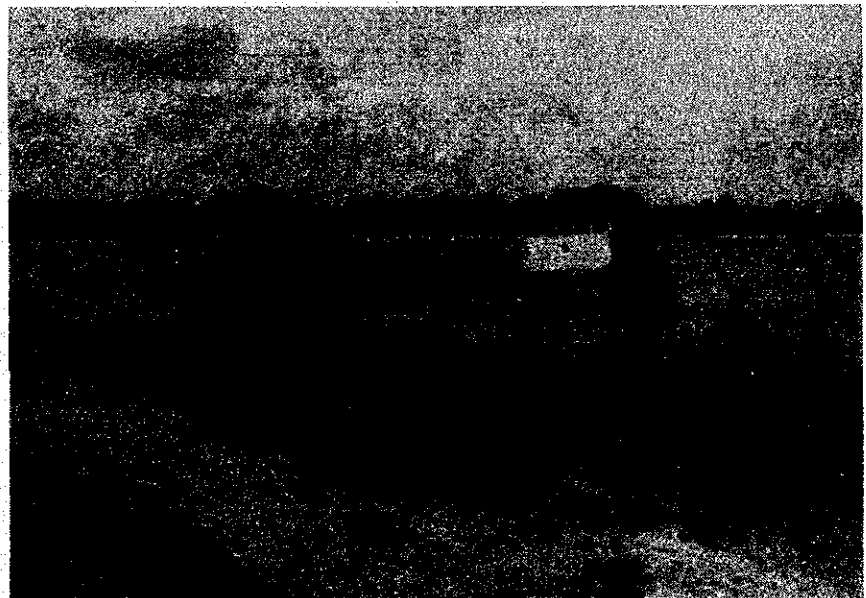


CHAPTER 3 TRAFFIC SURVEY AND ANALYSIS



CHAPTER 3 TRAFFIC SURVEY AND ANALYSIS

3.1 Method of Traffic Survey

3.1.1 Classification and Scope of Traffic Survey

In order to understand the characteristic of present traffic movement in Dar es Salaam and to prepare data necessary for future traffic demand forecast, the following traffic surveys were carried out.

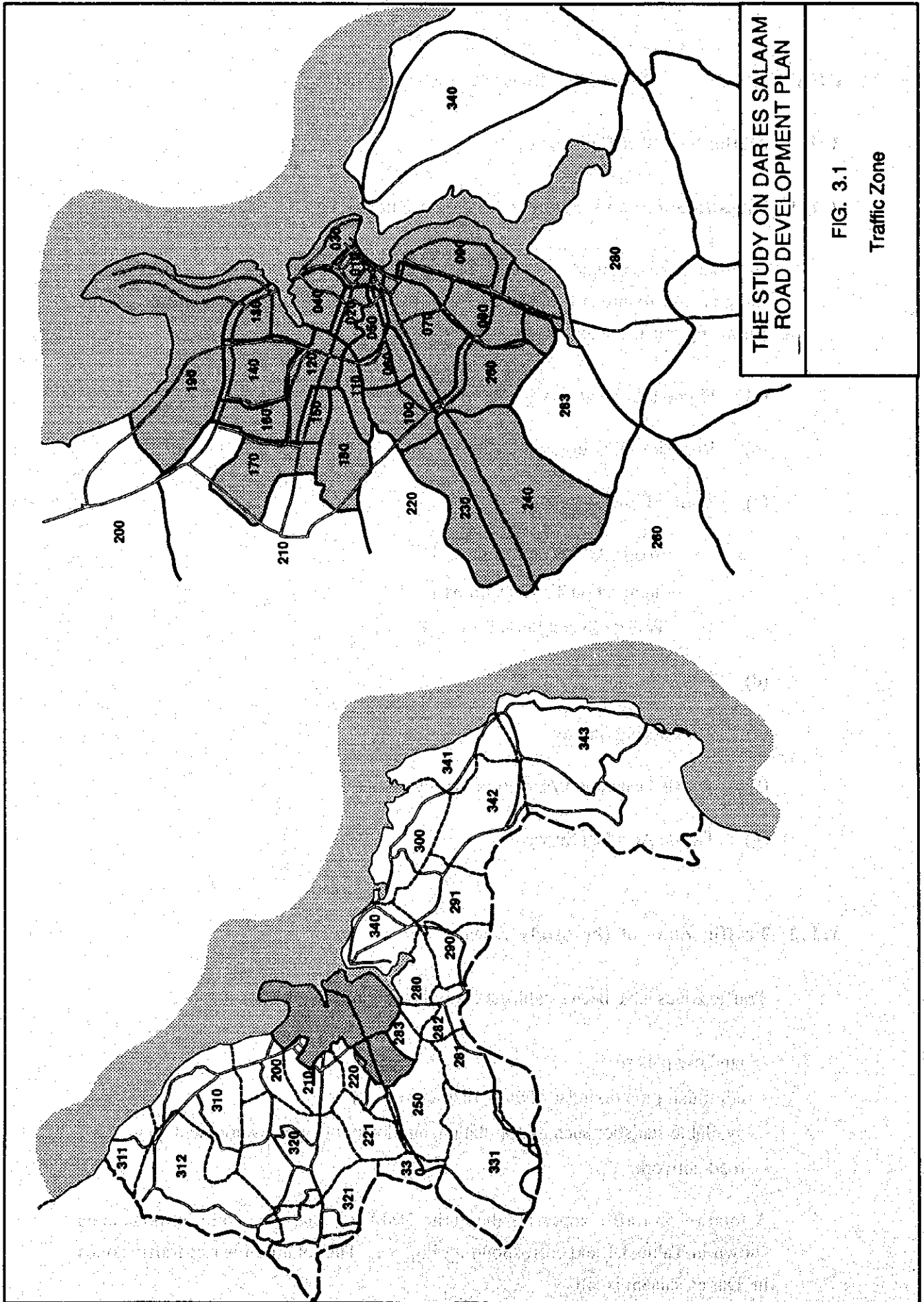
- (a) Home Interview survey (Person Trip Survey)
- (b) Roadside OD Survey
- (c) Traffic Flow Survey
 - Roadside Traffic Counts
 - Intersection Traffic Counts
 - Vehicle Speed Survey
- (d) Bus Terminal Survey
- (e) Car Parking Survey
- (f) Traffic Generation/Attraction Survey
- (g) Traffic Accident Survey

3.1.2 Traffic Zone of the Study Area

Traffic zones have been established based on the following consideration;

- land use pattern
- administration boundary (ward, district, region)
- available statistics such as population, employment, and development plans
- road network

A total of 55 traffic zones for the entire DSM regional area were introduced as shown in Table 3.1 and corresponding Fig. 3.1. The total number of traffic zones in Dar es salaam is 46.



THE STUDY ON DAR ES SALAAM
ROAD DEVELOPMENT PLAN

FIG. 3.1
Traffic Zone

Table 3.1 Traffic Zone in Dar es Salaam

Sequential No.	Zone Code	Ward(Area)
1	010	Kisutu, Mchafukoge
2	020	Kariakoo, Jangwani
3	030	Kivukoni
4	040	Upanga East, Upanga West
5	050	Mchikichini, Gerezani
6	060	Ilala
7	070	Keko
8	080	Migurani
9	090	Kurasini
10	100	Buguruni
11	110	Kigogo
12	120	Mzimuni, Ndugumbi, Magomeni
13	130	Kinondoni
14	140	Mwananyamala
15	150	Makurumla
16	160	Tandale
17	170	Manzese
18	180	Mabibo
19	190	Msasani
20	200	Kawe
21	210	Ubungo
22	220	Tabata
23	221	Kinyerezi
24	230	Vingunguti
25	240	Kipawa
26	250	Ukonga
27	260	Temeke 14
28	270	Mtoni
29	280	Mbagala
30	281	Chamazi
31	282	Charambe
32	283	Yombo Vituka
33	290	Toangoma
34	291	Kibada
35	300	Vijibweni
36	310	Kunduchi
37	311	Mbweni
38	312	Bunju
39	320	Goba
40	321	Kibamba
41	330	Pugu
42	331	Msongora
43	340	Kigamboni
44	341	Somagira
45	342	Kisarawe II
46	343	Kimbiji

In Dar es Salaam

Table 3.1 (Continued) Traffic Zone - Outside Dar es Salaam -

Sequential No.	Zone Code	District, Region, Country
47	350	Bagamoyo.
48	360	Kibaha.
49	370	Kisarawe.
50	380	Rufiji.
51	390	Mafia.
52	400	Zanzibar, Pemba Island.
53	410	Tanga, Arusha, Kilimanjaro, Kenya.
54	420	Morogoro, Dodoma, Tabora, Iringa, Mbeya, Rukwa, Kigoma, Shinyanga, Mara, Mwanza, Kagera, Zambia, Malawi, Mozambique, Zaire, Burundi, Rwanda, Uganda.
55	430	Lindi, Mtwara, Ruvuma.

3.1.3 Survey Area

All surveys were carried out in the Dar es Salaam Region except for the Home Interview Survey and Parking Condition Survey, which were carried out only in specific areas in Dar es Salaam.

- Home Interview Survey (Person Trip Survey).

The survey was carried out in urban area of Dar es Salaam, which is generally defined as the area bounded by Nelson Mandela Road and Mpakani Street.

- Parking Condition Survey.

The survey was carried out in central area of Dar es Salaam, which is generally defined as the area bounded by UWT road.

The traffic survey was conducted from the beginning of November to the middle of December 1993 as shown in Table 3.2. Weather conditions were not inclement and no adverse or detrimental events were encountered during the survey period, and traffic data obtained during the survey are deemed "Traffic in a Normal Day".

Table 3.2 Date of Traffic Survey

Survey	Date
Person Trip Survey	Nov. 15 - Dec. 2
Roadside OD Survey	Nov. 4 - Nov. 10
12hr Roadside Traffic Count	Nov. 4 - Nov. 22
24 hours Roadside Traffic Count	Nov. 5, 12, 19
1 week 12hr Roadside Traffic Count	Nov. 4 - Nov. 22
Intersection Traffic Count	Nov. 24 - Nov. 30
Vehicle Running Speed Survey	Nov. 9 - Nov. 15
Bus Terminal Survey	Nov. 22 - Nov. 29
Trip Generation/Attraction Survey	Nov. 22 - Nov. 23
Traffic Accident Survey	Nov. 25 - Dec. 10

3.1.4 Classification of Mode

Classification of transport modes is as follows;

- walking
- bicycle
- motorcycle
- passenger car (including taxi)
- light goods vehicle
- medium goods vehicle
- heavy goods vehicle
- mini bus
- bus
- others

3.2 Home Interview Survey (Person Trip Survey)

Person Trip Survey, obtained through home interviews, was carried out during November 16th -30th 1993. About 1.7% of the households (about 3,800 households) were selected using a systematic sampling technique. All family members in the selected households who were "deemed responsible for their behaviors" were interviewed. A sample survey sheet for the survey is attached in Appendix 3.1. The number of households for each traffic zone and the number of households interviewed are listed in Table 3.3.

Table 3.3 Number of Households Surveyed

Zone Code	Word(Area)	Number of households	Number of Household Interviewed
010	Kisutu, Mchafukoge	3,303	55
020	Kariakoo, Jangwani	5,407	39
030	Kivukoni	781	13
040	Upanga East, Upanga West	2,385	39
050	Mchikichini, Gerezani	4,929	81
060	Ilala	3,241	135
070	Keko	10,493	172
080	Miburani	16,793	276
090	Kurasini	5,781	95
100	Bugurumi	13,198	217
110	Kigogo	4,693	77
120	Mzimuni, Ndugumbi, Magomeni	18,101	297
130	Kinondoni	9,526	156
140	Mwananyamala	16,943	278
150	Makurumla	12,987	213
160	Tandale	13,380	220
170	Manzese	12,834	211
180	Mabibo	10,761	177
190	Msasani	10,839	178
200	Kawe	-	-
210	Ubungo	-	-
220	Tabata	-	-
221	Kinyerezi	-	-
230	Vingunguti	8,731	143
240	Kipawa	9,282	152
250	Ukonga	-	-
260	Temeke 14	22,271	366
270	Mtomi	9,745	160
280	Mbagala	-	-
281	Chamazi	-	-
282	Charambe	-	-
283	Yombo Vituka	-	-
290	Toangoma	-	-
291	Kibada	-	-
300	Vijibweni	-	-
310	Kunduchi	-	-
311	Mbweni	-	-
312	Bunju	-	-
320	Goba	-	-
321	Kibamba	-	-
330	Pugu	-	-
331	Msongora	-	-
340	Kigamboni	-	-
341	Somagira	-	-
342	Kisarawe II	-	-
343	Kimbiji	-	-
Total		226,350	3,800

3.3 Roadside OD Survey

A roadside OD Survey was conducted at 4 survey stations on major roads and at 1 ferry route (terminal) in Dar es Salaam as shown in Fig. 3.2. The survey was carried out over a 12 hour (6:00-18:00) on specified weekdays which were regarded as normal days of the week. Vehicles passing the survey points were stopped by traffic policemen and then interviewed about their origin, destination, purpose of trip, kind of commodity carried, income level and so on. A survey sheet for this survey is attached in Appendix 3.2. Approximately 15% of vehicles or one out every seven vehicles for each direction passing the survey points were interviewed. Approximately 80% of the vehicles which use the ferry were interviewed. The number of vehicles interviewed are shown in the Table 3.4.

Table 3.4: Sampling Rate of Roadside OD Survey

Road name	Number of Vehicle Interviewed	12hr Traffic Volume Counted	Sampling Rate
1. Bagamoyo Road	692	4,827	14.3%
2. Morogoro Road	850	4,417	19.2%
3. Pugu Road	664	3,636	18.3%
4. Kilwa Road	645	3,889	16.6%
5. Ferry	492	622	79.1%

3.4 Traffic Flow Survey

Traffic Flow Survey was carried out in order to analyze the actual road use patterns on major roads in Dar es Salaam. The survey consisted of following three sub-surveys:

- Roadside Traffic Counts
- Intersection Traffic Counts
- Vehicle Running Speed Survey

3.4.1 Roadside Traffic Counts

Roadside traffic counts were carried out at 55 points on major roads and streets in Dar es Salaam during November 4th - 22nd, 1993.

Location of survey points are indicated in Fig.3.2. These survey points are classified into following two categories:

Category A: Survey points which coincide with those of roadside OD survey (5 points)

Category B: Survey points where traffic counts were solely carried out. These are further classified into following three groups :

- 12 hours Traffic Counts (50 points)
- 24 hours Traffic Counts (3 points)
- 1 week 12 hours Traffic Counts (1 point)

Number of pedestrians, bicycles and vehicles which passed the survey points were counted by vehicle type, by time interval and by direction. 12hr Traffic Counts were conducted during 6:00 a.m. - 18:00 p.m. Survey forms are attached in Appendix 3.3.

Results of roadside traffic counts are listed in Table 3.5.

3.4.2 Intersection Traffic Counts

Intersection traffic counts were conducted at 20 major intersections in Dar es Salaam during November 22nd - 30th, 1993. Locations of survey points are shown in Fig. 3.2. Pedestrians and vehicles which passed the intersections were counted as per direction as shown in Appendix 3.4.

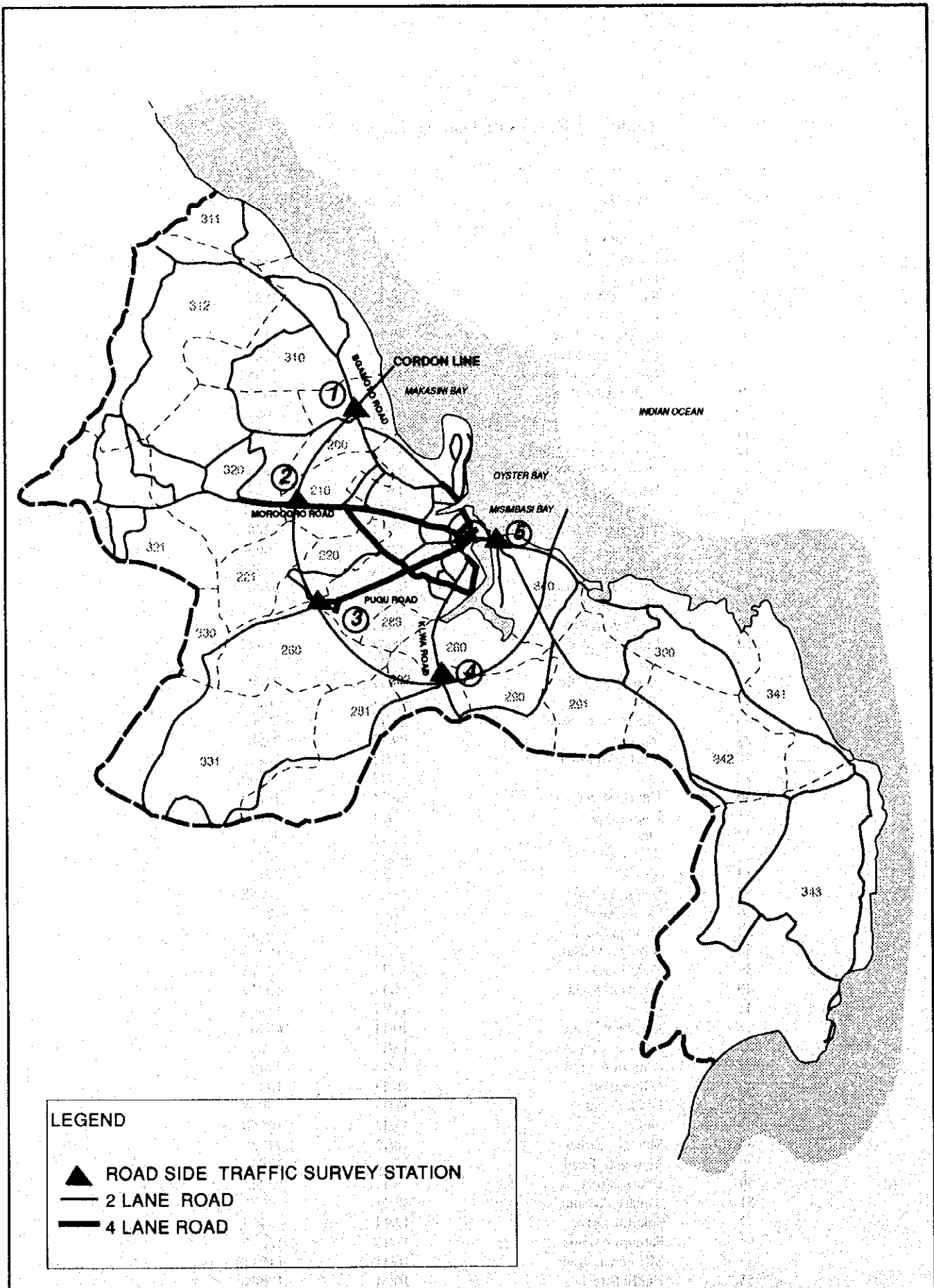
The survey was conducted at 12 intersections in the city center during two shifts; one from 7:00 to 9:00, and the other from 16:00 to 18:00. An additional survey, from 12:00 to 14:00, was also carried out.

3.4.3 Vehicle Running Speed Survey




A vehicle running speed survey was carried out along ten (10) routes within the city as indicated in Fig. 3.4. The survey was conducted from November 9th -15th, 1993. The surveys were carried out 4 times for each route, at 7:00, 10:00, 15:00 and 17:00, respectively.

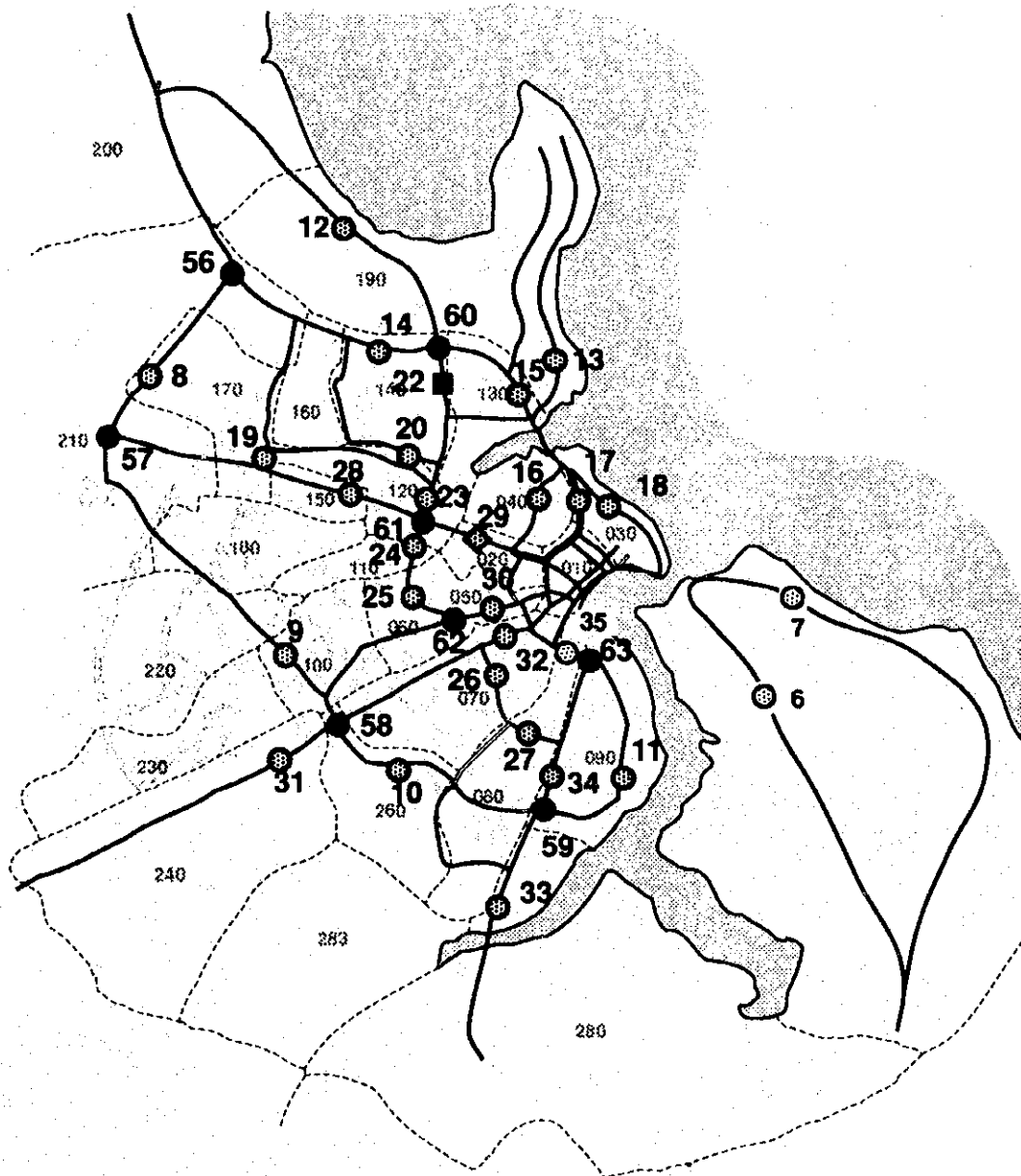
Table 3.5 Results of 12hr Traffic Counts

Station No.	Road Name	Survey Date	Vehicle Counted
1	Bagamoyo Road	04/11	4380
2	Morogoro Road	05/11	4417
3	Pugu Road	08/11	3636
4	Kilwa Road	09/11	3887
5	Ferry	10/11	621
6	Mwongozo Road	10/11	106
7	Mjimwema Road	10/11	189
8	Mpakani Road	05/11	5885
9	Port Access Road	08/11	14858
10	-do-	08/11	7094
11	-do-	11/11	4514
12	Old Bagamoyo Road	04/11	5233
13	Haile Selasie Road	04/11	6159
14	Bagamoyo Road	04/11	13272
15	-do-	04/11	15308
16	United Nation Road	22/11	8328
17	Upanga Road	22/11	16666
18	Ocean Road	22/11	12494
19	Shekilango Road	05/11	6186
20	Mwinjuma Road	15/11	2635
21	Kinondoni Road	22/11	8517
22	Morocco Road	05/11	10424
23	-do-	15/11	12892
24	New Kigogo Road	15/11	7760
25	-do-	08/11	9655
26	Chang'ombe Road	09/11	7996
27	-do-	09/11	2968
28	Morogoro Road	15/11	10113
29	-do-	12/11	21047
30	Uhuru Street	16/11	13294
31	Pugu Road	08/11	17212
32	-do-	11/11	30413
33	Kilwa Road	09/11	5220
34	-do-	09/11	8916
35	Bandari Road	11/11	14888
36	Ocean Road	22/11	1844
37	Upanga Road	18/11	20512
38	Morogoro Road	17/11	19475
39	Pugu Road	11/11	22723
40	Gerezani Road	11/11	10812
41	-do-	12/11	13268
42	Kivukoni Front	10/11	6596
43	Sokoine Drive	18/11	6520
44	Samora Avenue	10/11	3749
45	Ohio Street	18/11	10326
46	UWT Street	18/11	20927
47	-do-	17/11	16240
48	Maktaba Street	18/11	9475
49	Morogoro Road	17/11	10844
50	Uhuru Street	16/11	9324
51	Samora Avenue	12/11	10075
52	Sokoine Drive	12/11	16235
53	Samora Avenue	12/11	12046
54	Msimbazi Street	16/11	11955
55	Uhuru Street	16/11	10384



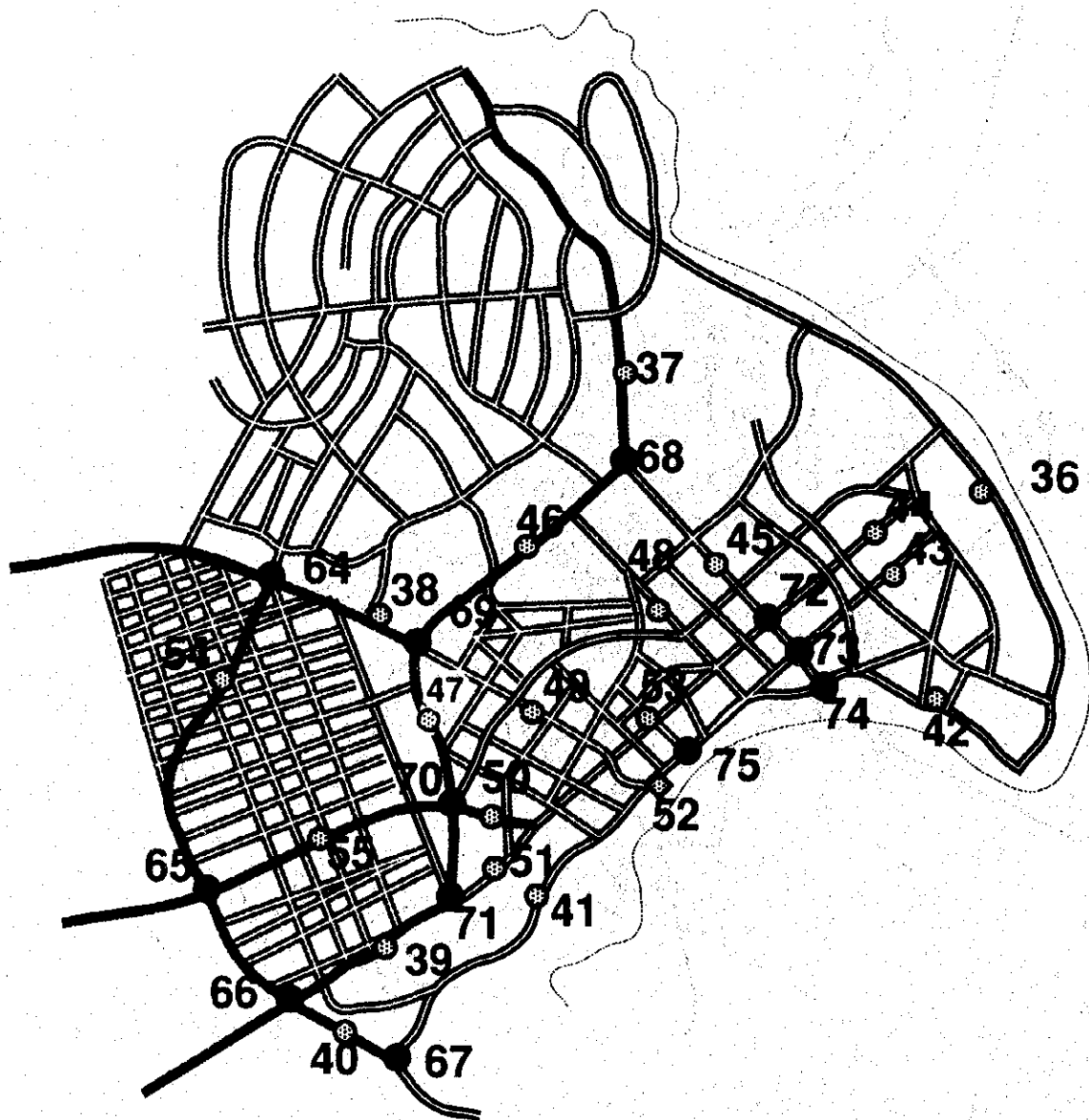
LEGEND

-  ROAD SIDE TRAFFIC SURVEY STATION
-  2 LANE ROAD
-  4 LANE ROAD



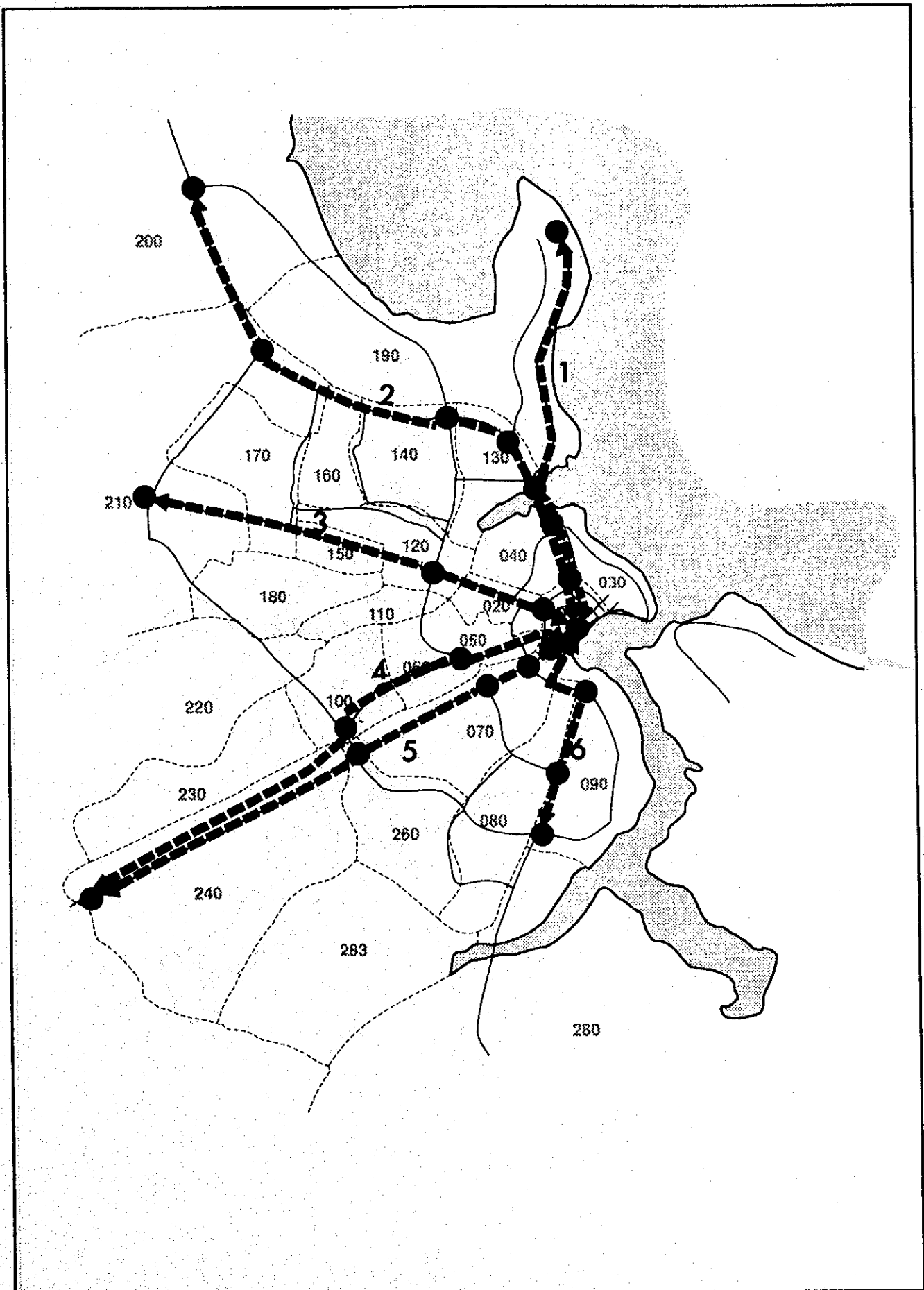
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- ⊗ 12hour Traffic Count Station
- ◊ 24hour Traffic Count Station
- 1 Week 12hour Traffic Count station
- Intersection Traffic Count Station



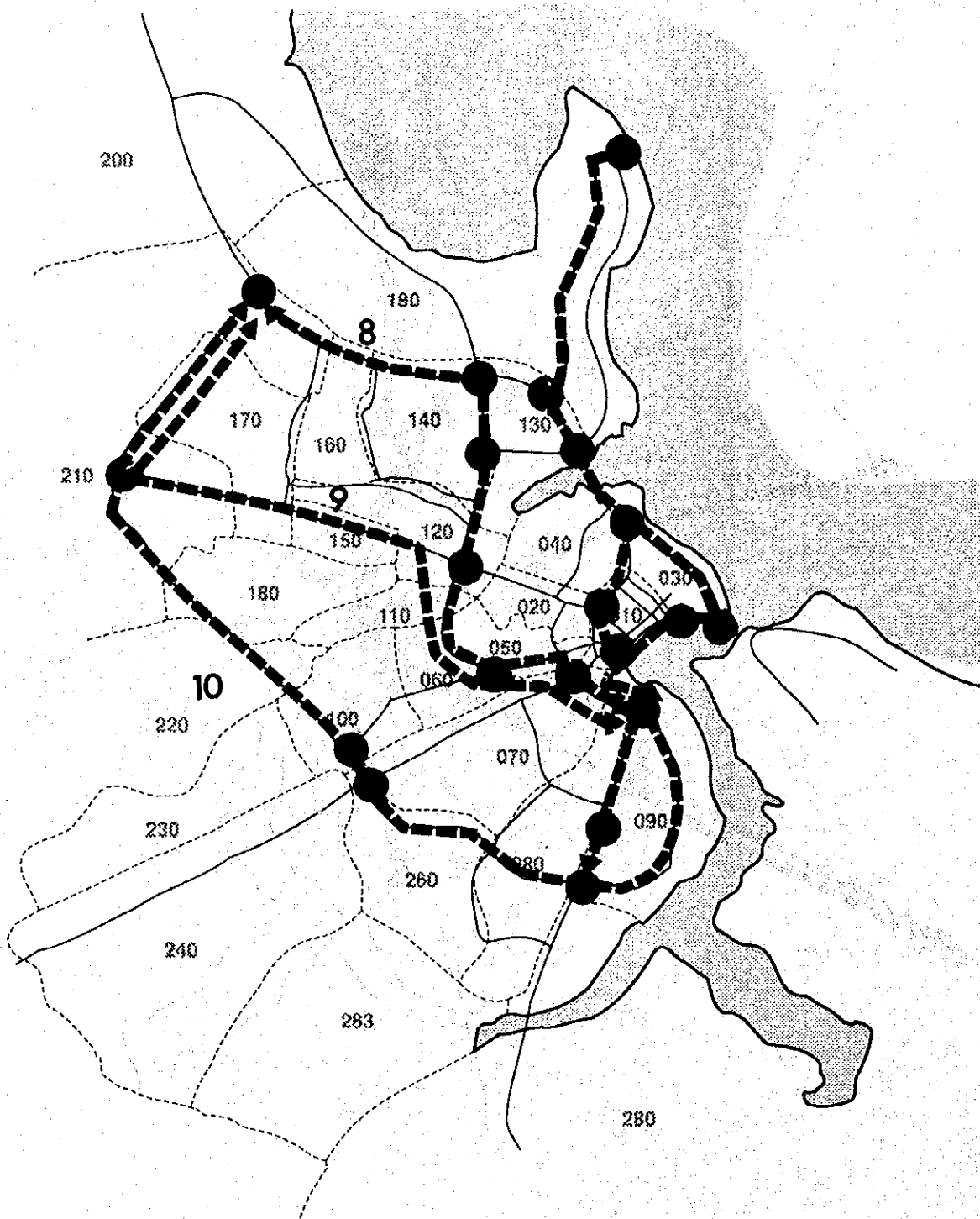
LEGEND

- ⊗ 12hour Traffic Count Station
- ⊠ 24hour Traffic Count Station
- 1 Week 12hour Traffic Count Station
- Intersection Traffic Count Station



THE STUDY ON DAR ES SALAAM
ROAD DEVELOPMENT PLAN

FIG. 3.3 (1/2) Location of Traffic Running Speed Survey



THE STUDY ON DAR ES SALAAM
ROAD DEVELOPMENT PLAN

FIG. 3.3 (2/2) Location of Traffic Running Speed Survey

3.5 Bus Terminal Survey

Bus Terminal Surveys were carried out at 13 points (bus terminals) in the city center as shown in Fig. 3.4. The number of bus passengers by bus per service route was counted over specified time interval. The duration of each count was 12 hours (7:00 - 19:00) for all the survey points. The survey was carried out between November 22nd - 29th, 1993.

3.6 Car Parking Survey

A Car Parking Survey was conducted from November 30th - December 2nd, 1993. The survey area is located within the city center which coincides with the inside area of UWT road as shown in Fig. 3.5.

The car parking survey consists of following four (4) items:

Item A: Car Parking Survey at One Time.

- Number of cars parked on a given road in the central area, at one given time, were counted and categorized by vehicle type (passenger car or truck).
- The survey was conducted between 9:00 - 15:00 via moving observation method.

Item B: 12 hour Car Parking Survey.

- Number of cars parked on certain sections of a given road in the city center was counted and categorized by vehicle type (passenger car or truck) for a specific interval of time.
- The duration of each count was 12 hours (7:00 - 19:00).
- The survey was carried out along Samora Avenue as shown in Fig. 3.5.

Item C: Car Parking Time Survey

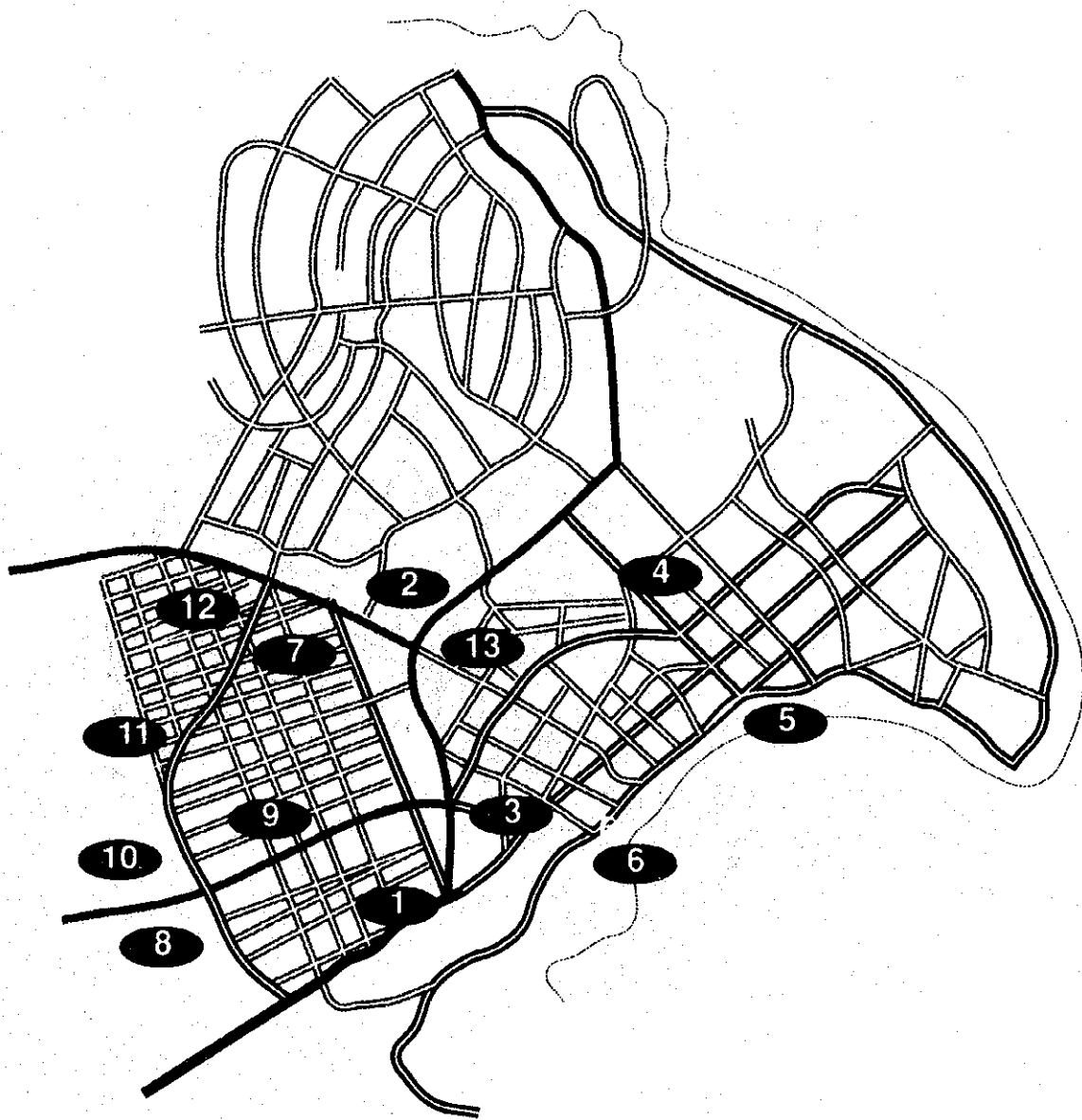
- License plate numbers of parked vehicles on certain road sections in the city center were recorded every fifteen minutes between 9:00 to 15:00.
- A survey was carried out along Samora Avenue as shown in Fig. 3.5.

Item D: Car Parking Facility Survey.

- Location and condition of parking facilities in the city center were surveyed for the following items; space, management system, parking fee and so on.
- The survey was carried out at parking facilities which have more than five (5) parking spaces.

3.7 Traffic Accidents Survey

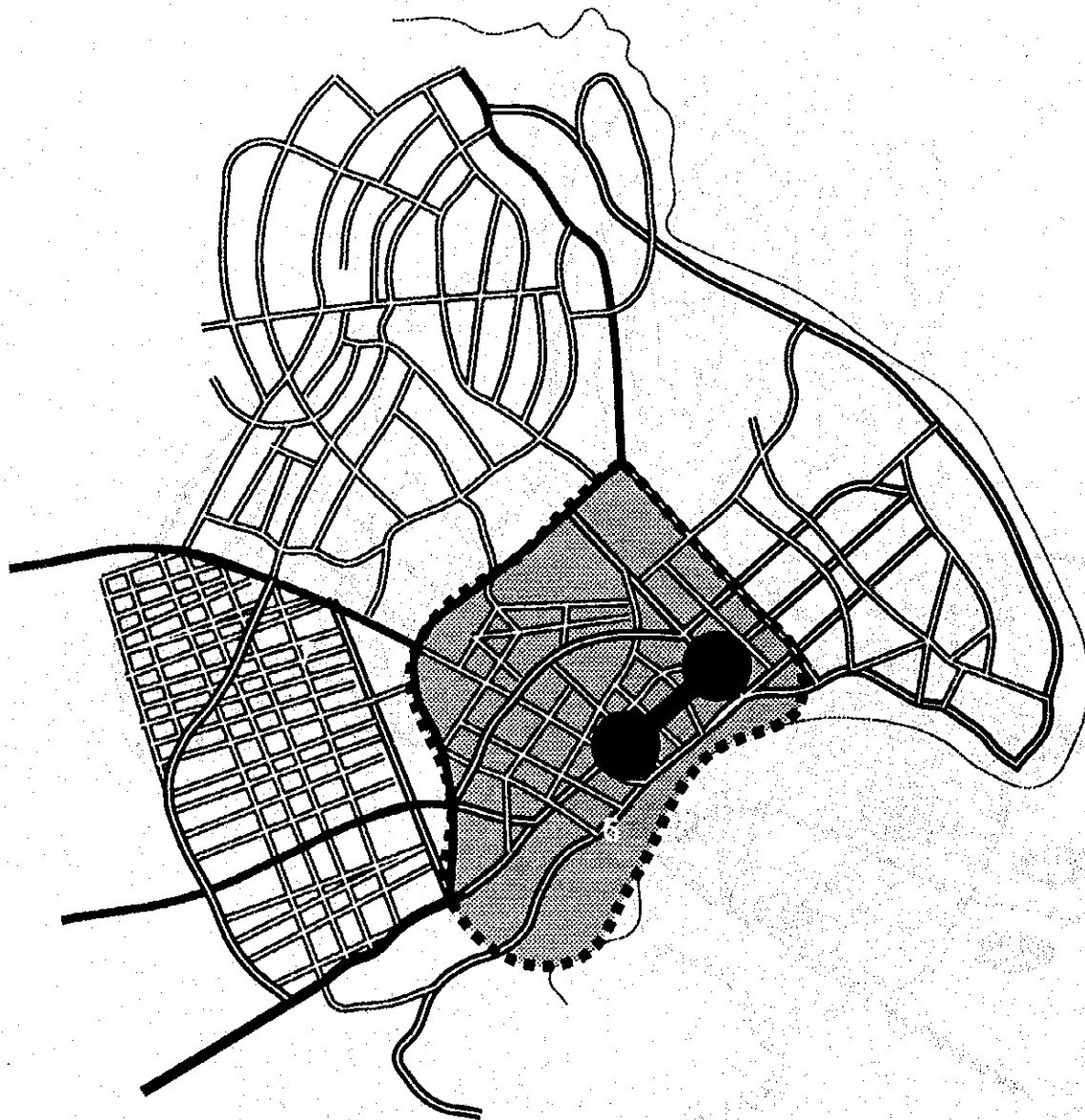
Information concerning recent traffic accidents was compiled from statistical information recorded by the city's Traffic Police. Major findings of this survey are presented in section 3.8 of this chapter.



LEGEND

NO.

Location of Bus Terminal Survey Points



LEGEND



Survey Area



12Hour Car Parking Survey and Parking Time Survey Section

3.8 Results of Traffic Survey

3.8.1 Characteristics of Road Traffic

(1) Traffic Volumes on Major Roads

Statistical results of the 12 hour (6:00 A.M. - 6:00 P.M.) traffic volume survey count for all 52 survey stations are given in Table 3.6 and attached in Appendix 3.5. Results of the 12-hour traffic volume survey as per vehicle type are shown in Fig. 3.6. The largest 12-hour volume of 30,413 vehicles was recorded on Pugu Road near Changiombe road, followed by 21,047 on Morogoro road near Jangwani playing field and 20,927 on UWT road near the junction with Maktaba street. Traffic volume on Kigamboni ferry which connects the city center with Kigamboni was approximately 600 vehicles, according to results.

Traffic volumes on major radial roads in the urban area ranged between 8,000 - 30,000 vehicles with the largest number on Pugu Road, followed by about 20,000 on Morogoro and Upanga Roads, and 15,000 on Bagamoyo road. Traffic volumes on Nelson Mandela (Port Access) road was about 15,000 vehicles near the intersection with Uhuru Road. In addition traffic volumes on UWT road ranged between 16,000 - 21,000.

(2) Historical Trend of Traffic Volumes

Table 3.7 presents the results of a 12 hours traffic count conducted in 1993 as well as results of a 12-hour traffic count carried out by JICA* in 1989, at the same survey stations. From these results it can be observed that total traffic volumes have increased at approximately 3.1% annually during the past 4 years. The largest annual increase of about 20% has been recorded for heavy trucks and buses.

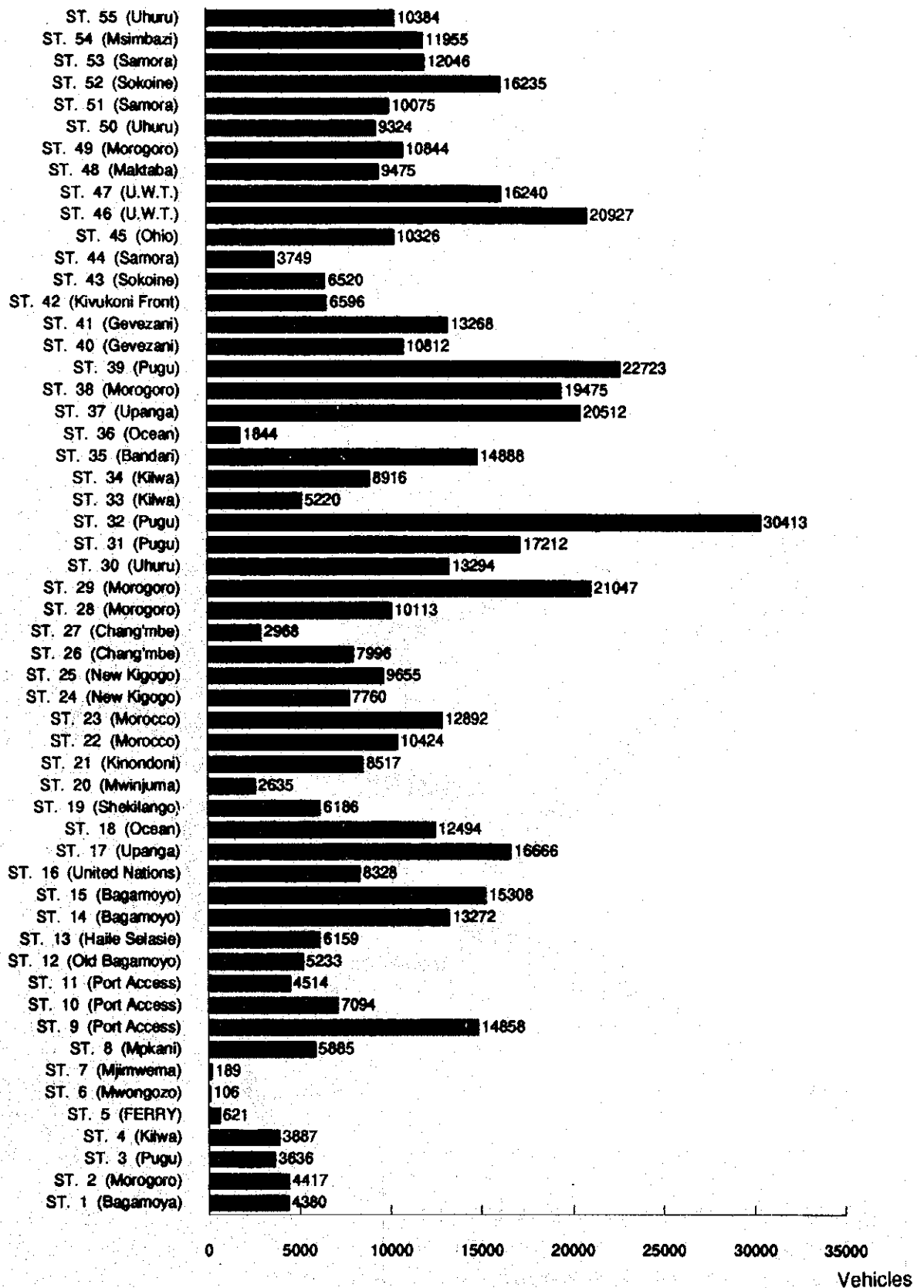
* The Study on Road Improvement and Maintenance in Dar es Salaam

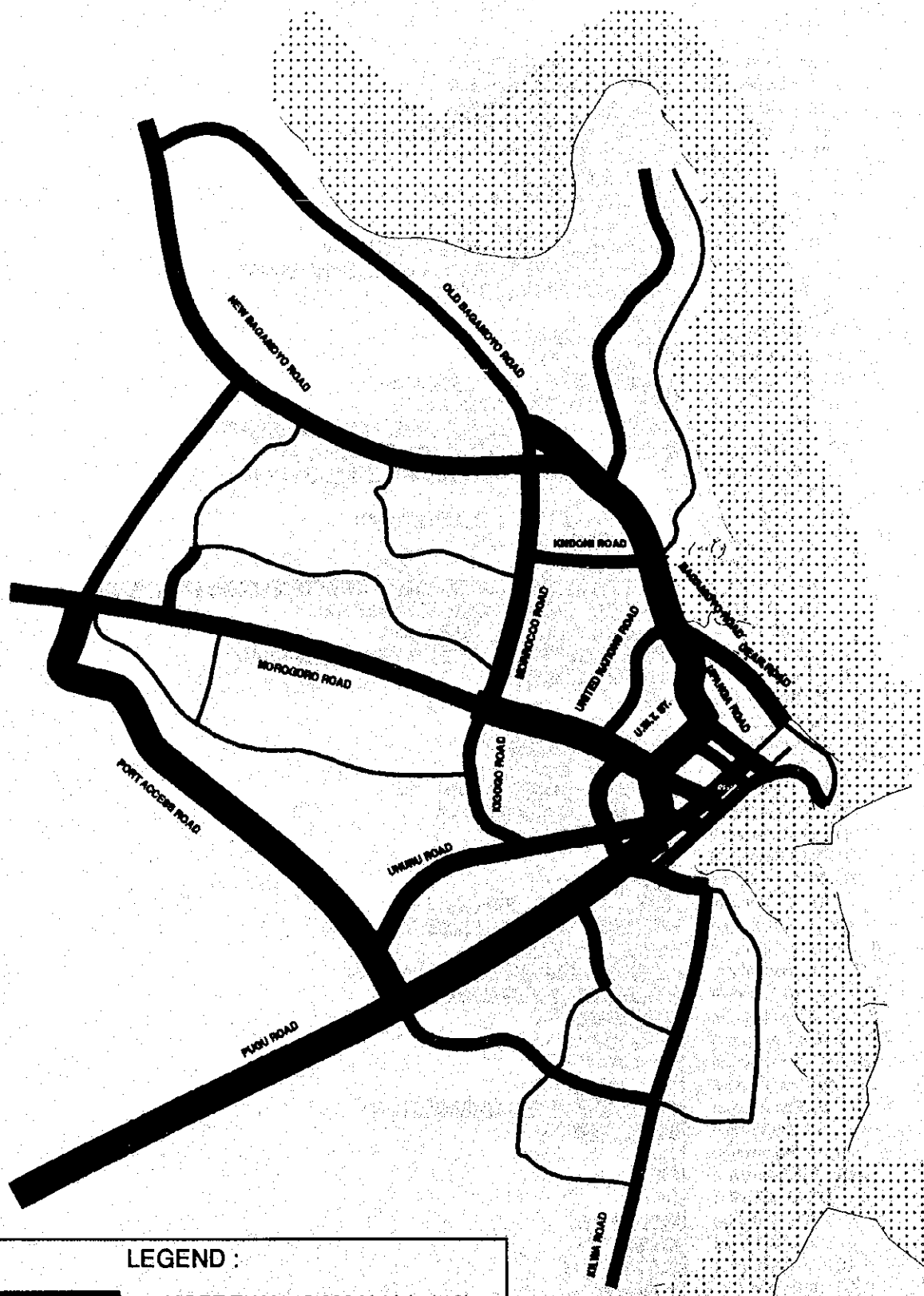
Table 3.6 12 hour Traffic Volume by Vehicle Type

Station *	Road Name	M/C	C/T	L/V	M/V	H/V	M/B	H/B	Others	Total
1	Bagamoyo	76	1,201	939	1,326	363	331	112	32	4,380
2	Morogoro	91	1,218	996	672	245	838	302	55	4,417
3	Pugu	124	810	742	711	78	868	275	28	3,636
4	Kilwa	205	814	622	577	110	932	332	295	3,887
5	FERRY	63	208	150	97	3	27	0	73	621
6	Mwongozo	14	15	16	29	7	10	0	15	106
7	Mjimwema	0	48	47	64	2	17	1	10	189
8	Mpakan	168	2,389	1,572	838	538	267	64	49	5,885
9	Port access	617	5,913	3,637	2,365	510	1,376	207	233	14,858
10	Port Access	293	2,944	1,480	1,186	641	316	121	113	7,094
11	Port Access	319	1,572	929	477	702	332	96	87	4,514
12	Old Bagamoyo	123	3,012	1,236	414	26	338	67	17	5,233
13	Haile Selasie	157	4,095	1,348	334	17	171	10	27	6,159
14	Bagamoyo	350	7,239	2,937	757	142	1,606	191	50	13,272
15	Bagamoyo	483	8,933	4,200	586	127	805	74	100	15,308
16	United Nations	216	5,832	1,879	219	16	125	32	9	8,328
17	Upanga	597	10,910	3,000	490	31	1,461	153	24	16,666
18	Ocean	303	9,382	2,134	256	5	357	42	15	12,494
19	Shekilango	281	2,859	1,459	522	58	834	131	42	6,186
20	Mwinjuma	177	859	272	89	17	1,055	124	42	2,635
21	Kinondoni	386	5,100	1,603	354	40	904	96	34	8,517
22	Morocco	361	4,780	1,952	739	78	2,266	187	61	10,424
23	Morocco	564	5,953	2,449	859	41	2,729	253	44	12,892
24	New Kigogo	508	3,786	1,796	599	78	817	119	57	7,760
25	New Kigogo	590	4,170	2,296	851	117	1,450	131	50	9,655
26	Changombe	512	3,126	1,431	770	113	1,705	232	107	7,996
27	Changombe	195	1,498	677	363	73	95	55	12	2,968
28	Morogoro	493	2,992	1,674	549	211	2,607	1,256	331	10,113
29	Morogoro	973	8,586	3,374	830	51	5,723	1,422	88	21,047
30	Uhuru	799	5,453	2,416	712	290	2,669	753	202	13,294
31	Pugu	787	6,444	3,532	1,929	717	2,174	582	1,047	17,212
32	Pugu	1,748	14,889	7,096	2,610	184	3,277	359	250	30,413
33	Kilwa	305	1,549	925	528	359	1,039	412	103	5,220
34	Kilwa	435	4,262	1,713	557	119	1,308	497	25	8,916
35	Bandar	918	7,461	2,713	623	769	1,621	722	61	14,888
36	Ocean	69	1,227	370	97	2	56	17	6	1,844
37	Upanga	674	13,611	3,694	597	37	1,718	145	36	20,512
38	Morogoro	1,080	11,316	3,999	676	42	1,308	975	79	19,475
39	Pugu	1,281	13,605	5,439	1,395	97	645	191	70	22,723
40	Gerezani	739	5,180	2,145	982	141	1,071	518	36	10,812
41	Gerezani	899	8,090	2,594	700	56	591	321	17	13,268
42	Kivukoni Front	337	4,271	967	248	1	415	272	85	6,596
43	Kokoine Drive	286	4,788	1,097	117	0	184	29	19	6,520
44	Samora	124	2,810	658	54	1	89	12	1	3,749
45	Ohio	432	7,425	1,889	205	39	230	89	17	10,326
46	U.W.T.	886	13,432	4,065	599	44	1,259	541	101	20,927
47	U.W.T.	620	10,089	2,557	677	225	503	496	73	15,240
48	Maktaba	406	4,933	1,390	165	35	1,969	526	51	9,475
49	Morogoro	734	7,153	2,219	322	1	192	50	173	10,844
50	Uhuru	431	4,391	1,458	264	17	1,234	1,348	181	9,324
51	Samora	767	6,124	2,333	374	15	327	52	83	10,075
52	Sokoine	804	8,293	2,600	491	32	2,398	1,585	32	16,235
53	Samora	748	8,227	2,349	203	15	403	50	51	12,046
54	Msimbazi	556	4,040	1,659	363	29	4,680	497	131	11,955
55	Uhuru	581	5,215	1,921	391	9	1,340	793	134	10,384




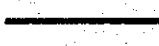
* Refer Fig. 3.2

Note: • M/C: Motorcycle • C/T: Car & Taxi • L/V: Light goods Vehicle
 • M/V: Medium Goods Vehicle • H/V: Heavy Goods Vehicle • M/B: Mini Bus
 • H/B: Heavy Bus





LEGEND :

	MORE THAN 15,000 Vehicle / 12h
	15,000 - 10,000 Vehicle / 12h
	10,000 - 5,000 Vehicle / 12h
	LESS THAN 5,000 Vehicle / 12h

Traffic Growth 1989 - 1993

Type of Vehicle	1993/1989	Annual Growth Rate
Passenger Car	1.11	2.6%
Light Goods Vehicle	1.02	0.5%
Medium Goods Vehicle	1.22	5.0%
Heavy Goods Vehicle	2.47	25.4%
Bus	2.15	21.1%
Total Vehicle	1.13	3.1%

(3) Vehicle Composition

It could be pointed out that a relatively high share of passenger vehicles and buses has been seen in most of the roads in the Study Area. A large composition of passenger cars was recorded in such streets in the city center as Samora avenue (77%), Sokoine drive (77%), and Ocean road (77%). The share of passenger cars on major radial roads is relatively small being in the range of 35% - 55%. These roads are characterized by large percentages of buses (mini buses and heavy buses). This is due to the fact that these roads are used both for intra-region and a inter-regional bus services.

Higher share of truck traffic could be seen on such roads as Nelson Mandela (50%), Morogoro road (40%) and Kilwa road (38%). This fact suggests that these roads are for a great deal used for industrial transport. This is especially true for heavy truck traffic on Nelson Mandela road which accounts for about 20% in the Kurasini area. UWT road is mainly used by passenger vehicles (passenger cars and buses) and the share of trucks on this road is about 30% which is considered average.

(4) Hourly Variation of Traffic Volume

The pattern in hourly traffic variation differs for each road and the results reveal that traffic volumes on Morogoro road (Radial Arterial road) has two distinct peak periods; 7:00 - 8:00, and 15:00 - 16:00, or 12.4% shares and 12.3% respectively. Streets in the central area such as Sokoine drive indicates no distinguishable peak-hour period with a rather flat distribution pattern as shown in Fig. 3.10.

Table 3.7 (1/2) Comparison of Traffic Volume (1993/1989)

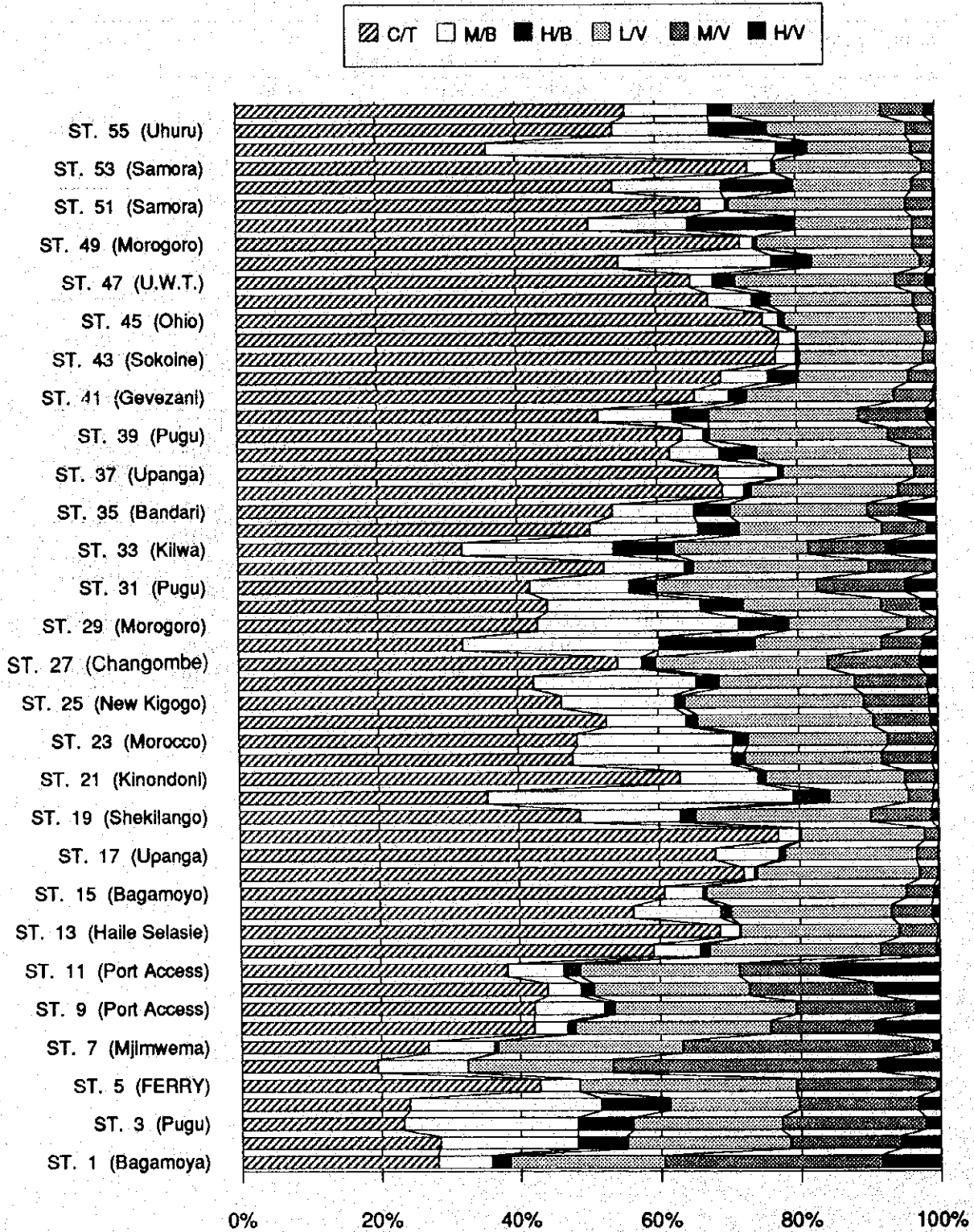
Station	No. *	Year	Passenger Car	L-goods Vehicle	M-goods Vehicle	H-goods Vehicle	Bus	Total	1993/1994
		1989	1,716	1,404	817	149	348	4,434	
8		1993	2,389	1,572	838	587	331	5,717	1.289
		1989	3,455	3,296	1,618	466	698	9,533	
9		1993	5,913	3,637	2,365	743	1,538	14,196	1.489
		1989	2,510	1,592	1,216	471	425	6,214	
10		1993	2,944	1,480	1,186	754	437	6,801	1.094
		1989	1,061	1,010	926	926	561	4,484	
11		1993	1,573	929	754	789	428	4,473	0.998
		1989	3,019	1,443	238	39	105	4,844	
12		1993	3,012	1,236	414	43	405	5,110	1.055
		1989	3,730	1,298	248	93	142	5,511	
13		1993	4,095	1,348	334	44	181	6,002	1.089
		1989	4,273	2,532	474	614	585	8,478	
14		1993	7,239	2,937	757	192	1,797	12,922	1.524
		1989	9,424	4,146	454	314	280	14,618	
15		1993	8,933	4,200	586	227	879	14,825	1.014
		1989	4,566	2,148	208	12	340	7,274	
16		1993	5,832	1,879	219	25	159	8,114	1.115
		1989	8,414	3,256	552	46	831	13,099	
17		1993	10,910	3,000	490	55	1,614	6,069	1.227
		1989	7,009	2,379	118	89	246	9,841	
18		1993	9,384	2,134	256	20	399	12,193	1.239
		1989	3,162	787	355	58	160	4,522	
19		1993	2,859	1,459	522	100	965	5,905	1.306
		1989	4,807	1,770	298	14	929	7,818	
21		1993	5,100	1,603	354	74	1,000	8,131	1.040
		1989	5,049	1,479	648	85	467	7,728	
23		1993	5,953	2,449	859	85	2,982	12,328	1.595
		1989	3,161	1,784	385	698	472	6,500	
25		1993	4,170	2,296	851	167	1,581	9,065	1.395
		1989	5,960	3,339	968	130	2,703	13,100	
28		1993	2,992	1,674	549	542	3,858	9,615	0.734
		1989	9,903	4,159	687	356	3,262	18,367	
29		1993	8,130	3,102	843	109	7,300	19,484	1.061
		1989	7,185	4,306	986	220	2,113	14,810	
30		1993	5,453	2,416	712	492	3,422	12,495	0.844
		1989	5,549	3,970	1,370	190	1,332	12,411	
31		1993	6,444	3,532	1,929	1,764	2,756	16,425	1.323
		1989	13,722	8,993	1,579	318	2,184	26,796	
32		1993	14,899	7,096	2,610	434	3,636	28,665	1.070
		1989	1,228	1,109	854	159	471	3,821	
33		1993	1,549	925	528	462	1,451	4,915	1.286

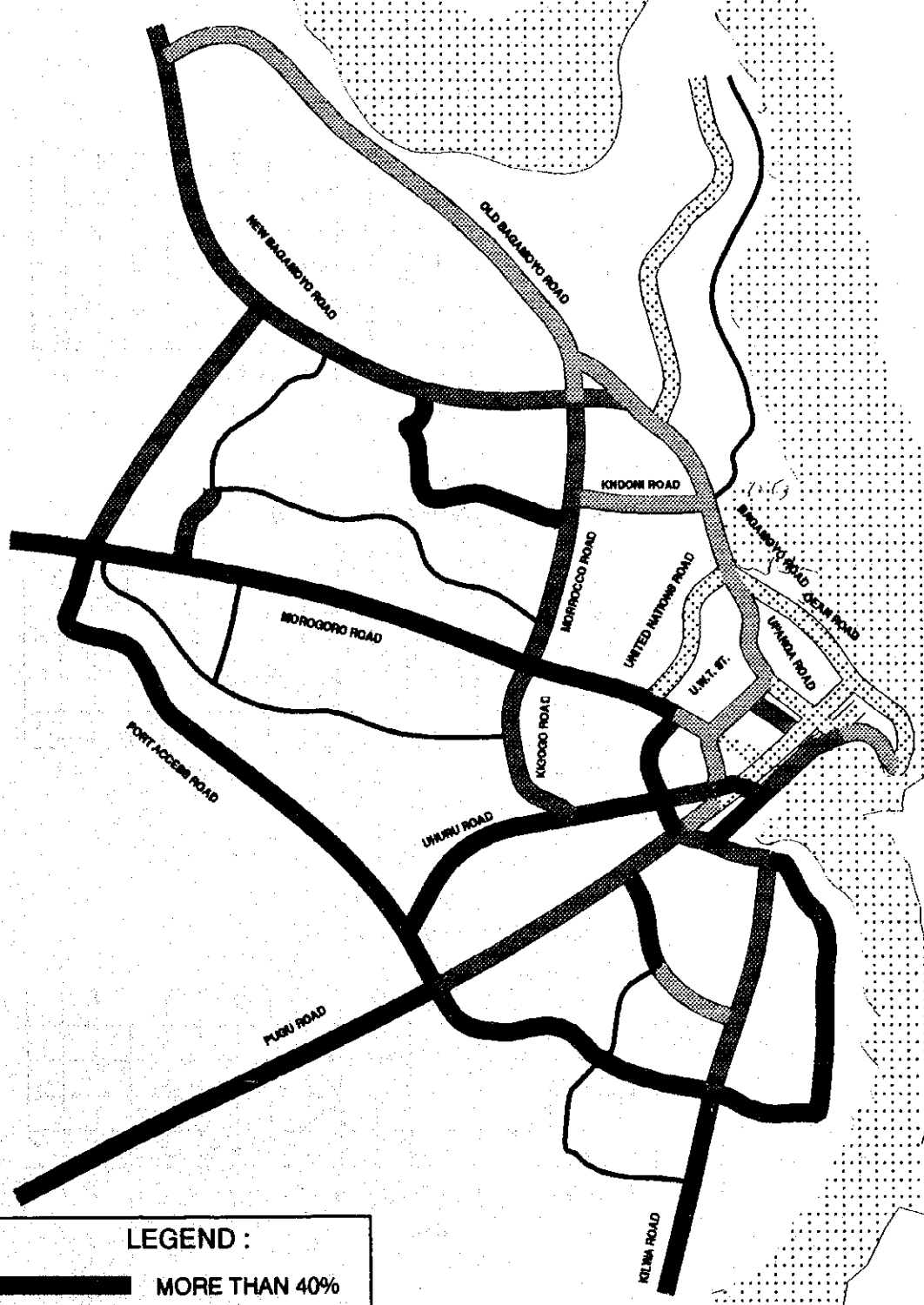
* Refer Fig. 3.2.

Table 3.7 (2/2) Comparison of Traffic Volume (1993/1989)

Station	No. *	Year	Passenger Car	L-goods Vehicle	M-goods Vehicle	H-goods Vehicle	Bus	Total	1993/1994
		1989	5,615	2,129	961	151	646	9,502	
	35	1993	7,461	2,713	623	830	2,343	13,970	1.470
		1989	4,694	2,744	1,127	271	538	9,374	
	40	1993	5,180	2,145	982	177	1,589	10,073	1.075
		1989	8,608	3,571	578	52	1,741	14,550	
	41	1993	8,090	2,594	700	73	912	12,369	0.850
		1989	3,593	179	62	4	39	3,877	
	44	1993	2,810	658	54	2	101	3,625	0.935
		1989	6,660	2,152	307	27	814	9,960	
	45	1993	7,425	1,889	205	56	319	9,894	0.993
		1989	10,026	4,212	548	117	844	15,747	
	47	1993	10,089	3,557	677	298	999	15,620	0.992
		1989	7,498	3,137	220	34	1,387	12,276	
	48	1993	4,933	1,390	165	86	2,495	9,069	0.739
		1989	5,599	2,469	122	15	260	8,465	
	49	1993	7,153	2,219	322	174	242	10,110	1.194
		1989	6,939	2,620	100	15	243	9,917	
	53	1993	8,227	2,349	203	66	453	11,298	1.139
		1989	4,862	2,214	688	60	2,790	10,614	
	54	1993	4,040	1,659	363	160	5,177	11,399	1.074
		1989	6,611	2,933	537	54	1,155	11,290	
	55	1993	5,215	1,921	391	143	2,133	9,803	0.868

* Refer Fig. 3.2.





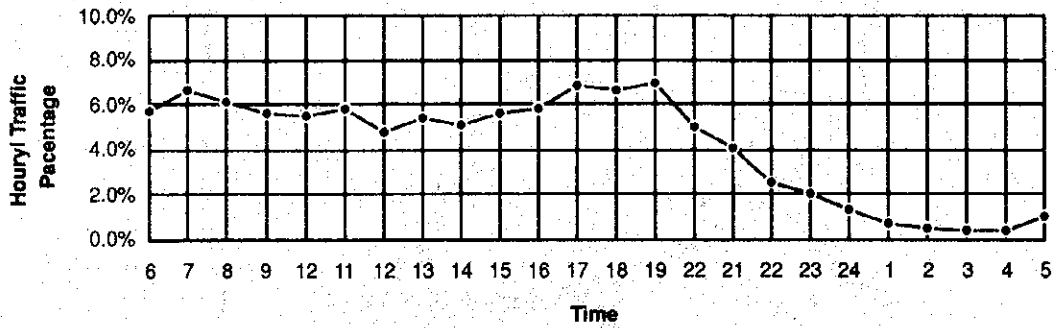
LEGEND :

	MORE THAN 40%
	40 - 30%
	30 - 20%
	20 - 10%
	LESS THAN 10%

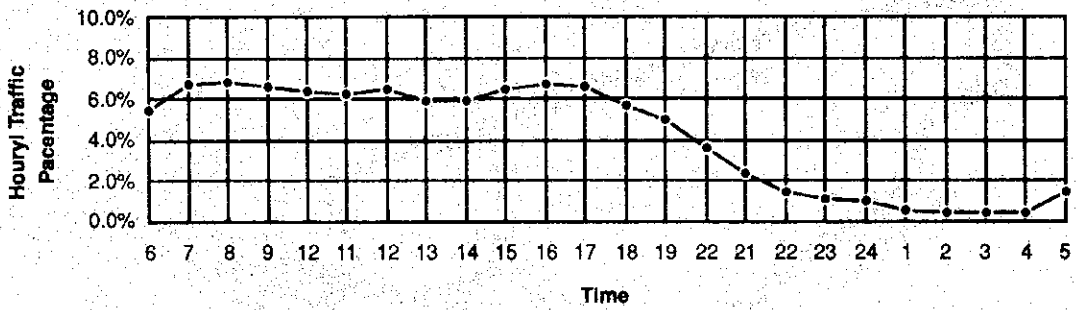
THE STUDY ON DAR ES SALAAM ROAD DEVELOPMENT PLAN

Figure 3.9 Heavy Vehicle Ratio

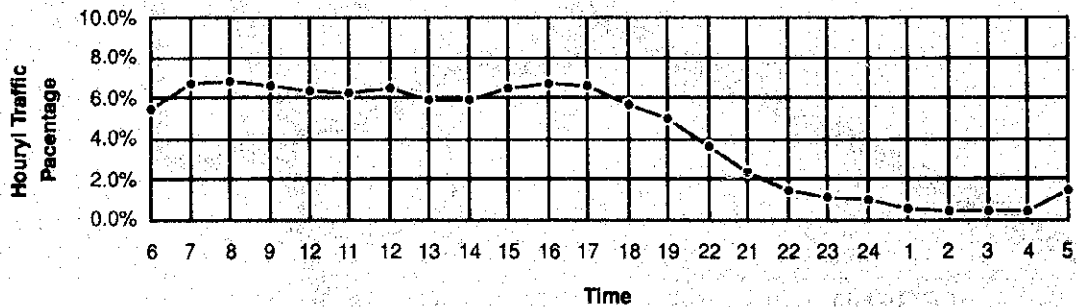
MOROCCO ROAD (STATION NO. 22)



MOROGORO ROAD (STATION NO. 29)



SOKOINE DRIVE (STATION NO. 52)



(5) Daylight Traffic Ratio

Daylight traffic ratios, which are defined by 24 hour traffic volume / 12 hour traffic volume during the daytime, differ by road location and function. The streets in the city center tend to give relatively small values as shown in Sokoine Drive (1.17). However, inter-regional trunk roads such as Morogoro road are apt to give larger values. This is explained by the fact that these roads are used heavily by night buses and port related vehicles.

Table 3.8 Daylight Traffic Ratio

Traffic Type	1)	2)	3)
	Morogoro Road (Trunk Road)	Morocco Road (Collector Road)	Sokoine Drive (Urban Road)
Walk	1.29	1.60	1.12
Bicycle	1.23	1.30	1.10
Motorcycle	1.21	1.37	1.07
Passenger car	1.33	1.52	1.18
Light-Goods Vehicle	1.21	1.52	1.14
Medium-Goods Vehicle	1.24	1.17	1.12
Heavy-Goods	2.57	1.35	1.06
Mini Bus	1.36	1.39	1.22
Bus	1.27	1.25	1.18
Others	1.14	1.11	1.31
Total Vehicles	1.31	1.45	1.17

1) Near Jangwani Playing Field

2) Kinondoni

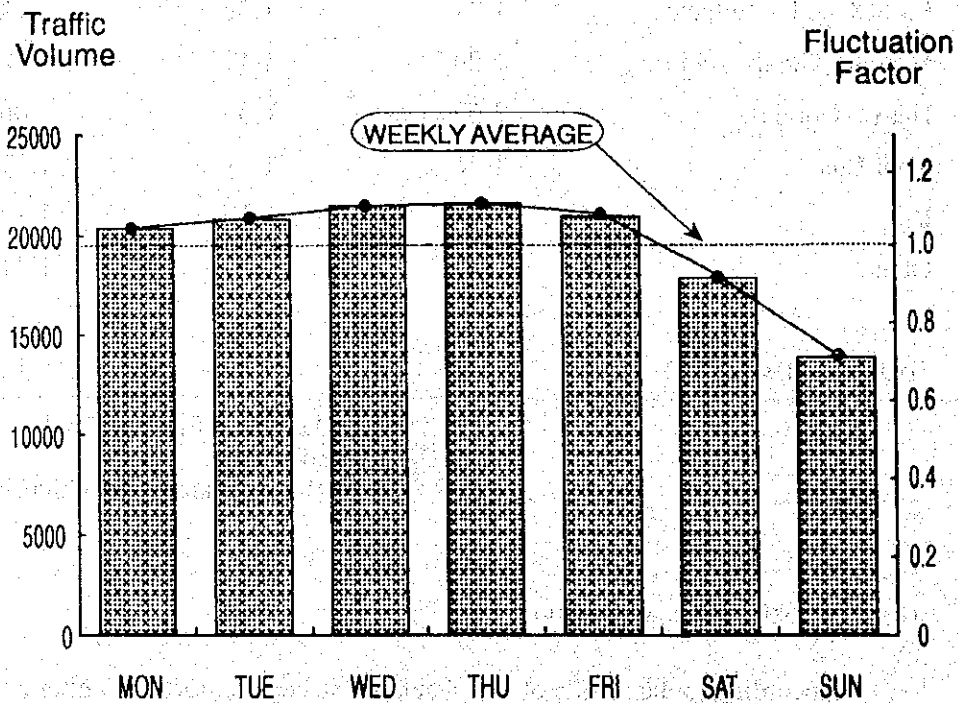
3) Near Dar es Salaam City Council

(6) Weekly Traffic Fluctuation

According to the results of one-week traffic counts, traffic is rather uniformly distributed during week days (Monday - Friday). However, traffic on Sunday and that of Saturday, when about 50% of offices and shops are closed in Dar es Salaam, is smaller than that of a normal working day. The ratios of Sunday and Saturday traffic pattern are 71% and 91% of the weekly averages respectively.

Weekly Fluctuation of Traffic Volume on Morogoro road

Date	Day of the Week	Traffic Volume (12 hours)	Weekly Fluctuation Factor
Nov. 15	Mon.	20,376	1.037
16	Tue.	20,889	1.068
17	Wed.	21,617	1.100
18	Thu.	21,765	1.107
19	Fri.	21,047	1.071
13	Sat.	17,947	0.913
14	Sun.	13,966	0.710



(7) Traffic Congestion Rate

Traffic congestion rate, which is defined by AADT (Annual Average Daily Traffic)/ Road Capacity, has been calculated by road in terms of PCU (Passenger Car Unit). Components necessary for the application of this calculation method are explained below:

a) AADT

AADT is defined by the following formula:

$$\text{AADT} = \sum Q_{ij} \cdot D_{ij} \cdot W_{ij}$$

where Q_{ij} : Traffic volume
 D_{ij} : Daytime traffic ratio
 W_{ij} : Weekly factor
 i : Vehicle type
 j : Direction

b) Capacity

Road Capacity has been calculated applying the Road Capacity Manual in Japan, in which capacities are defined by the following formula:

- Single Carriageway

$$C = 2,500 \cdot r_L \cdot r_C \cdot r_N \cdot r_I \text{ (p.c.u. / hour)}$$

- Dual Carriageway

$$C = 2,200 \cdot r_L \cdot r_C \cdot r_N \cdot r_I \cdot N \text{ (p.c.u. / hour)}$$

where C : Passable capacity
 r_L : Adjustment factor of lane width
 r_C : Adjustment factor of lateral clearance
 r_N : Adjustment factor of included motorcycle and bicycle
 r_I : Adjustment factor of roadside conditions
 N : Number of lanes

Detail of the above formula is explained in Appendix 3.6.

c) PCU

P.C.U. was calculated based on the following conversion factors:

Car, Taxi and Light Goods Vehicle	: 1.0 P.C.U.
Medium Goods Vehicle	: 2.0 P.C.U.
Heavy Goods Vehicle, Heavy Bus and Mini Bus	: 3.0 P.C.U.

d) Congestion Ratio

As per results, congestion ratios on roads such as Bagamoyo road, Morocco road, New Kigogo road, Morogoro road, Uhuru road and Sokoine drive are found to be relatively large and exceed 1.5, which is deemed above the saturation level.

Road with Congestion Ratio more than 1.5

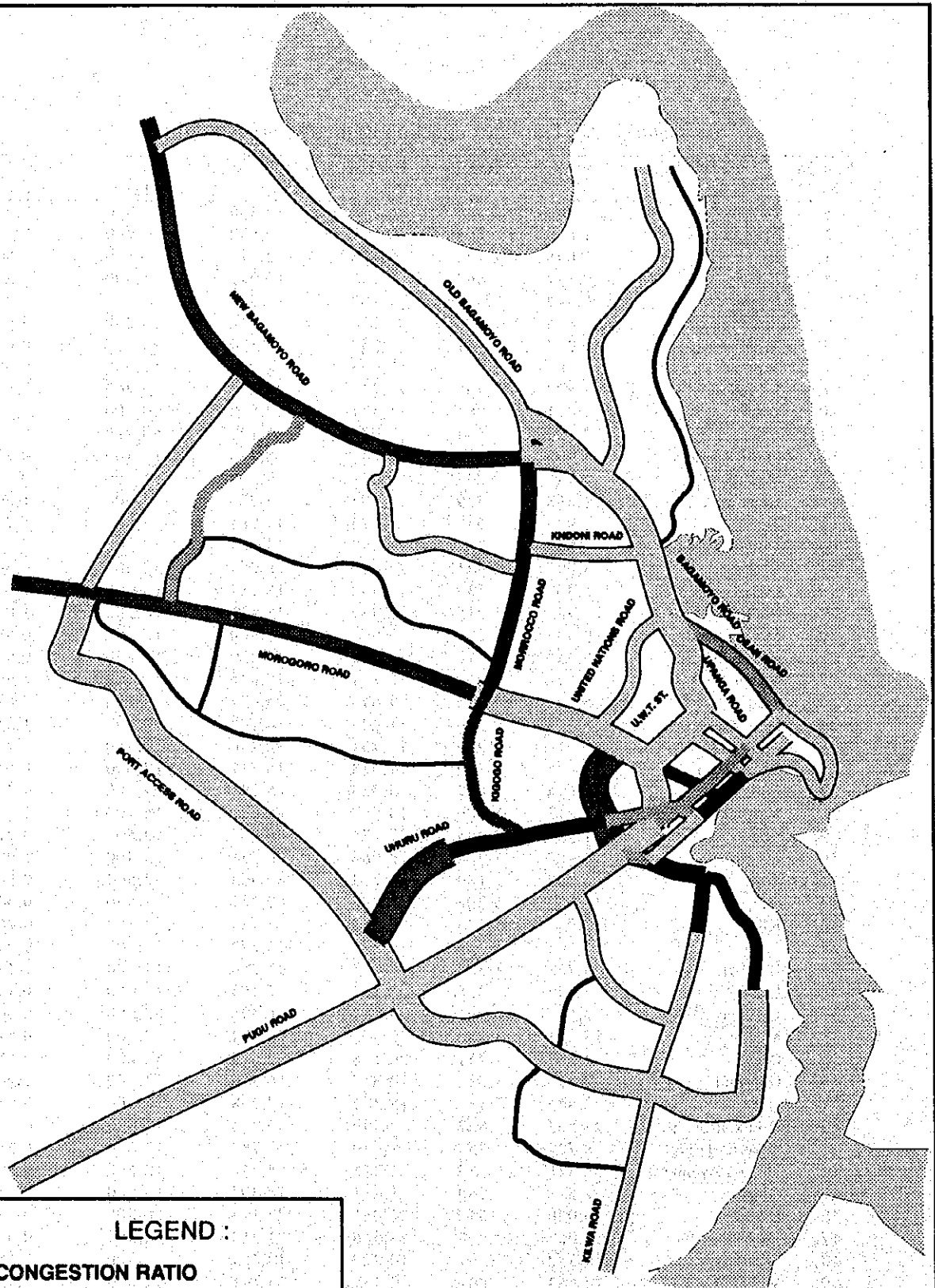
Road name	Congestion Ratio
Bagamoyo road	1.75
Morocco road	2.07
New Kigogo road	1.74
Morogoro road	1.70
Uhuru road	1.97
Bandari road	2.13
Sokoine drive	2.08

(8) Intersection Traffic Movement

Traffic movements at major intersections are shown in Fig. 3.13. From which it is found that most of the legs at intersections located in city center have great traffic volumes, mainly due to sharp concentration of traffic during peak hours of traffic.

Table 3.9 Traffic Congestion Ratio by Survey Station

Station No.	Road Name	Walk	Bicycle	Total of Vehicle	Total of Vehicle (pcu)	Capacity (pcu)	Congestion Ratio
1.	Bagamoyo	988	384	6,778	12,340	13,000	0.95
2.	Morogoro	1,880	263	5,897	9,852	14,700	0.67
3.	Pugu	2,098	1,284	5,108	8,672	17,300	0.50
4.	Kilwa	9,372	2,867	5,130	9,082	17,300	0.52
5.	Ferry	20,542	2,106	705	989		
6.	Mwongozo	825	1,670	136	218	10,200	0.02
7.	Mjimwema	273	91	252	374	10,200	0.04
8.	Mpkani	705	265	7,948	11,939	19,900	0.60
9.	Port Access	7,872	2,268	21,145	30,799	60,200	0.51
10.	- do -	2,471	881	11,537	19,568	60,200	0.33
11.	- do -	2,899	854	7,970	15,121	60,200	0.25
12.	Old Bagamoyo	903	1,023	7,641	8,899	12,400	0.72
13.	Haile Selasie	1,587	224	9,052	9,809	11,500	0.85
14.	Bagamoyo	1,868	589	17,303	2,970	13,000	1.69
15.	- do -	1,925	939	19,673	11,981	17,300	1.75
16.	United Nations	4,551	489	11,442	11,981	17,300	0.69
17.	Upanga	3,097	891	23,010	26,049	52,600	0.50
18.	Ocean	2,403	533	17,334	18,164	18,000	1.01
19.	Shekilango	3,582	1,215	8,932	11,136	10,200	1.09
20.	Mwinjuma	9,832	1,294	3,972	5,960	10,200	0.58
21.	Kinondoni	5,449	1,010	13,342	15,279	16,300	0.94
22.	Morocco	7,590	1,260	15,111	19,826	12,100	1.64
23.	- do -	5,352	1,556	19,646	25,072	12,100	2.07
24.	New Kigogo	8,513	966	11,923	14,185	10,500	1.35
25.	- do -	8,012	786	14,701	18,290	10,500	1.74
26.	Changombe	11,875	1,969	11,633	15,711	18,000	0.87
27.	- do -	1,674	612	4,384	5,201	14,100	0.37
28.	Morogoro	17,813	1,706	14,598	25,010	14,700	1.70
29.	- do -	21,531	2,985	27,731	40,587	52,600	0.77
30.	Uhuru	14,900	1,388	18,068	26,331	13,400	1.97
31.	Pugu	6,402	3,189	25,712	41,903	52,600	0.80
32.	- do -	13,543	5,502	39,276	49,231	52,600	0.94
33.	Kilwa	10,097	2,234	7,554	13,149	17,300	0.76
34.	- do -	2,668	1,352	11,976	16,292	17,300	0.94
35.	Bandari	3,753	1,322	20,943	31,280	14,700	2.13
36.	Ocean	592	318	2,262	2,465	18,000	0.14
37.	Upanga	4,677	961	23,512	26,495	52,600	0.50
38.	Morogoro	15,501	1,236	22,372	26,594	52,600	0.51
39.	Pugu	4,651	1,251	26,138	29,024	52,600	0.55
40.	Gerezani	7,471	1,052	12,517	16,370	13,000	1.26
41.	- do -	2,666	1,187	15,271	17,298	18,300	0.95
42.	Kivukoni Front	28,563	1,832	7,599	9,012	18,000	0.50
43.	Sokoine Drive	8,727	256	7,440	7,784	12,600	0.62
44.	Samora Avenue	876	59	4,315	4,443	12,600	0.35
45.	Ohio	2,571	360	11,811	12,493	13,500	0.93
46.	UWT	6,090	540	24,081	27,318	60,800	0.45
47.	- do -	12,063	499	18,566	21,218	60,800	0.35
48.	Maktaba	19,532	507	10,827	14,487	15,300	0.95
49.	Morogoro	14,663	891	12,457	13,171	11,800	1.12
50.	Uhuru	28,886	1,081	11,123	16,417	13,400	1.23
51.	Samora Avenue	6,289	1,099	11,619	12,414	15,900	0.78
52.	Sokoine Drive	11,667	1,615	19,038	26,264	12,600	2.08
53.	Samora Avenue	19,698	577	13,908	14,531	12,600	1.15
54.	Msimbazi	14,838	1,257	14,335	21,738	16,400	1.33
55.	Uhuru	24,918	1,061	12,354	16,341	13,400	1.22



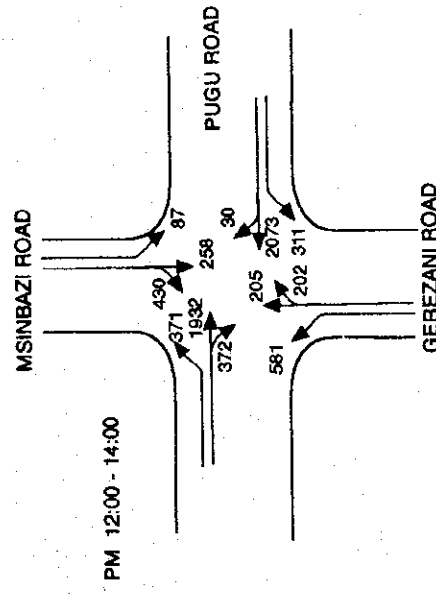
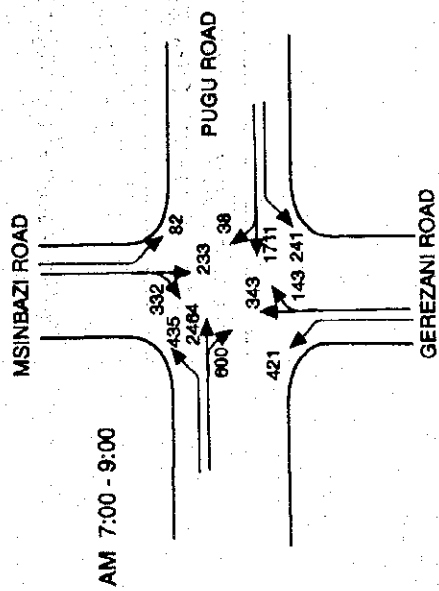
LEGEND :

CONGESTION RATIO

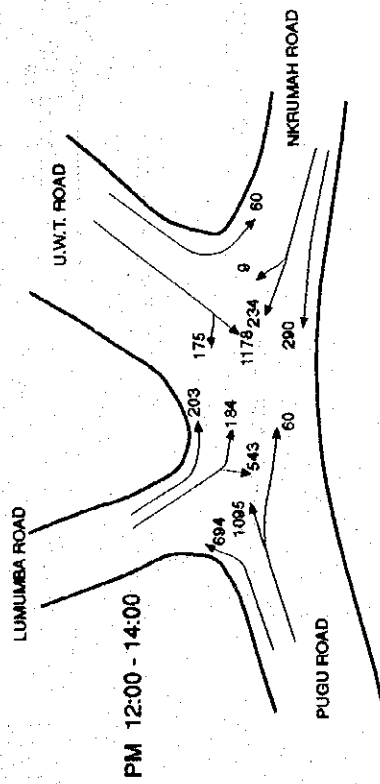
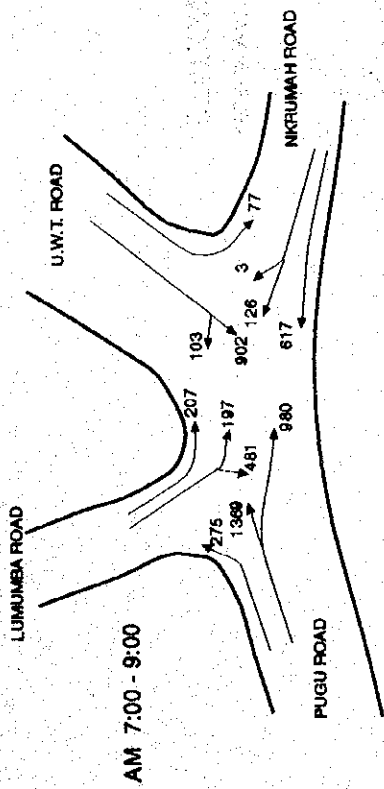
	LESS THAN 1.0
	1.0 - 1.25
	1.25 - 1.75
	MORE THAN 1.75

THE STUDY ON DAR ES SALAAM
ROAD DEVELOPMENT PLAN

FIG. 3.12 Traffic Congestion Ratio



STATION NO. 66



STATION NO. 71

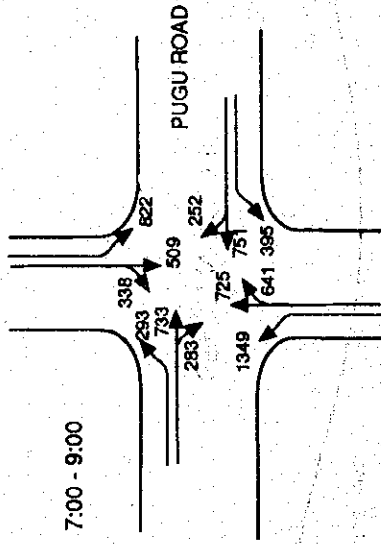
THE STUDY ON DAR ES SALAAM ROAD DEVELOPMENT PLAN

Fig 3.13 (1/2)

Traffic Movement at Major Intersection

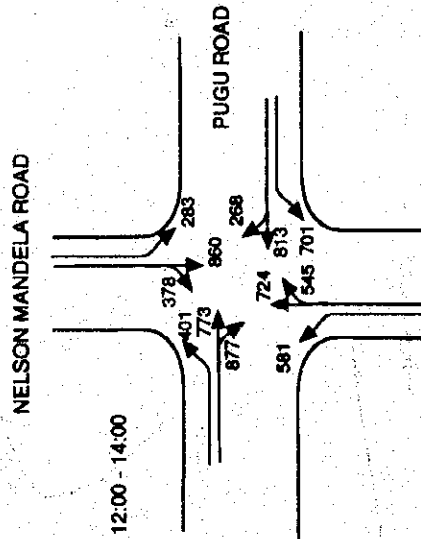
NELSON MANDELA ROAD

AM 7:00 - 9:00



NELSON MANDELA ROAD

PM 12:00 - 14:00



NELSON MANDELA ROAD

STATION NO.58

THE STUDY ON DAR ES SALAAM
ROAD DEVELOPMENT PLAN

Fig 3.13(2/2)

Traffic Movement at Major Intersection

(9) Vehicle Travel Speed

Average vehicle speed on roads in the central area ranged from 15 km / hour to 20 km / hour, due to chronic traffic congestion. Higher vehicle speeds were recorded on such high standard roads as Nelson Mandela (Port Access) and Pugu roads. New Bagamoyo and Upanga road showed lower speed levels due to congestion brought about by road maintenance works which were in progress.

Table 3.10 Results of Vehicle Travel Speed Survey

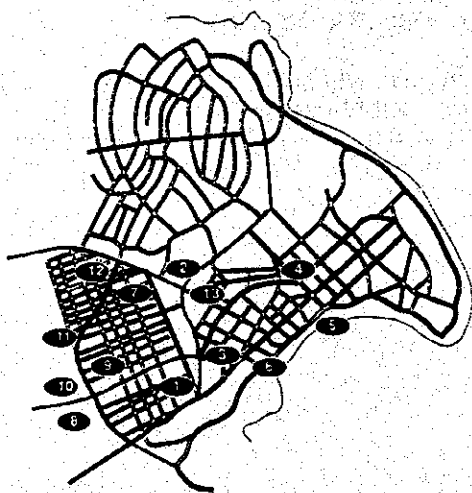
Survey Route No.	Route	Length (km)	Travel Speed (km/hour)		
			Average	Max.	Min.
1.	TOURE DRIVE - UPANGA ROAD	9.8	35.6	43.7	25.8
2.	NEW BAGAMOYO ROAD - UPANGA ROAD	12.9	25.4	33.9	12.2
3.	MOROGORO ROAD	10.5	24.6	33.4	15.0
4.	PUGU ROAD - UHURU ROAD - SAMORA AVENUE	12.0	26.6	35.3	22.6
5.	PUGU ROAD - SAMORA AVENUE	11.0	34.9	42.5	24.1
6.	KILWA ROAD - SAMORA DRIVE	6.0	29.8	39.1	15.5
7.	TOURE DRIVE - OCEAN ROAD - KIVUKONI FRONT - UHURU ROAD	24.7	23.5	27.2	18.9
8.	NEW BAGAMOYO ROAD - MOROCCO ROAD - UHURU ROAD	13.2	25.4	32.6	14.9
9.	SAM NUJOMA - MOROGORO ROAD - KIGOGO ROAD - MSIMBAZI ROAD	15.0	24.6	29.5	17.8
10.	SAM NUJOMA ROAD - NELSON MANDELA ROAD - KILWA ROAD	23.8	53.0	68.6	41.6

3.8.2 Usage of Existing Bus Terminal

Total number of public buses to and from the city center and Kariakoo is estimated to be around 16,000 / day (7:00 a.m. - 7:00 p.m.). The number of passengers for these buses is estimated to be about 300,000 of which 4,000 are long distance passengers on inter-regional buses. Average number of passengers per vehicle was around 19.

Table 3.11 Results of Bus Terminal Survey

Terminal	City Service			Long Distance Service		
	No. of Routes	No. of Buses Observed	No. of Passengers Observed	No. of Routes	No. of Buses Observed	No. of Passengers Observed
1. MNAZI MMOJA	6	1,299	13,673	10	58	1,933
2. AKIBA (NPF)	6	693	6,259	-	-	-
3. REMS	5	367	2,522	-	-	-
4. NEW POST OFFICE	11	1,738	17,559	-	-	-
5. OLD POST OFFICE	28	3,248	46,531	-	-	-
6. STESHENI	14	1,317	15,605	-	-	-
7. KABIAKOO	14	3,789	101,232	-	-	-
8. KARIAKOO-GEREZANI AREA BUS TERMINAL	7	429	78,057	-	-	-
9. UHURU (CONGO)	6	1,311	6,608	-	-	-
10. SHULEYA UHURU	3	988	10,263	-	-	-
11. UHURU - MCHANGANYIKO	3	397	9,749	-	-	-
12. MSIMBAZI STREET STATION	-	-	-	6	27	897
13. KISUTU	-	-	-	6	30	1,427
TOTAL	103	15,576	308,058	22	115	4,257



Location of Bus Terminals

3.8.3 Car Parking

Total number of cars being parked in the city center was estimated to be 5,000 during 9 a.m. - 11 p.m. The number of parking spaces in this area was estimated to be around 4,000. The average parking time was estimated at approximately 25 minutes. The above information would suggest that there is shortage of parking spaces in the area.

Table 3.12 Car Parking Facility in City Center

Management Type	Total No. of Sample	Total Capacity (vehicle)	Total Space (m ²)	Average Capacity (vehicle)	Average Space (m ²)
Free	129	2,289	37,322	17.7	289
Contract/month	4	97	2,037	24.3	509
Contract/year	1	40	1,500	40	15,000
Exclusive use	63	1,291	34,138	20.2	523
Others	12	218	2,370	18.2	198
Total	210	3,935	77,367	18.7	368

3.8.4 Trip Generation/Attraction by Urban Facility

Trip generation and attraction by type of activity centers is given in Table 3.13. Estimated unit ratios in terms of employment and floor space are shown in Table 3.13.

	<u>Per Employee</u>		<u>Per Floor Space</u>	
	<u>Walk</u>	<u>Vehicle</u>	<u>Walk</u>	<u>Vehicle</u>
School / College	11.03	3.24	0.046	0.014
Hospital	9.30	4.97	0.571	0.305
Manufacture	2.33	0.47	0.087	0.017
Office	7.45	2.46	0.221	0.073
Retail Shop	46.75	3.19	4.118	0.281
Wholesale	64.51	2.48	6.715	0.258

Unit: Trips/Day

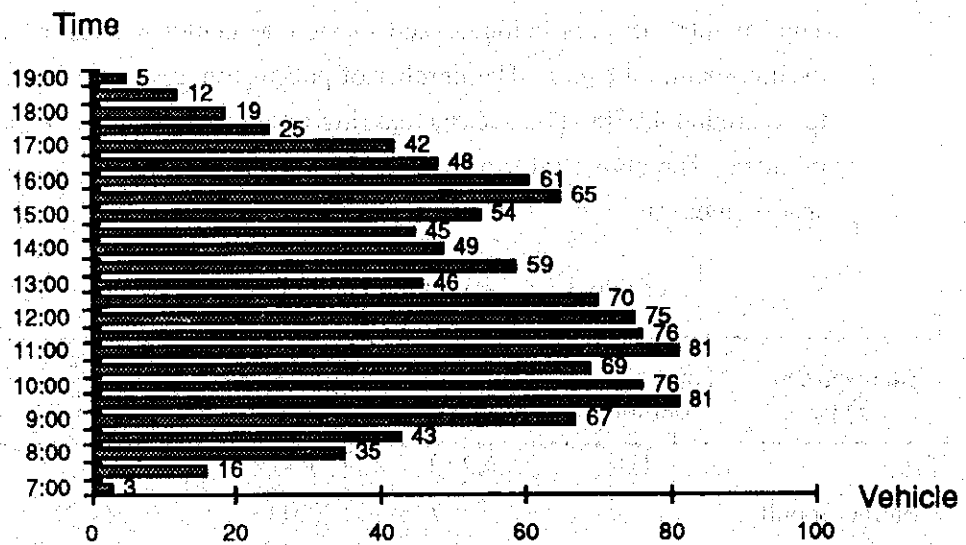


Fig. 3.14 Number of Parked Cars by Time Band
- Samora Avenue -

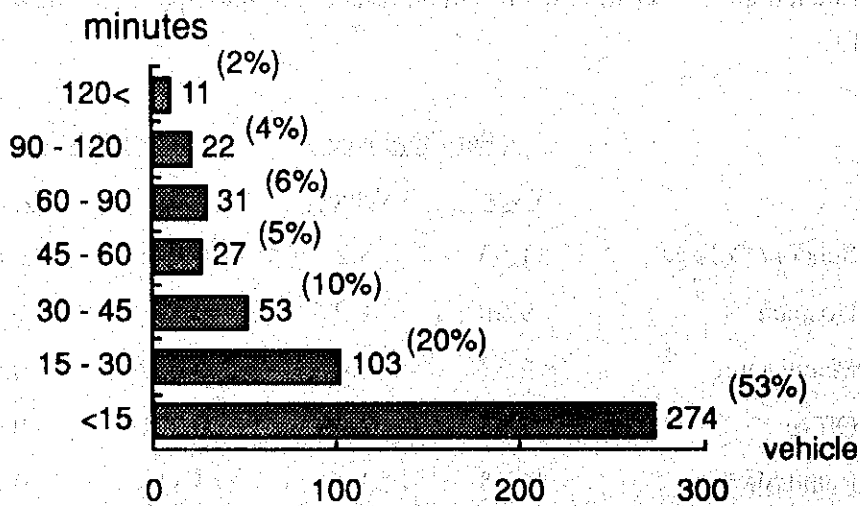


Fig. 3.15 Average Parking Time
- Samora Avenue -

Table 3.13 Trip Generation / Attraction by Urban Facility

TYPE OF FACILITY	NO. OF EMPLOYEES	FLOOR SPACE (m)	GENERATION / ATTRACTION						TOTAL OF VEHICLE
			WALK	BICYCLE	MOTOR-CYCLE	CAR	TRUCK		
COLLEGE OF BUSINESS EDUCATION	125	15,000	1,501	11	11	110	14	146	
DAR ES SALAAM TECHNICAL COLLEGE	307	25,000	2,944	24	37	343	167	571	
CHU CHA POSTA	124	105,000	923	25	21	456	40	542	
DSA	138	20,800	2,303	67	27	660	235	989	
TOTAL	694	165,800	7,671	127	96	1,569	456	2,248	
MWANANYAMALA HOSPITAL	320	12,240	5,848	126	37	1,331	38	1,532	
MIKOCHENI HOSPITAL	350	1,680	2,231	46	2	162	25	235	
AGAKHAN HOSPITAL	430	4,000	2,148	36	53	3,323	291	3,703	
TOTAL	1,100	17,920	10,227	208	92	4,816	354	5,470	
FRENDSHIP TEXTILE MILL LTD.	3,133	65,208	7,174	105	5	277	109	496	
NATINAL BIYLLWS COMPANY LTD.	196	20,568	413	59	8	164	79	310	
TANZANIA FISHNET INDU. LTD.	230	11,321	466	12	2	103	27	144	
TANZANIA DAIRIES LTD.	110	3,390	750	166	9	203	93	471	
AUTOMECH LTD	321	6,644	502	16	27	332	68	443	
TOTAL	3,990	107,131	9,305	358	51	1,079	376	1,864	
EXTEL COMS HOUSE	433	16,585	3,843	7	31	435	0	473	
CO-ARCHITECTURE	140	3,983	1,122	0	0	0	0	0	
ATC HOUSE	167	3,987	1,309	32	56	1,361	160	1,609	
RUBADA	187	6,680	632	12	23	162	0	197	
TOTAL	927	31,235	6,906	51	110	1,958	160	2,279	
ABDALA MOHAMED STORE	13	16	577	12	2	12	4	30	
ACACIA BAZAAR LTD.	11	190	1,359	0	0	0	0	0	
DSM SUPERMARKET	20	408	1,186	8	10	168	0	186	
SUKITA SUPERMARKET	42	375	828	0	4	66	2	72	
LIGHT CORNER LTD.	8	78	444	0	4	8	0	12	
TOTAL	94	1,067	4,394	20	20	254	6	300	
MANICAL PPARDHAN NATWANI LTD.	6	50	270	2	2	13	0	17	
MEHTA BROTHERS LTD.	6	67	232	8	0	32	0	40	
MOHAMMED DECOSHI & SONS 1988 LTD	6	50	182	0	0	0	0	0	
KAMPUNI YA BIASHARA YA MKOA DSM	5	54	800	0	0	0	0	0	
TOTAL	23	221	1,484	10	2	45	0	57	
HOTEL AGIP	330	3,069	1,029	3	2	507	0	512	

NOTE :

SC : School / College HP : Hospital MF : Manufacture RS : Retail Shop WS : Wholesale HT : Hotel

3.8.5 Traffic Accident

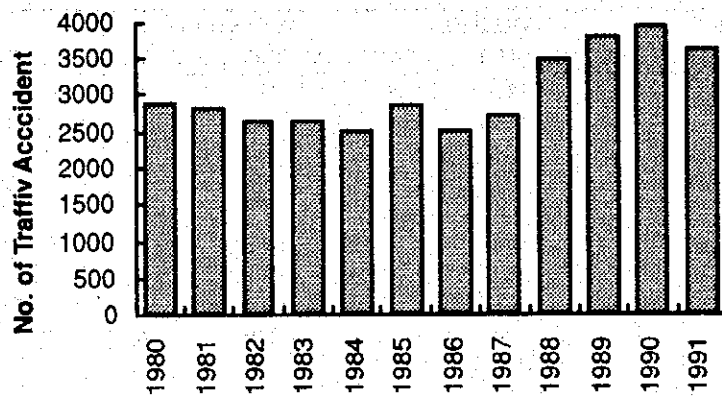
The number of traffic accidents in Dar es Salaam is on the increase. The number of traffic accidents in 1991 was about 3,600 as shown in Fig. 3.16. On the other hand, the number of death accidents in Dar es Salaam has leveled off in the last few years at about 400 a year in the same period.

According to the survey results, Morogoro and Kilwa roads showed high accident rates while Pugu and Uhuru roads tended to have low accident rates as shown in Fig. 3.17. and Table 3.14.

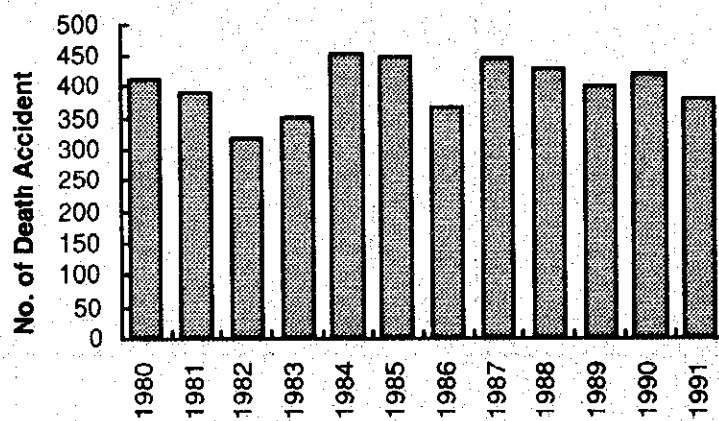
The number of accidents in the last five years has been declining. This is explained mainly by recent improvement of road conditions and control by traffic police.

TABLE 3.14 ACCIDENTS AND DEATHS ON DAR ES SALAAM ROAD NETWORK - 1991

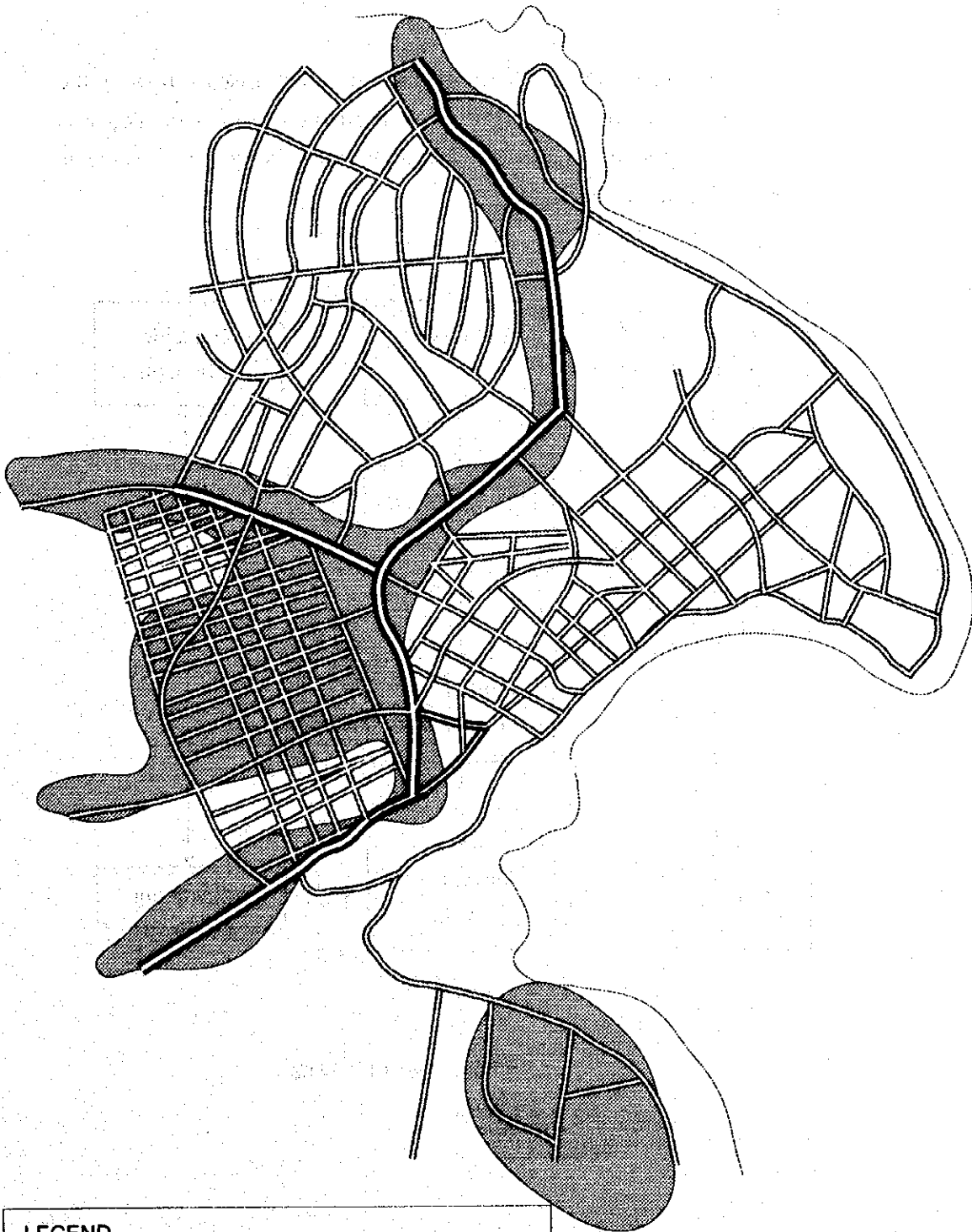
ROAD NAME	COLLISION		PEDESTRIAN		OBJECT	
	ACCIDENT	DEATH	ACCIDENT	DEATH	ACCIDENT	DEATH
MOROGORO ROAD	415	8	225	35	58	1
PUGU ROAD	218	3	94	21	50	1
NELSON MANDELA	104	1	109	27	30	-
NEW BAGAMOYO ROAD	137	2	61	8	29	1
KILWA ROAD	90	2	60	10	11	-
UHURU ROAD	106	-	66	2	11	-
MOROCCO ROAD	62	-	42	5	9	1
UPANGA ROAD	46	-	12	-	13	-
CHANGO'OMBE ROAD	56	1	29	6	8	-
AZIKIWE ROAD	20	-	4	-	1	-
OYSTERBAY ROADS	16	-	3	-	6	-
UNITED NATION	16	-	11	-	2	-
BANDARI ROAD	11	-	6	-	5	-
KIGOGO ROAD	39	-	14	5	3	-
TEMEKE ROADS	47	-	36	5	10	-
KARIAKOO ROADS	30	-	24	-	2	-
NKRUMAH ROAD	23	-	2	-	3	-
KIVUKONI FRONT	12	-	6	-	2	-
MWANANYAMALA ROADS	7	-	7	2	3	-
UWT ROADS	45	-	7	-	9	-
SAM NUJOMA ROAD	15	-	4	2	-	-
OLD BAGAMOYO ROAD	11	-	1	-	-	-
OHIO	8	-	-	-	1	-
KINONDONI ROAD	19	-	8	2	5	-
SHEKILANGO ROAD	15	-	4	-	1	-
KENYATTA ROAD	25	1	3	-	4	-
MSIMBAZI ROAD	62	1	34	6	2	-
OCEAN ROAD	17	-	5	-	3	-
MAKTABA ROAD	9	-	-	-	1	-
LUMUMBA	20	-	6	-	1	-
SIBRIDGE	40	-	3	-	-	-
HAIL SELLASIE	25	1	2	-	15	1
CITY CENTRE	179	4	30	2	11	-
OUTSKIRTS	74	1	73	10	50	3
OTHER PLACES	139	-	75	11	59	-
TOTAL	2,158	25	1,066	159	409	8



Number of Traffic Accidents



Number of Death Traffic Accidents



LEGEND



AREA OF ACCIDENT PRONE ROADS

3.9 Characteristics of Person Trips

(1) Introduction

The results of Person Trip (PT) Survey have been processed following the procedure described in Fig. 3.18 in which original data of Person Trip was processed into generalized data with respect to traffic behaviors of residents on average day of the year.

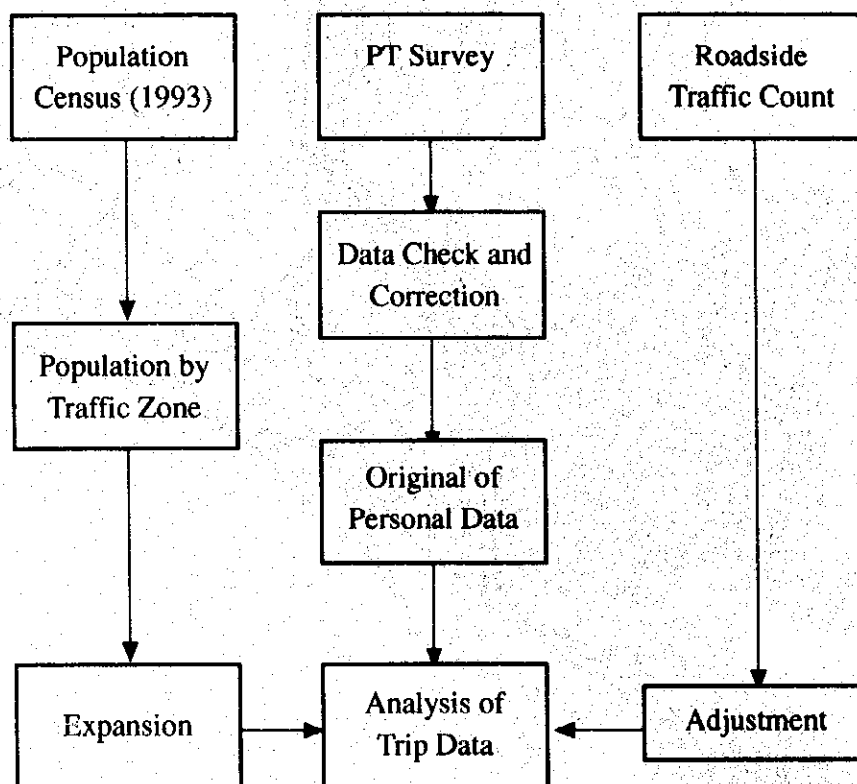
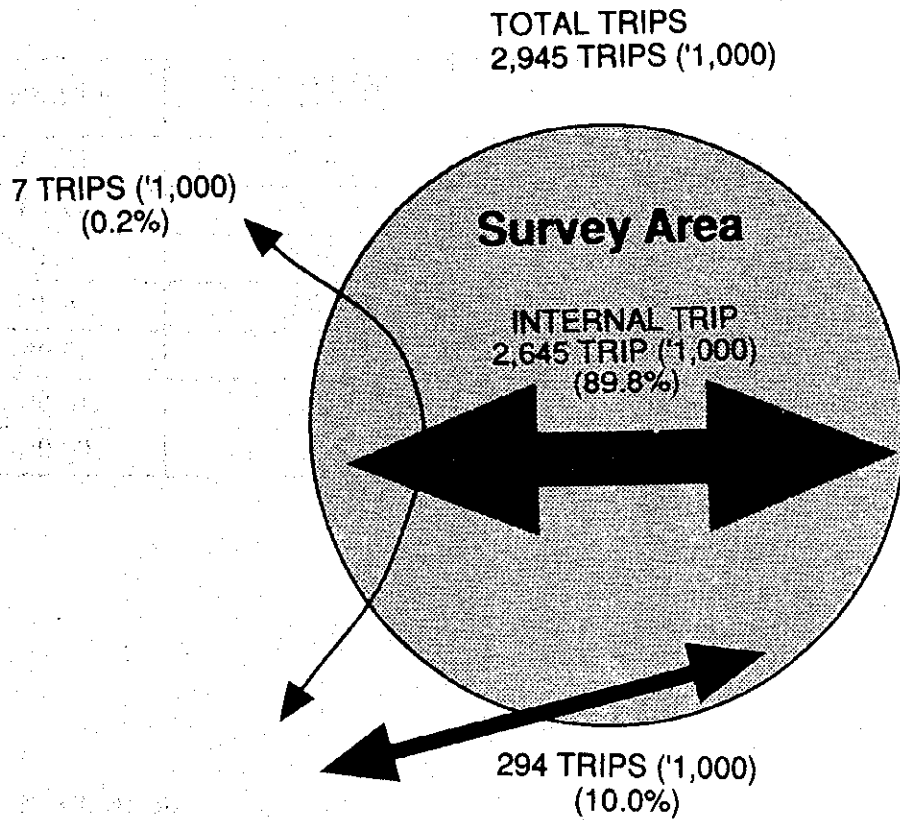


Fig. 3.18 Processing of PT Data

(2) Number of Person Trips

The total number of trips made by residents in the Person Trip Survey area is 2.95 million of which 89.8 percent (2.65 million trips) were trips which had both of the trip ends within the survey area.



Survey Area: Area within Nelson Mandela and Mpakani roads

Fig. 3.19 Number of Person Trips

(3) Composition of Purposes

The "to office" trips account for 15.7 percent of total trips while the "business" trips account for 8.2 percent. The working related trips account for one fourth of total trips. The "home" trips occupy about one-half of the total trips. Trips related to "shopping" and "others" are about 23% of total trips.

TRIP PURPOSE	NO. OF TRIP ('1000)	PERCENTAGE
GO TO OFFICE	463	15.7%
GO TO SCHOOL	276	9.4%
BUSINESS	241	8.2%
SHOPPING	182	6.2%
BACK TO HOME	1,293	43.9%
OTHERS	490	16.6%
TOTAL	2,945	100.0%

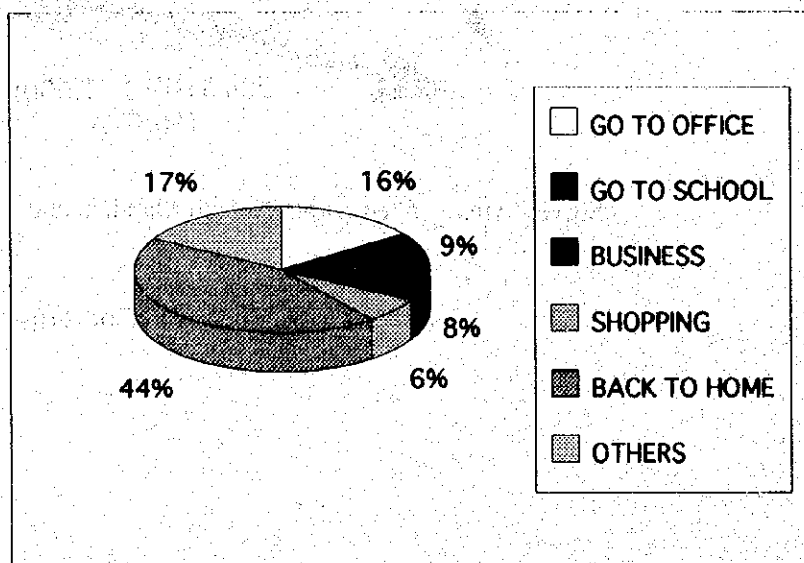


Fig. 3.20 Trip Composition by Purpose

(4) Trip Composition by Mode

Walking trips account for more than 30% of total trips. Bus trips account for 47.8 percent while passenger cars and trucks constitute 12.2 and 2.6 percent respectively. It could be pointed out that fairly great number of trips are made by vehicles in Dar es Salaam.

MODE	NO. OF TRIPS ('000)	PERCENTAGE
WALK	959	32.6%
BICYCLE & MOTORCYCLE	138	4.7%
TAXI & PASSENGER CAR	359	12.2%
BUS	1,407	47.8%
TRUCK	76	2.6%
OTHERS	1	0.0%
TOTAL	2,941	100.0%

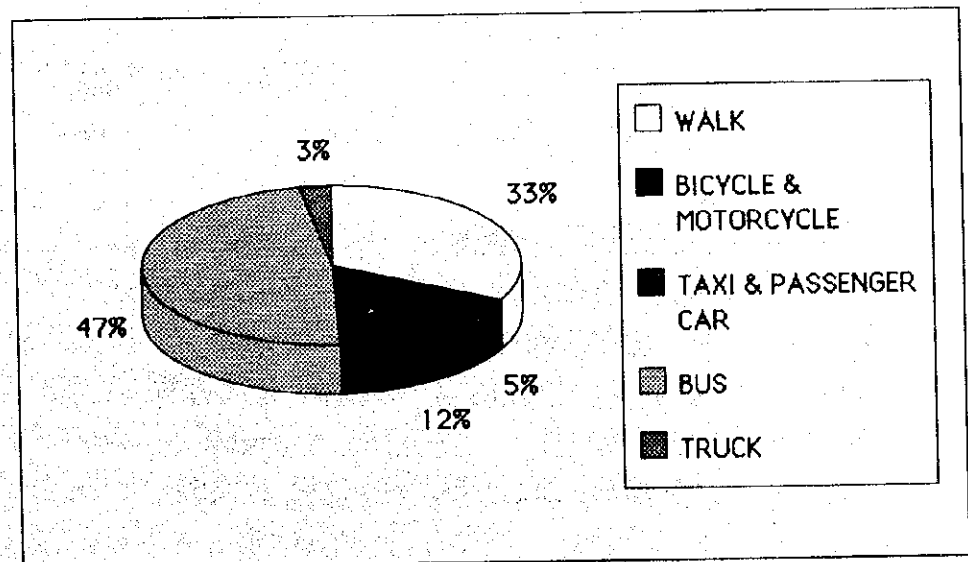


Fig. 3.21 Trip Composition by Mode

(5) Modal Share by Purpose of Trip

The share of bus is high for the purpose of "to office" and "back to home". Walking constitutes only 16.9% of trips in the purpose "to office" while the share of bus in the same purpose is 43.9%. Relative to business trip, the share of passenger car is 20.3%, second to that of bus.

It is characteristic of Dar es Salaam that vehicles are used for all purposes. This is attributed to the urban structure of Dar es Salaam where urban facilities are located in wider area.

PURPOSE	WALK	BICYCLE & MOTORCYCLE	TAXI & PASSENGER CAR	MINI BUS	BUS	TRUCK	OTHERS	TOTAL
GOTO OFFICE	16.90%	6.71%	19.22%	10.13%	43.92%	3.12%	0.00%	100%
GO TO SCHOOL	48.92%	1.11%	4.48%	6.81%	37.79%	0.85%	0.04%	100%
BUSINES	19.20%	9.73%	20.27%	9.84%	35.97%	5.00%	0.00%	100%
SHOPPING	46.89%	3.04%	7.85%	5.96%	33.55%	2.71%	0.00%	100%
BACK TO HOME	34.37%	4.25%	10.54%	8.50%	39.97%	2.31%	0.05%	100%
OTHERS	34.80%	4.16%	12.04%	8.89%	37.48%	2.59%	0.05%	100%
TOTAL	32.60%	4.70%	12.21%	8.62%	39.25%	2.59%	0.03%	100%

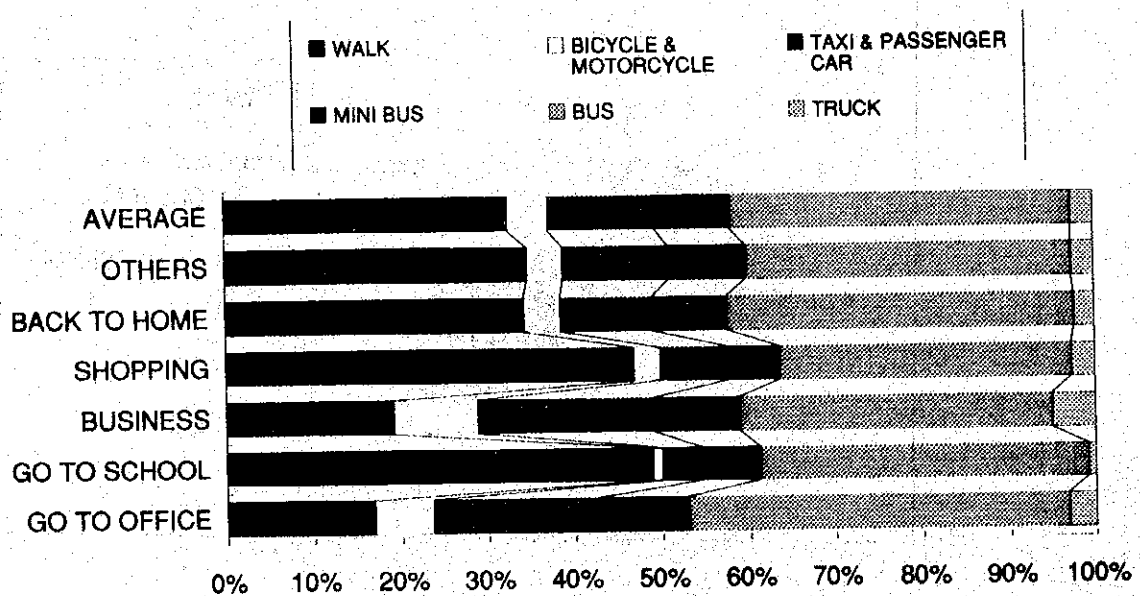


Fig. 3.22 Modal Share by Purpose of Trip

(6) Modal Share by Travel Time

There exists distinct relation between the share of mode and travel time as shown in Fig. 3.23. The share of "walk" declines with the increase in travel time whilst the share of "bus" tends to increase with the increase in travel time. The share of bus in the total trips which takes 30 minutes and over is about 60 percent.

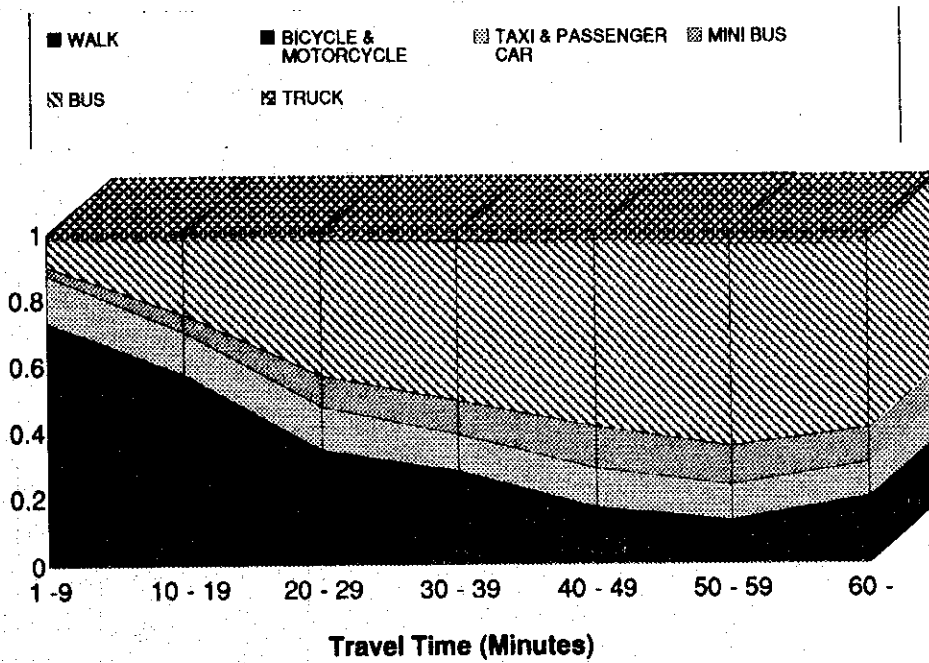


Fig. 3.23 Modal Share by Travel Time

(7) Trip by Time-band

The peak hours in terms of departure lie in 6:00 – 7:00 in the morning and 14:00 – 15:00 in the afternoon. This is due to the pattern of activities of people in Dar es Salaam who begin to work in the early morning and finish in the early afternoon.

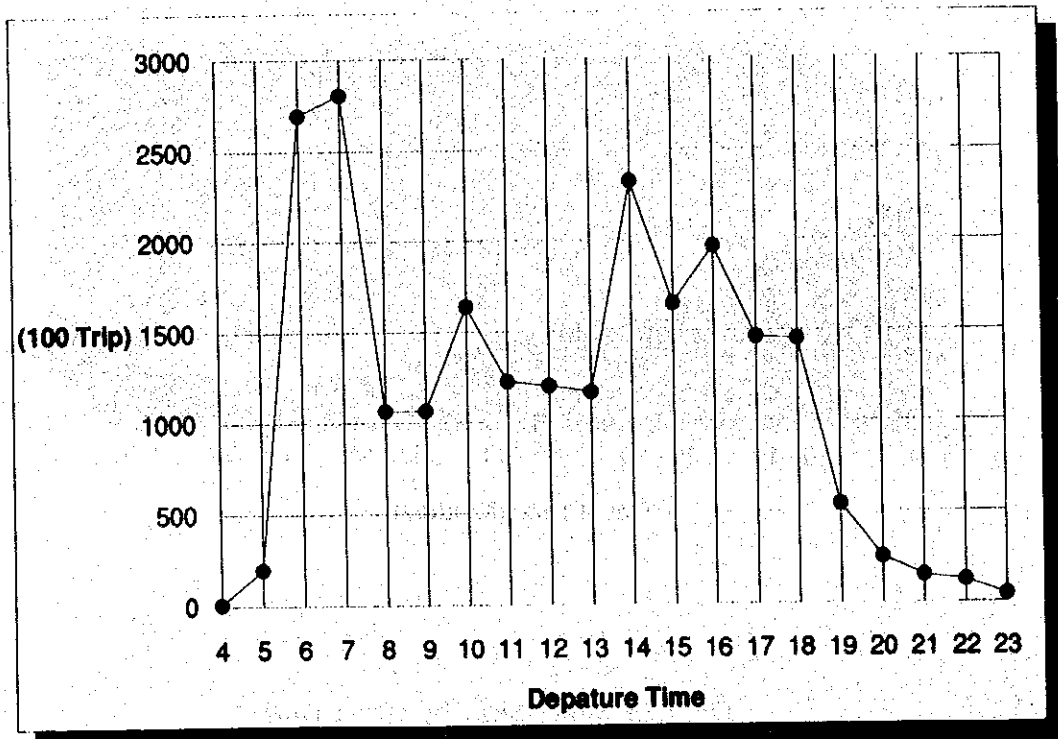


Fig. 3.24 Trip by Time-band

(8) Trip by Individual Characteristics

1) Trip Production Rate by Age Group

Trip production rates by "forties" is the largest of all. There is no distinct difference in production rate among age groups.

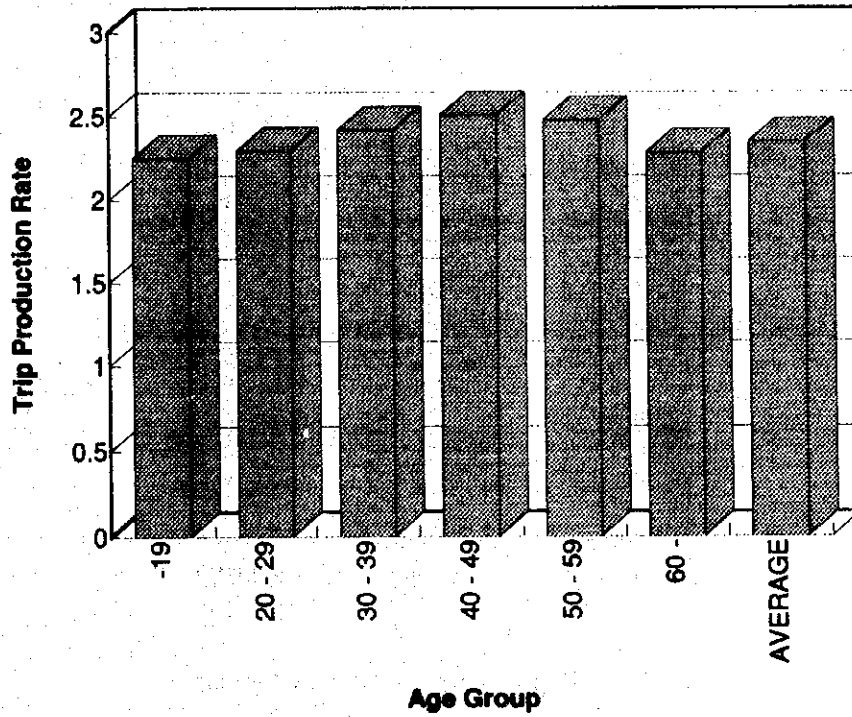


Fig. 3.25 Trip Production Rate by Age Group

2) Trip Production Rate by Industry

There is no particular difference in trip production rates by industry to which people engage. However, secondary industry tends to show higher rate.

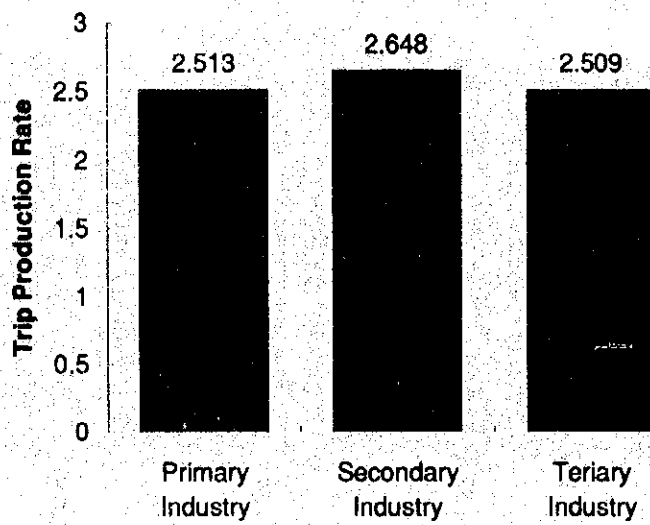


Fig. 3.26 Trip Production Rate by Industry

3) Trip Production Rate by Vehicle Ownership

Vehicle owners are apt to show higher trip production rate than non-vehicle owners. Motorcycle owners show highest rate.

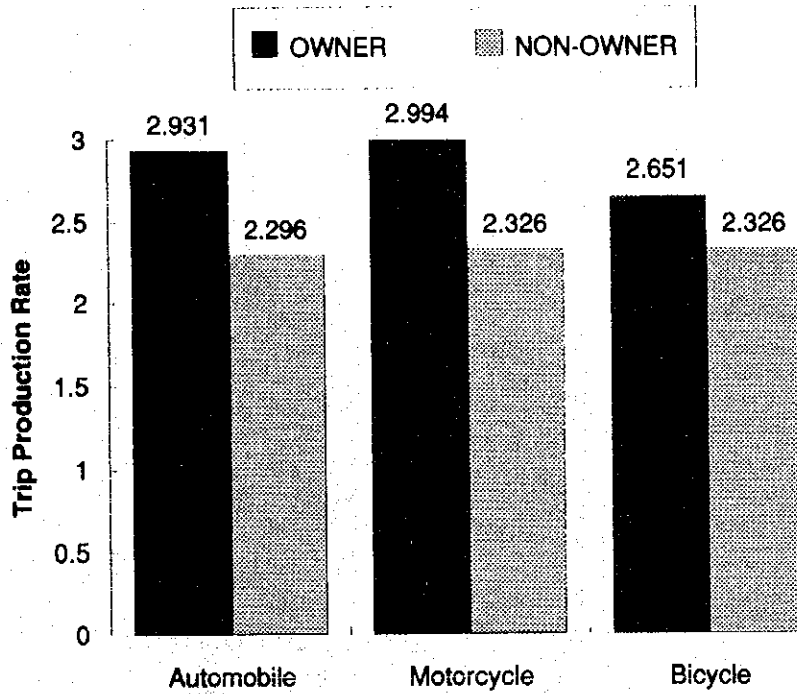


Fig. 3.27 Trip Production Rate by Vehicle Ownership

4) Trip Production Rate by Income Level

Higher income groups tend to show higher trip rate as shown in Fig. 3.28. This fact suggests that higher income groups have easier access to travel modes such as passengers car and motorcycles.

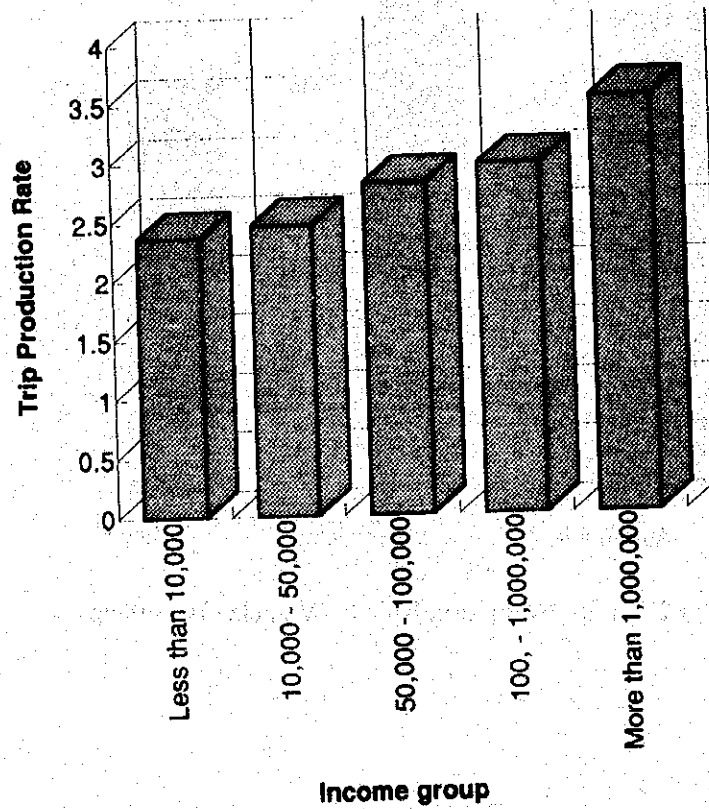


Fig. 3.28 Trip Production Rate by Income Level

3.10 Estimation of Present OD Tables

Traffic distribution in terms of vehicle number has been obtained through the integration of the results of Person Trip Survey and Roadside OD Survey.

This process is explained in Fig. 3.29.

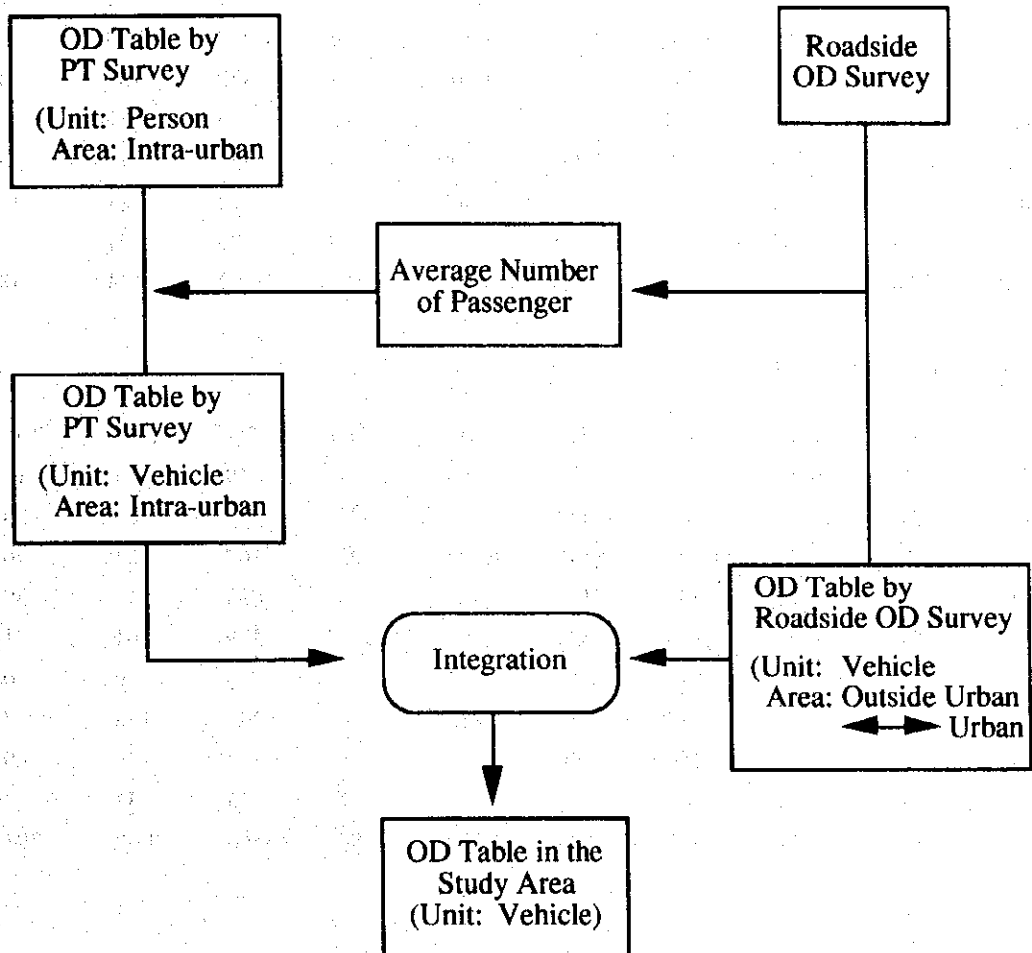


Fig. 3.29 Process of Estimation of OD Table in the Study Area

Traffic distribution among consolidated traffic zones is shown in Table 3.15 while Fig. 3.30 shows traffic desire line among original traffic zones. This is characterized by strong concentration of traffic in the city center.

Table 3.15 Vehicle OD Table among Consolidated Traffic Zone (1993)

Unit: Vehicles/day

(1) Type: Passenger-car

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Total
(1)	6,425	9,051	4,097	2811	1,310	24	2,316	886	98	27,018
(2)	8,841	10,524	4,074	3,404	1,177	25	950	731	36	29,762
(3)	4,200	4,026	3,590	3,435	1,877	23	729	881	59	18,820
(4)	3,275	3,587	2,945	5,017	1,355	7	1,079	1,048	65	18,378
(5)	1,694	1,170	1,513	1,529	1,202	4	372	757	49	8,290
(6)	34	32	18	14	9	2	9	15	1	137
(7)	2,552	1,548	726	1,237	309	6	426	314	59	7,049
(8)	872	842	46	1,115	880	10	372	721	114	5,623
(9)	93	91	16	85	77	3	29	91	7	492
Total	27,986	30,871	17,551	18,647	8,196	104	6,282	5,444	488	115,569

(2) Type: Light-goods Vehicle

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Total
(1)	805	1,099	1,126	837	563	21	849	326	17	5,643
(2)	841	1,807	1,601	520	288	22	503	82	25	5,689
(3)	938	1,976	1,673	2,056	1,197	25	467	563	40	8,935
(4)	816	614	1,701	2,408	327	3	823	559	38	7,289
(5)	533	445	1,249	626	855	5	239	161	71	4,184
(6)	14	22	19	16	1	2	5	0	0	79
(7)	854	478	449	725	238	4	434	138	7	3,327
(8)	424	88	486	394	177	6	213	129	80	1,997
(9)	45	20	41	43	104	2	33	51	13	352
Total	5,270	6,549	8,345	7,625	3,750	90	3566	2009	291	37,495

(3) Type: Medium-goods Vehicle

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Total
(1)	0	48	198	606	0	6	362	54	24	1,298
(2)	96	1,961	640	245	380	10	436	231	14	4,013
(3)	0	389	246	785	166	4	211	525	31	2,357
(4)	0	0	767	1,622	198	8	306	398	28	3,327
(5)	0	197	190	712	0	5	286	640	84	2,114
(6)	6	17	8	11	2	0	8	8	0	60
(7)	243	451	241	436	286	3	557	284	43	2,564
(8)	99	290	547	342	479	5	383	348	87	2,580
(9)	16	0	46	28	49	0	60	95	7	302
Total	460	3,353	2,894	4,787	1,560	41	2,609	2583	318	18,615

(4) Type: Heavy-goods Vehicle

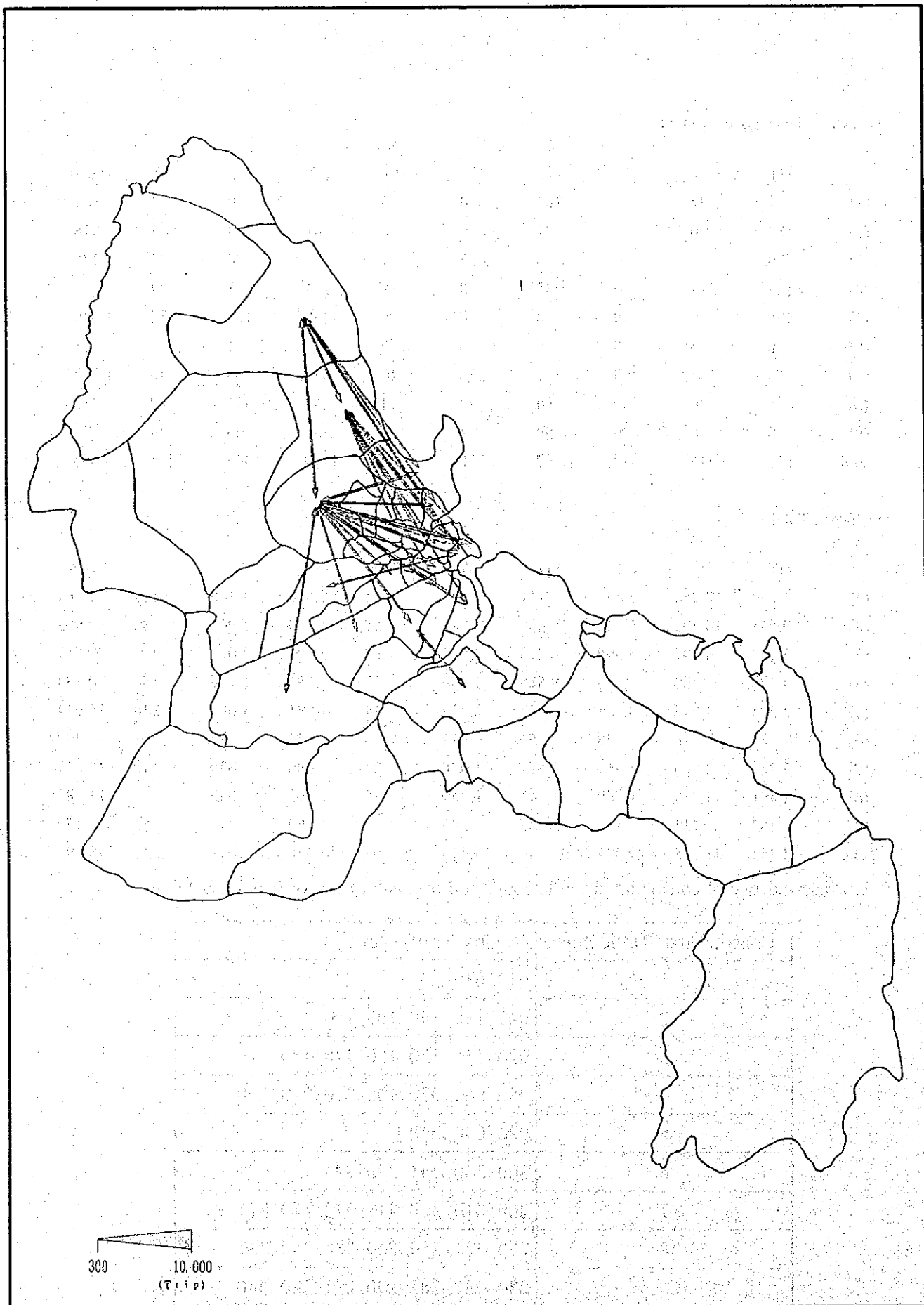
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	Total
(1)	0	82	0	187	0	0	29	200	4	502
(2)	83	0	0	297	0	0	101	24	13	518
(3)	0	0	0	0	297	17	91	38	32	475
(4)	187	297	0	538	0	19	151	121	27	1,340
(5)	278	0	399	0	0	0	188	125	36	1,026
(6)	0	5	0	9	0	0	13	4		31
(7)	75	131	63	177	235	10	473	103	40	1,307
(8)	6	30	39	90	323	14	195	337	49	333
(9)	8	0	36	99	73	0	38	55	24	333
Total	637	545	537	1,397	928	60	1279	1007	225	5,865

(5) Type: Total

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		Total
(1)	7,230	10,280	5,421	4,441	1,873	51	3,556	1,466	143	34,461
(2)	9,861	14,292	6,315	4,466	1,845	57	1,990	1,068	88	39,982
(3)	5,138	6,391	5,509	6,276	3,537	69	1,498	2,007	162	30,587
(4)	4,278	4,498	5,413	9,585	1,880	37	2,359	2,126	158	30,334
(5)	2,505	1,812	3,351	2,867	2,057	14	1,085	1,683	240	15,614
(6)	54	76	48	50	12	4	35	27	1	307
(7)	3,724	2,608	1,361	2,575	1,078	23	1,890	839	149	14,247
(8)	1,401	1,250	1,769	1,941	1,859	35	1,163	1,535	330	11,283
(9)	162	111	140	255	303	5	160	292	51	1,479
Total	34,353	41,318	29,327	32,456	14,444	295	13,736	11,043	1,322	178,294

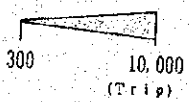
* Correspondence of consolidated traffic zones and original traffic zones is given below:

Consolidated Traffic Zone	Original Traffic Zone
1	010, 030
2	040, 130, 140, 160, 190
3	020, 110, 120, 150, 170, 180
4	050, 060, 070, 100, 230, 240, 260
5	080, 090, 270
6	300, 340, 341, 342, 343
7	200, 210, 310, 311, 312, 320, 321
8	220, 221, 250, 260, 283, 330, 331
9	280, 281, 282, 290, 291, 380, 430



THE STUDY ON DAR ES SALAAM
ROAD DEVELOPMENT PLAN

Fig. 3.30(1/2) Present Traffic Desire Line- DSM Regional Areas
- Total Vehicle -



**THE STUDY ON DAR ES SALAAM
ROAD DEVELOPMENT PLAN**

**Fig. 3.30 (2/2) Present Traffic Desire Line - DSM Urban Area
- Total Vehicle -**

