQABAD  
( 7 DAY AVERAGE )

<u>Time</u>	<u>M/Cycle</u>	<u>Car</u>	<u>Wagons</u>	<u>Bus</u>	<u>Trucks</u>	<u>Others</u>	<u>Total</u>
0100	2	10	6	19	605	3	645
0200	-	7	15	11	485	1	519
0300	3	5	6	18	551	2	585
0400	1	12	10	24	547	1	595
0500	12	30	16	45	818	9	930
0600	28	40	16	82	774	9	949
0700	36	33	33	74	803	8	987
0800	27	55	43	108	827	62	1122
0900	32	40	29	115	962	5	1183
1000	25	47	46	95	988	7	1208
1100	24	70	38	93	1090	12	1137
1200	20	52	46	86	1082	7	1033
1300	20	29	35	71	746	9	910
1400	17	47	27	82	773	7	953
1500	22	40	30	82	795	11	980
1600	21	46	44	83	964	6	1167
1700	32	63	16	65	1122	9	1307
1800	26	54	40	96	902	12	1130
1900	16	37	34	62	808	19	976
2000	9	28	24	40	642	2	745
2100	7	25	19	22	665	5	743
2200	4	30	23	23	754	-	834
2300	-	12	11	21	661	3	708
2400	-	14	16	26	628	1	685
<b>Total:</b>	<b>387</b>	<b>826</b>	<b>623</b>	<b>1443</b>	<b>18542</b>	<b>210</b>	<b>22031</b>

Table 8

HOURLY VOLUME OF TRAFFIC AT KARACHI SUPER HIGHWAY  
(7 DAY AVERAGE)

<u>Time</u>	<u>M/Cycle</u>	<u>Car</u>	<u>Wagons</u>	<u>Buses</u>	<u>Trucks</u>	<u>Other</u>	<u>Total</u>
0100	2	70	64	55	1423	1	1615
0200	2	42	52	38	1518	6	1658
0300	1	37	52	38	1696	-	1824
0400	1	59	61	48	1758	1	1928
0500	5	142	113	57	1986	3	2306
0600	22	242	109	132	1946	1	2452
0700	38	381	130	147	1784	-	2480
0800	24	477	161	193	1499	-	2354
0900	37	493	168	212	1327	2	2239
1000	37	344	168	214	1359	5	2163
1100	27	301	186	214	1328	1	2057
1200	29	327	167	221	1359	4	2107
1300	25	256	159	223	1490	9	2162
1400	30	271	164	200	1409	3	2077
1500	32	268	146	203	1491	5	2145
1600	36	417	188	177	1476	6	2300
1700	37	534	254	249	1563	4	2641
1800	45	578	237	242	1472	6	2580
1900	51	538	206	215	1444	5	2459
2000	25	364	187	215	1573	5	2369
2100	19	252	161	210	1923	5	2570
2200	7	185	116	199	1608	-	2115
2300	10	142	103	139	1593	-	1987
2400	3	97	77	111	1559	-	1847
<b>Total:</b>	<b>545</b>	<b>6817</b>	<b>3429</b>	<b>3952</b>	<b>37620</b>	<b>72</b>	<b>52435</b>







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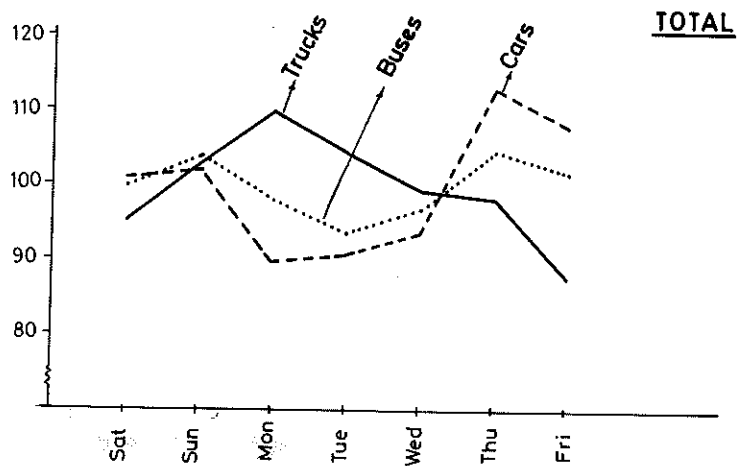
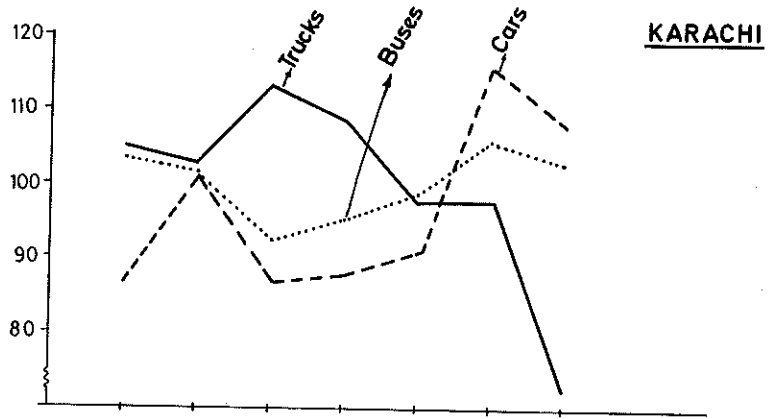
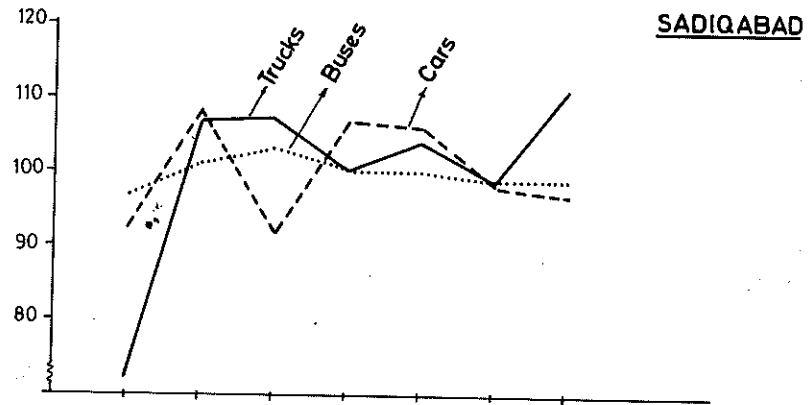
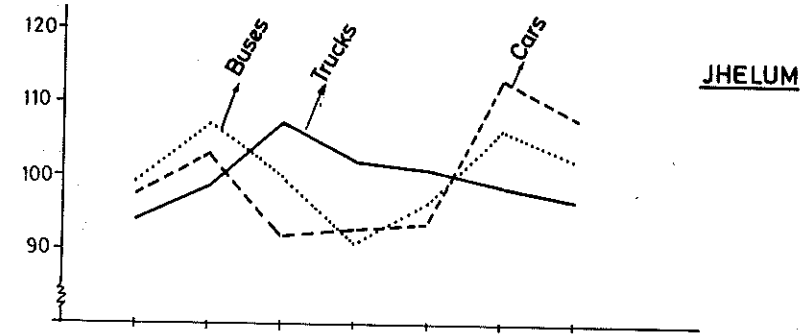
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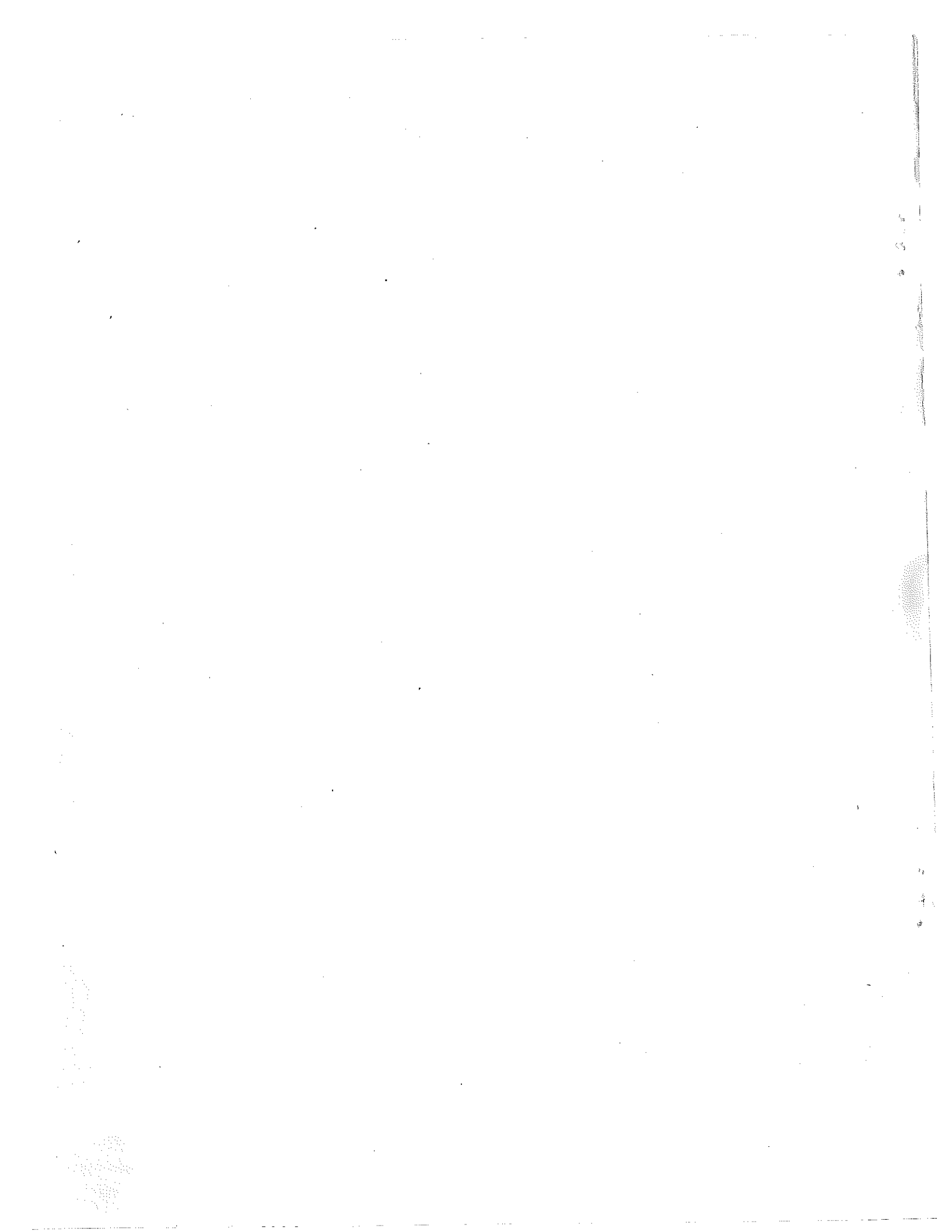
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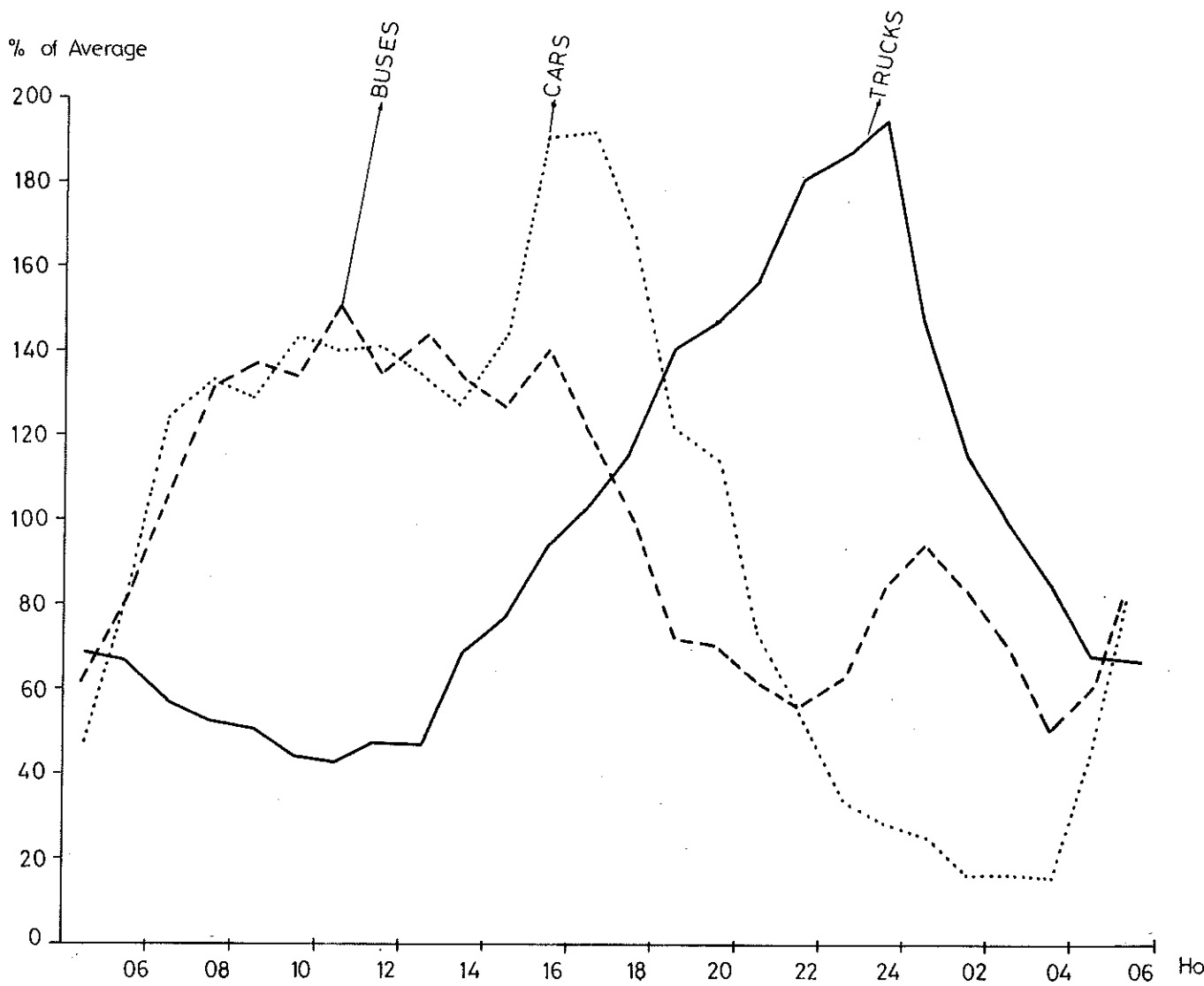
### VARIATIONS ACCORDING TO WEEK DAY

% of Average





# HOURLY VARIATIONS AT JHELUM BRIDGE

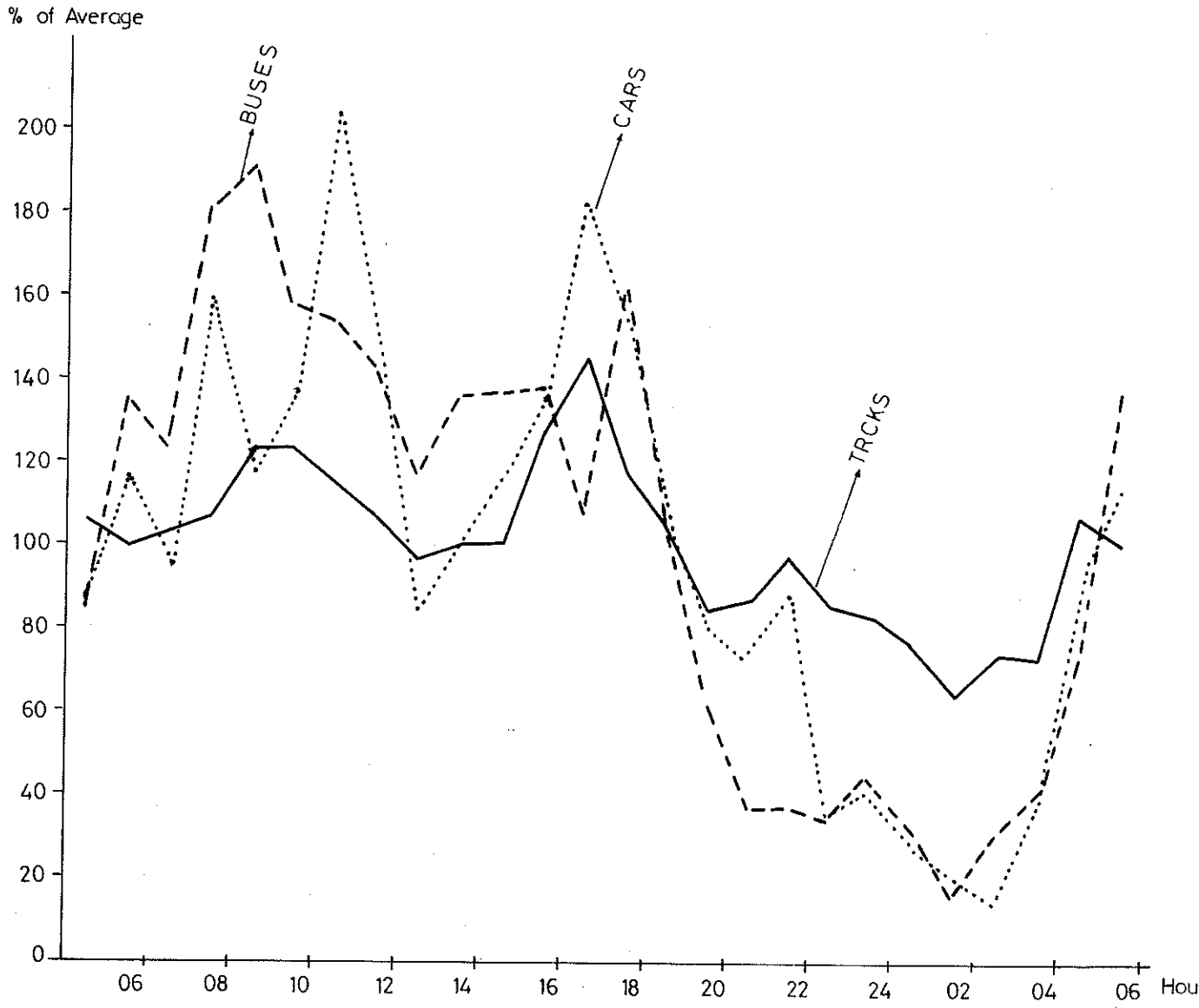


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# HOURLY VARIATIONS AT SADIQABAD





# HOURLY VARIATIONS AT KARACHI SUPER HIGHWAY

