

CHAPTER 4 PRESENT TRANSPORTATION SYSTEM IN DAR ES SALAAM



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4.1 Outline of Transportation System

4.1.1 General

Dar es Salaam is the largest city in Tanzania and the nation's center of economy, industry and government. As the city has grown rapidly, the demand for urban transport service has exceeded the capacity in which these services can be provided.

The city of Dar es Salaam has developed around the Dar es Salaam port which is not only the center of distribution in Tanzania but also that of nearby inland nations, including Zambia and Malawi. Historically, the transport system in Dar es Salaam has been developed along the road network which connects to the city's port. An outline of major transportation systems in the city are described below:

4.1.2 Sea Transportation

(1) Dar es Salaam Port

Dar es Salaam Port has been developed along the Mzinga Creek which separates the mainland and peninsula of Kigamboni. The port is provided with relatively modern container berths, a deep-sea oil products berth and other facilities. A passenger terminal is located along the Sokoine Drive in the city center where passenger service to Zanzibar is being carried out an average of three times a day.

At present, a port development plan is being formulated by the Tanzania Harbors Authority to cope with growing demand. In this plan, expansion of container and general cargo terminal, dredging of entrance channel, improvement of cargo handling equipment and etc., are being proposed. The trends in cargo as well as passengers and types of cargo handled at Dar es Salaam port are given in Table 4.1 and 4.2, respectively.

Regarding the mode of distribution of cargo to and from the port, about of 70% are transported via road while the remaining of 30% are transported via rail as shown in Table 4.3.

Table 4.1 Trend of Cargo Handled at Dar es Salaam Port

Year	Unit 1,000 dwt		
	Loaded	Unloaded	Total
1982	782	2,472	3,254
1983	726	2,424	3,150
1984	965	2,568	3,533
1985	830	2,297	3,127
1986	1,015	2,619	3,724
1987	1,154	2,557	3,711
1988	1,030	2,994	4,009
1989	1,030	3,205	4,235
1990	1,038	2,581	3,619
1991	1,058	3,835	4,893

Source: Tanzania Transport Statistics 1991

Table 4.2 Passengers and Cargo Handled at Dar es Salaam Port

Year	Ships (No.)	NRT (000)	Passen- ger(No.)	Unit 1,000 dwt					(1)			
				Cargo Unloaded				Cargo Loaded				
				General	Bulk Fert-	Bulk Cem-	Bulk Oil	Total		Gen- eral	Bulk Oil	
1978	975	3887	28348	1206	-	-	1862	3068	941	135	1076	1
1979	850	3651	25598	915	-	-	1542	2457	786	124	910	1
1980	880	3719	29265	1150	-	-	1704	2854	732	169	901	5
1981	807	3333	67524	1036	-	-	1532	2568	695	96	791	2
1982	884	3738	82300	1166	-	-	1306	2472	670	112	782	1
1983	808	3579	134718	863	-	-	1561	2424	615	111	726	5
1984	795	3445	56976	1077	-	-	1491	2568	756	209	965	5
1985	866	3286	71900	1088	-	-	1209	2297	708	122	830	1
1986	887	3614	72400	1016	-	-	1603	2619	889	216	1105	4
1987	889	3801	73000	1202	-	-	1355	2557	1034	120	1154	1
1988	1013	3990	58000	1228	-	-	1766	2994	925	90	1015	11
1989	1253	4296	95000	1108	273	4	1820	205	791	239	1030	13
1990	1079	3967	47000	842	140	1	1598	2581	883	155	1038	-
1991	2130	7609	319000	1889	-	-	1946	3835	866	192	1058	3

(1) Transshipment

Source: Tanzania Transport Statistics 1991

(2) Ferry Services at Kigamboni Creek

Ferry service to and from Kigamboni is provided at a ferry boat dock which is located at the mouth of the creek. Ferry service is offered between 5.00 a.m. and 11.00 p.m. with an average frequency of three times per hour for both directions. The number of passengers and vehicles transported by ferry in 1992 were around 14 million and 200 thousand respectively.

Table 4.3 Access Modes of Port Cargo for 1992

Unit: 000 ton

Model of Transport	Imported Cargo			Exported Cargo			Total Cargo		
	Break Bulk	Container	Total	Break Bulk	Container	Total	Break Bulk	Container	Grand Total
Road	766 (0.70)	389 (0.88)	1,155 (0.75)	194 (0.41)	358 (0.98)	552 (0.66)	960 (0.61)	747 (0.93)	1,707 (0.72)
TRC	245	25	270	228	7	235	473	32	505
Rail TAZARA	89	26	115	47	2	19	136	28	164
Total	334 (0.30)	51 (0.12)	385 (0.25)	275 (0.59)	9 (0.02)	284 (0.34)	609 (0.39)	60 (0.07)	669 (0.28)
Grand Totals	1,100 (1.00)	440 (1.00)	1,540 (1.00)	469 (1.00)	367 (1.00)	836 (1.00)	1,569 (1.00)	807 (1.00)	2,376 (1.00)

Source: Dar es Salaam Port Development Study, Tanzania Harbor Authority, 1993

4.1.3 Road Transportation

Dar es Salaam has a total road length of 1,150 km, with 148 km of trunk roads, 65 km of regional roads and 933 km of local roads, according to the road classification in Tanzania. Among the 1,150 km road network in Dar es Salaam, 450 km is paved while the remaining 700 km are gravel or earth, as shown in Table 4.4.

Table 4.4 Road Length in Dar es Salaam by Classification and Number of Lanes and Surface Condition

Roads by Classification	Number of Lanes	Pavement Condition	Length (km)
Trunk Roads	4	Paved	35
	2	Unpaved	113
	Total		148 (13%)
Regional Roads	2	Paved	52
	2	Unpaved	13
	Total		65 (6%)
Local Roads	2	Paved	251
	1 - 2	Unpaved	682
	Total		933
Paved Roads			338 (39%)
Unpaved Roads			808 (61%)
Grand Total			1,146 (100%)

The road network in Dar es Salaam has been developed on a radial pattern with major arteries focusing on the central area and the port. Roads radiating out of the city center are Bagamoyo road, Morogoro road, Pugu road, and Kilwa road.

Bagamoyo road connects Dar es Salaam with the Northern Coastal Region and functions partially as a commuter service road for the residents of newly developed suburban areas along this axis. Morogoro road is an inter-regional/inter-national road which connects Dar es Salaam and the central region of Tanzania and nearby countries. The road is extremely important for the regional economy in that most cargo shipped into and out of Dar es Salaam port are shipped along this route. Morogoro road also is a part of the Tanzam Highway, an international trunk road in the central part of East Africa; however, the nature of the road changes to that of an urban arterial after the town of Kimara which is located about 16 km from the city center of Dar es Salaam.

Pugu road, on the other hand, functions as vital industrial road in the city with several manufacturers and distributing industries being located along it. The road is used as an access to the Dar es Salaam International Airport as well. It is a high standard 4-lane road with pedestrian walks on both sides of the thoroughfare.

Kilwa road connects Dar es Salaam to the coastal regions in southern Tanzania and is the only land route which links the Kigamboni peninsula with the main land. The function of this road is becoming increasingly important due to residential development along the road.

No statistical data is available concerning the number of registered vehicles in Dar es Salaam; however, the number of vehicles in use is estimated to be 50,000 according to traffic accident data and customs office records on imports. It is further estimated that the number of vehicles on the roads in the city is increasing annually at a rate of 3% according to roadside traffic counts.

At present there are few completed circumferential roads linking these radial roads, especially in the middle of the city, although Nelson Mandela/Mpakani road forms a ring-shaped road along the urban fringe as well as UWT road in the central core area. The lack of suitable circumferential roads has resulted in increased traffic flow through urban areas which has almost paralyzed urban traffic flow in Dar es Salaam city core. All intersections between radial roads and circumferential roads are at-grade level and lack efficient traffic control. When controls do exist i.e., (traffic signals), they are often in improper working order. Traffic in the Dar es Salaam city center is characterized by a mixture of auto

traffic, pedestrians, roadside hawkers, and a large number of parked automobiles along roadsides thus lowering their capacity to a great extent.

The traffic volume on major roads differs from road to road and even section to section on the same road as be seen in Table 3.6. However, traffic volume on radial roads ranges between 15,000 - 25,000 in a 12-hour day-time period. The maximum traffic volume for a single road in an urban area is Pugu road. Traffic volumes on major streets in the downtown area are in the range of 10,000 - 30,000 ADT. Traffic in the city is on the increase with an annual rate of about 3 % for the last five years.

4.1.4 Railway Transportation

Dar es Salaam is the terminus point of two separate railway lines; the Central Line and Tanzania - Zambia Line. The Central Line is operated by the Tanzania Railway Corporation (TRC) while the Tanzania - Zambia Line is operated by the Tanzania - Zambia Railway Authority (TAZARA). The passenger terminal for the Central Line is located near the junction of Sokoine and Gerezani streets near the city center, while its freight terminal is located at the seaport area.

Annual cargo and freight transported by railway in Tanzania are on the decrease since 1985 as shown in Table 4.5. Inefficiency of railway transportation, due to poor maintenance of freight cars and related facilities, are major reasons for the decline in railway transportation. The slump in the national economy since the middle of the 1980's in addition to an increase in agricultural products (which are more suitable to be transported via roads), are among other reasons for the decline in railroad activity.

The Tanzania-Zambia railway is mainly used for international transportation of cargo between the port of Dar es Salaam and Tanzania's neighboring inland countries such as Zambia and Malawi. Mining products and other agro-related raw materials are transported via this railway. The railway also handles substantial quantities of domestic cargo within Tanzania, mainly between the regions of Rukwa, Mbeya, Ruvuma, Iringa, and Dar es Salaam. Passenger service is made infrequently between Dar es Salaam and the inland regions of Tanzania and neighboring countries with scheduled service three times a week. All railway/road crossings are at grade level which is one cause of road traffic congestion and extended waiting periods.

Re-designing of major railway crossings into separated grade rail crossings especially in the city center and other adjacent areas, is one measure in which to improve urban traffic flow.

Table 4.5 Annual Cargo/Passenger Transportation by Tanzania Railway Corporation

Item	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freight (000 t)	926	791	916	952	877	790	-	900	930	-
Livestock (000 t)	173	176	155	151	125	80	-	86	140	89
Passengers (000)	2443	3104	2977	3040	2291	1740	-	1480	1570	1714

Source: Transport Statistics 1991

Table 4.6 Annual Cargo/Passenger Transportation by TAZARA

Item	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freight (000 t)	796	824	973	1096	984	1185	1143	1075	977	825
Passengers (000 t)	987	564	1198	1065	1161	1424	1621	1617	1699	1550

Source: Transport Statistics 1991

Table 4.7 Cargo/Passenger Handled By TRC at Dar es Salaam Station

Item	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Freight (000 t)	-	790	910	950	800	974	933	902	927	922
Passengers (000 t)	-	-	-	-	-	-	-	-	-	-

Table 4.8 Passengers Carried by TAZARA (000)

Year	Zambia Region	Tanzania Region	Total	Pairs of Trains per Week
1976/77	354	472	826	4
1977/78	553	581	1134	6
1978/79	641	671	1312	6
1979/80	533	864	1397	6
1980/81	424	600	1024	2-3
1981/82	384	603	987	2
1982/83	294	315	564	1
1983/84	404	779	1183	2
1984/85	431	634	1065	2-3
1985/86	446	774	1220	3
1986/87	518	817	1335	3
1987/88	650	860	1510	3

Source: Revised 10 Years Development Plan 1988

Table 4.9 Cargo Carried by TAZARA (000 ton)

Year	Transit		Local Traffic		Total
	Imports	Exports	Etanzania	Zambia	
1976/77	429	500	168	38	1135
1977/78	425	596	236	16	1273
1978/79	271	393	251	8	923
1979/80	204	228	325	33	790
1980/81	235	312	185	20	752
1981/82	252	328	174	42	796
1982/83	241	391	150	42	824
1983/84	288	431	197	56	972
1984/85	284	491	266	55	1096
1985/86	183	444	303	61	991
1986/87	337	535	310	46	1228
1987/88	365	483	301	53	1202

Source: 10 Year Development Plan 1988

Table 4.10 Frequency of Passenger Services at Dar es Salaam Station

Item	Frequency of Day of the Service Service (per week)	
Mwanza	4 times	Sunday, Tuesday, Wednesday, Friday
DSM	4 times	Tuesday, Thursday, Saturday, Friday
Moshi	3 times	Monday, Wednesday, Friday
DSM	3 times	Wednesday, Monday, Thursday

4.1.5 Air Transportation

Dar es Salaam International Airport is located 11 km southwest of the city's central business district along Pugu road. The Airport has both international and domestic terminals with a 3,000m long, 60m wide main runway and 1,000m long 30m wide runway intersecting with the main runway.

Volumes for both passenger and freight handled at the airport are steadily increasing, especially for the freight over the past 12 years as shown in Table 4.11. Most of passengers and freight loads/unloaded at Dar es Salaam are usually transported to the city center via Pugu road, which has a high standard 4-lane carriageway. There are no direct airport limousine or direct city bus services to the airport on this road.

In terms of the long-term foreseeable future, air transport in Tanzania will remain the dominant means of transportation and the role of the Dar es Salaam International Airport will become more important as the hub of air transportation for the nation.

Table 4.11 Passenger/Freight Handled at Dar es Salaam Airport

Year	Move-ment	Passengers (numbers)			Freight (tons)		Mail (tons)	
		Dis-embarked	Embarked	Transit	Off-loaded	Loaded	Off-loaded	Loaded
1978	8,155	134,737	132,903	26,876	1,616	1,373	273	233
1979	14,377	185,766	193,005	23,610	1,989	1,870	380	274
1980	18,905	227,257	228,921	42,934	2,432	2,024	451	308
1981	13,921	215,766	216,866	53,307	2,886	1,741	475	351
1982	15,179	233,071	246,767	39,737	2,801	1,961	522	325
1983	15,286	224,870	228,069	37,828	3,125	2,054	650	361
1984	16,647	260,168	263,701	39,949	3,165	2,623	609	442
1985	15,275	251,963	247,203	30,182	4,946	4,021	1,381	468
1986	13,418	265,279	261,997	44,981	3,798	3,250	709	409
1987	12,901	267,243	265,502	47,846	2,861	2,937	469	323
1988	18,211	255,031	269,130	45,635	4,966	3,260	533	301
1989	11,495	191,694	226,329	53,140	2,086	3,151	299	531
1990	19,173	222,361	230,351	52,126	4,429	3,229	464	363

4.2 Present Road Network System in Dar es Salaam

4.2.1 Present Road Classifications and Jurisdiction

Dar es Salaam roads are classified into six categories according to the "DRAFT ROAD MANUAL" prepared by the former Ministry of Communications and Works (presently the Ministry of Works, Communications and Transport) in 1989 as illustrated in Table 4.12.

Table 4.12 Present Road Classification and Jurisdiction

Categories of Roads	Function and Jurisdiction
(a) Trunk Roads:	All inter-territorial and main internal through routes. These are under the Ministry of Works.
(b) Local Main Roads:	All inter-regional roads, other than trunk roads, which connect regional centers and such centers of the trunk roads. These are under the Ministry of Works.
(c) Regional Roads:	All inter-district roads connecting district centers other than trunk and local main roads. These are funded by the Ministry of Works.
(d) District Roads:	All other major roads within a district, other than the above three categories. District roads should at least connect centers of Divisions or main centers of production to the above main roads. These are funded by the Local Government.
(e) Major Feeder Roads:	All roads other than the four categories above which connect Wards. They are funded by the Local Government.
(f) Minor Feeder Roads:	All other roads funded by the Local Government.

As MWCT stated in the Draft Road Manual, that the above road classification is applied only to the rural road system and as such does not cover urban roads. However, in actual practice, MWCT has applied the above classification to the road network system in the Dar es Salaam Regional area regardless of whether roads were located inside or outside of urban areas. It is therefore necessary to clarify the classification of the road network system in the Dar es Salaam Region as well as the jurisdiction of rural and urban roads in this region.

The present road classification, which consists of six categories, is recommended to be reduced to four categories as shown below:

- (a) Trunk Roads (Local Main Roads are included in the category of trunk roads)
- (b) Regional Roads (District Roads are included in the category of regional roads)
- (c) Local Roads (Major Feeder Roads are included in this category)
- (d) Minor Feeder Roads

To date, MWCT has not applied the road classification evenly to the present road network system in Dar es Salaam Region and as such it lacks uniformity and consistency. For example, there are no roads presently under the category of Main Feeder Roads or Minor Feeder Roads.

4.2.2 Recommended Road Classification and Jurisdiction for Road Network in Dar es Salaam Region

In order to clarify the road classification system to be applied to urban roads as well as ascertaining the jurisdiction of roads with each network system in the Dar es Salaam Region, a new road network system has been proposed by the Study Team based on Japanese Road Network Systems.

The main points of the newly proposed road network system are as follows:

- (i) Road function is classified into four categories: Trunk Road, Regional Roads, Local Roads and Minor Feeder Roads.
- (ii) Road classification has been widely divided into two categories: Rural Areas and Urban Areas,
- (iii) Road classification is further divided into three categories of roads which is dependent on the importance of the roads and/or jurisdiction: National Highway, Regional Roads and City/Town Roads.
- (iv) Jurisdictions of National Highways and Regional Roads (regardless of rural and urban locations) are the responsibility of the Ministry of Works, Communications and Transport, while the City/Town roads in rural and urban areas are the responsibility of local governments including city councils, municipal councils, town councils and district councils.

Table 4.13 shows the recommended road classification and jurisdiction to be applied for the road network system in the Dar es Salaam Region.

Table 4.13 Recommended Road Classification and Jurisdiction

Function of Roads/(1)	Rural Areas			Urban Areas			Remarks (Relationship to the present road classification)
	National Highway	Regional/District Road	City/Town Road	National Highway	Regional/District Road	City/Town Road	
(a) Trunk Roads	0	0		0	0		Local main roads are included.
(b) Regional Roads		0			0		District roads are included.
(c) Local Roads			0			0	Main feeder roads are included.
(d) Other Roads			0			0	Minor feeder roads are included.
Jurisdiction of roads	MWCT	MWCT	LOCAL GOV.	MWCT	MWCT	LOCAL GOV.	

Note (1) Function of Roads

(a) Trunk Roads

a-1: Rural Areas

These roads form inter-territorial through routes and inter-regional roads other than trunk roads which connect regional centers and such centers to the trunk roads.

a-2: Urban Areas

These roads form the primary road network for the town as a whole. They are so called as "Arterial Road" All longer-distance traffic movements to, from and within the town should be canalized on the trunk roads

(b) Regional Roads:

b-1: Rural Areas

These roads are inter-district roads connecting district centers other than trunk and local main roads.

b-2: Urban Areas

They form the link between the primary network and the roads within environmental areas. They are so called as "Collector Roads" These roads distribute traffic within the residential, industrial and principal business districts of the town.

(c) Local Roads

c-1: Rural Areas

These roads form major road network within a district other than the above two (2) categories.

c-2: Urban Areas

They should be at least connect centers of division (TARAF) or main centers of production to the above main roads. They form the link between regional (or collector roads) and access roads, and distribute traffic within environmental areas. Main streets forming road network in the city or urbanized areas are included in this category.

(d) Other Roads

d-1: Rural Areas

These roads comprises of all roads other than the above three categories which connects Wards (KATA).

d-2: Urban Areas

All other motorable roads are included in this category. These roads gives direct access to buildings and lands within environmental areas.

4.2.3 Existing Road Network System in Dar es Salaam

The existing road network system in Dar es Salaam is served by a semicircular ring, four major radial roads and numerous other roads for a total length of 1,150 km as shown in Fig. 4.1.

A list of Trunk and Regional Roads provided by MWCT at the beginning of the Study, is presented in Appendix 4.1. MWCT has classified all important roads in the Dar es Salaam Regional area into the category of Trunk Roads (defined under the category of DTR No.) or Regional Roads (defined under the category of DRR No.). As such, roads under the category of Local Main Roads or District Roads have been included in the category of Trunk and Regional Road.

The Study Team conducted a road inventory survey based on the above categorical listings prepared by MWCT; however, it was observed that some roads identified by the MWCT involved some discrepancy between their presumed functions and actual conditions.

The Study Team, therefore, has conducted an overall review of the existing road network system in relation to the road classification. As a result of this review, Trunk and Regional Roads identified by MWCT have been classified into three categories which includes the category of District Roads as shown below:

	Identified by <u>MWCT (km)</u>	Identified by <u>the Study Team (km)</u>
(1) Trunk Roads	212.7	144.5
(2) Regional Roads	447.8	302.9
(3) District Roads	<u>Not identified</u>	<u>213.1</u>
Total	660.5	660.5

The review of the classification for each road was made taking into account the present road conditions including land-use pattern of surrounding areas, present function of the roads, number of lanes, surface type and condition, and the width of the carriageways. The results of their are presented in Appendix 4.2.

Table 4.14 shows a summary of the DSM Regional Road Network System by Lane No. and surface type on the basis of road classification as recommended by the Study Team.

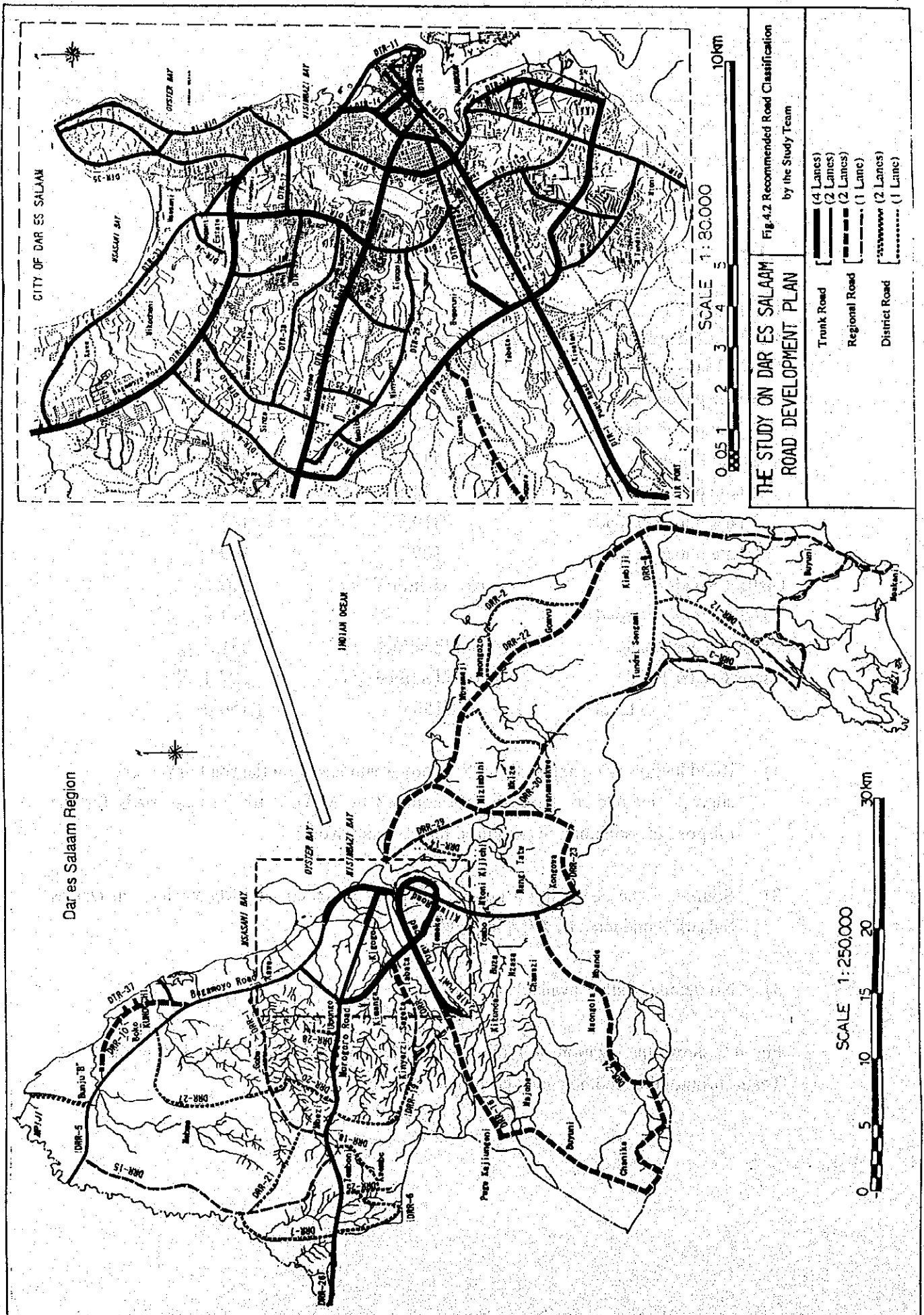
As for categories of Major Feeder and Minor Feeder Roads, their road lengths were estimated from data published in "The Feasibility Study on Road Improvement and Maintenance in Dar es Salaam" conducted by JICA in 1990.

Table 4.14 Summary of Road Network System Identified by the Study Team

<u>Recommended Road Classification</u>	<u>Road Length Originally Identified by MWCT (km)</u>	<u>Road Length Identified by the Study Team (km)</u>
Trunk Roads/Local Main Roads	<u>212.7</u> /1	<u>144.5</u>
4-lane paved roads	39.8	39.8
2-lane paved roads	199.8	104.7
Regional Roads	<u>447.8</u>	<u>314.0</u>
2-lane paved roads	18.6	60.7
2-lane unpaved roads	319.7	143.8
1-lane unpaved roads	109.5	109.5
District Roads	Not identified /3	<u>213.1</u>
1-lane unpaved roads		213.1
Major Feeder Roads	Not identified /3	<u>251.0</u> /2
Minor Feeder Roads	Not identified /3	<u>227.4</u> /2
Totals	1,150.0	1,150.0

- 1) Road lengths were adjusted by the Study Team based on the road inventory survey. Double road length was counted by MWCT for 4-lane roads for the purpose of estimating the required maintenance work.
- 2) Source: "The Feasibility Study on Road Improvement and Maintenance in Dar es Salaam" conducted by JICA in 1990.
- 3) No detailed data is available in MWCT.

Fig. 4.2 shows the location of Trunk Roads and Regional Roads identified by the Study Team through the recommended classification.



4.3 Existing Road Conditions

4.3.1 General

A road inventory survey was conducted by the Study Team in December 1993 for the purpose of identifying existing problems and issues of the present road network system in the Dar es Salaam Region, the results of which are as follow:

Road Inventory Survey:

- Road Length, Width of Carriageway, Pavement Condition, Drainage and Bridge Conditions, Roadside Land-use Pattern, etc.

Roads inspected during the road inventory survey consisted of roads under the categories of Trunk Roads, Regional Roads and District Roads in accordance with the minutes on the Inception Report. Therefore, roads under the categories of Major Local Roads and Minor Local Roads were not included in the Study.

4.3.2 Road Density by Traffic Zone

Road density per population has been analyzed for each traffic zone. This analysis was conducted in order to check for inadequacies of road facilities based on populations in each zone. The analysis was also to identify the necessity of construction or other improvements to the road network. Road classifications considered in this analysis are as follows:

- (i) Trunk Roads, (ii) Regional Roads, (iii) District Roads

A wighted road length was introduced for the purpose of calculating road density since the efficiency of a road network is dependent not only on the road length but also the number of lanes and surface conditions which could be directly related to the traffic capacity. In this study, the following weighted rates were considered for calculating the road density, assuming a that 2-lane paved road with a weighted rate of 1.0 is standard.

<u>Road Classification</u>	<u>Road Conditions</u>	<u>Weighted Rate</u>
Trunk Road	4 lanes (paved)	1.5 /*
	2 lanes (paved)	1.0
Regional Road	2 lanes (paved, gravel, earth)	0.75
Regional Road/District Road	1 lane (gravel, earth)	0.5

It should be noted while the number of lanes is an important factor, it is not a decisive factor in presuming the efficiency of a road network. Therefore, the weighted rate of a 4-lane Trunk Road for example was determined to be 1.5 (not 2.0) in order to avoid an excessive estimation of the road density. Road densities were calculated for each traffic zone applying the above weighted rate and then were categorized into five levels as shown below.

<u>Category</u>	<u>Road Density (m/1,000 person)</u>
Level - 1	less than 100
Level - 2	100 - 200
Level - 3	200 - 300
Level - 4	300 - 400
Level - 5	more than 400

Results of the road density calculations are given in Appendix 4.4 and are illustrated in Fig. 4.3. Following are the major findings and issues identified through analysis of road density:

- (i) The areas outside the Port Access Road, especially along New Bagamoyo Road and Morogoro Road indicate mostly high road densities where it might not be necessary to strengthen or improve the present road network system in the short-term. The reason for the high road density is mainly because of the small populations in these areas. The road density of the Kigamboni areas also indicated a high level because of the small population.
- (ii) The areas along Pugu Road outside the Port Access Road shows a low road density where strengthening or improvements might be necessary. Urban expansion has proceeded along Pugu Road due to the flat terrain of the land, such that areas south of Pugu Road as well as the Tabata area are identified as potential areas for residential and industrial development. In order to promote orderly development along these areas, it is necessary to provide an efficient road system as soon as possible.

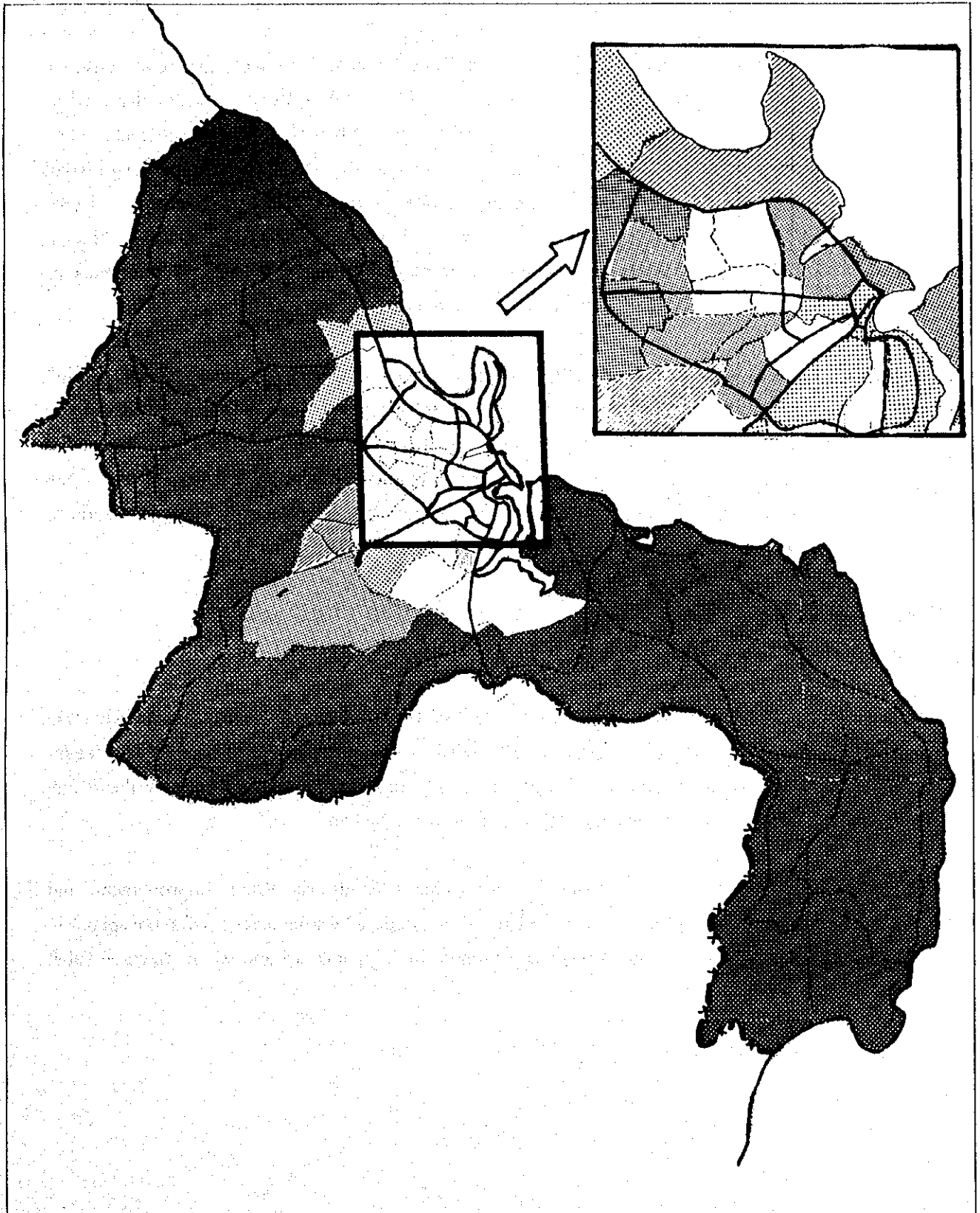


Fig.4.3 Road Density Map

Category	Road Density (m/1,000 person)	Legend
Level - 1	less than 100	[White box]
Level - 2	100 - 200	[Dotted box]
Level - 3	200 - 300	[Cross-hatched box]
Level - 4	300 - 400	[Diagonal lines box]
Level - 5	more than 400	[Solid black box]

- (iii) Road areas inside of the Port Access Road indicated extremely low road densities, though the areas between Port Access Road and UWT Road could be identified as urban areas (functioning as a collector road seems extremely insufficient). The upgrading of important collector roads, such as Morocco Road, New Kigogo Road and Chang'ombe Road, will also necessitate the introduction of additional collector roads between Port Access, Morocco and New Kigogo Roads. The introduction of additional roads will be necessary to promote homogeneous urban development as well as to facilitate the traffic demand induced from the areas.
- (iv) The Central Area inside UWT Road also indicated low densities because of the high population in the daytime. Traffic congestion on major roads in the Central Area is getting worse due to the rapid increase of the city population. Since road facilities cannot be extended in terms of road length because of existing dense urban structures, road densities should be expanded by widening of some trunk roads to four lanes.

4.3.3 Pavement Conditions

Pavement conditions were inspected by the Study Team for all Trunk Roads, Regional Roads and District Roads. Roads categorized into Major Feeder Roads and Minor Feeder Roads were excluded from the inspection taking into account the purpose of the Study which is aimed at the establishment of a road network system.

Pavement records obtained from "The Feasibility Study on Road Improvement and Maintenance in Dar es Salaam" were reviewed and updated on the basis of above inspection. The results of the pavement survey are presented in Appendix 4.4 and summarized in Table 4.15 below.

Table 4.15 Summary of Pavement Conditions

Road Classification	Total Length (km)	Type of Surface Conditions				
		Asphalt			Gravel	Earth
		Good	Fair	Bad		
Trunk Roads	144.5	38.4	60.4	45.7		
4 lanes roads	39.8	15.1	22.5	2.2		
2 lanes roads	104.7	23.3	37.9	43.5		
Regional Roads	314.0	25.6	35.1	0.0	143.8	109.5
2 lanes roads	204.5	25.6	35.1	0.0	143.8	0.0
1 lane roads	109.5	0.0	0.0	0.0	0.0	109.5
(3) District Roads	213.1	0.0	0.0	0.0	22.9	190.2
1 lane roads	213.1	0.0	0.0	0.0	22.9	190.2
Grand Totals	671.6	64.0	95.5	45.7	166.7	299.7
	(100.0%)	(9.5%)	(14.2%)	(6.8%)	(24.8%)	(44.6%)

Following are the major findings in terms of pavement conditions for the existing road network:

- (i) 4-lane Trunk Roads have a surface in relatively good conditions; however, it was found that deterioration of the pavement is progressing in some parts of Mandela Road (Port Access) and Pugu Road.
- (ii) Out of 104.7 km of 2 lanes Trunk Roads, 43 km (approximately 40 %) have a bad pavement condition. These roads, however, are scheduled to be improved under the present IRP program within the next few years.
- (iii) As for the 314 km of Regional Roads, the paved portions account for only 50 km (or 20 %), while one-third are still 1-lane roads with earth surfacing. Since the Regional Roads play an important role for the regional economic and social activities, they should be improved or upgraded to meet the minimum design standards of Regional Roads (i.e., all-weather roads) as specified by MWCT.
- (iv) District Roads are located outside the urban areas and are mostly 1-lane earth roads constructed without proper engineering techniques. Although these District Roads are narrow and in poor condition, the standards of them are generally acceptable for the present traffic volumes.

(v) Although Feeder Roads were excluded from this Study, some of the Major Feeder Roads located in urban areas, such as the Central, Kariakoo, Chang'ombe, Temeke, Sinza, Ilala, Mwinijuma and Oyster Bay areas were observed. The total length of these roads is about 90 km and they are either 2-lane or 1-lane roads with asphalt pavement. However, due to the absence of maintenance, most roads have deteriorated to such a level that the need for overlay or reconstruction of pavement is necessary.

Since these roads were identified as not only useful for localized movement but also important in helping to form the city and urban areas, proper and timely maintenance work should be carried out to enhance the economic and social activities of these areas.

4.3.4 Drainage Conditions

The drainage system is a major problem which Dar es Salaam needs to solve. Inadequate provision of drainage facilities and poor maintenance often greatly shorten the pavement life of a road.

The drainage system in Dar es Salaam basically consists of storm drainage and roadside drainage systems. Specific data concerning such drainage has been obtained from the 1990 JICA Feasibility Study and is discussed in the following sub-sections.

(1) Storm Drainage System

Dar es Salaam is served by a storm drainage system consisting of major waterways, secondary waterways and a local drainage system. The existing rivers are utilized as major waterways with their tributaries regarded as secondary waterways as shown in Fig. 4.4.

Urban areas are served by local drainage systems which are comprised of underground pipe sections fed by roadside channels and open ditches. The sub-urban areas are served by local roadside ditches which have been constructed to drain runoff from adjacent areas. As many other areas have no conventional drainage system, runoff collects and seeps into the ground.

The rehabilitation and emergency maintenance works for storm water, sewage and sanitation was planned by the Ministry of Lands, Natural Resources and Tourism in 1984. Unfortunately, the project has not been implemented until now because of the financial constraints. This prepared plan was mainly aimed at the rehabilitation and maintenance of the existing storm drainage systems and but not at the improvement and construction of new storm drainage systems.

The current growth trend has resulted in a rapid increase of Dar es Salaam's population, as well as unplanned urban areas that are expanding outside of Nelson Mandela Road and spreading uncontrolled along the major Trunk Roads.

(2) Roadside Drainage System

The roadside drainage system of Trunk and Regional Roads located in urban areas such as at Central, Kariakoo, Chang'ombe, Ilala and Oysterbay, are generally served properly by lined channels and an underground pipe system. The major roads outside the urban areas are served by drainage ditches along the roads which are usually grass-lined and occasionally concrete or rip-rapped.

No apparent roadside drainage system are found in most of the Regional and District Roads located in rural areas. Surface water on these roads is either absorbed into the soil, or collects in ponds to slowly percolate and/or evaporate.

The roadside drainage system in the urban areas is generally in poor working condition due to the lack of, or improper, maintenance work. Surface water on the roads is normally collected by means of ditches and discharged through a drainage pipe system. Most drainage pipes laid under the carriageways are not working due to gratings which have become blocked by soil and debris that must be cleaned through routine maintenance action.

Fig. 4.5 shows the location of flooded areas seriously affecting roads. These areas were observed previously during the 1990 JICA Feasibility Study; however, some drainage and roads have already been improved under the DRIMP or IRP improvement projects.

Following are the recommended countermeasures to be carried for the drainage facilities:

Table 4.16 Recommended Countermeasures for Drainage

Name of Road	Routine Maintenance	Leveling of Road Surface	Provision of Drainage	River Improvement
Kariakoo Area Roads	O	O		
Chang'ombe Area Roads		O	O	
Ilala Area Roads	O	O		
Temeke Area Roads	O	O		
Sinza Area Roads		O		
Mwinyijuma Area Roads	O	O		
Mandela Road			O	
Old Kigogo Road		O		
UWT/Morogoro Road	O			
Pamba/Ohio Street	O			
Kilwa Road	O			
United Nations Road	O			
Pugu Road	O			
Old Bagamoyo Road				O
Kivukoni-Vijibweni Road		O		
Other Regional Roads		O		

(O) indicates the degree of urgency

4.3.5 Bridge Conditions

It was observed through the road inventory survey that bridge structures on Trunk and Regional Roads were generally old and narrow, and did not meet the requirements of the recent design standards established by MWCT.

Some existing bridges are in such critical condition that they require urgent improvement or reconstruction for reason of safety. Following are the main findings of the bridges on the trunk and Regional Roads:

- (i) Most of bridges have damaged sub-structures which might have been caused by insufficient river section or a too-short span length of the bridge. Such bridges should be reconstructed with a sufficient span length and sub-structures including river-bank protection against scouring of the riverbed during flooding.
- (ii) Bridge widths on the Trunk Roads were usually narrower than the widths of the Approach Roads. Bridges on Morogoro Road are especially dangerous in terms of traffic safety with traffic accidents occurring on the bridge approaches almost everyday. Large vehicles cannot pass each other at the same time because of the narrow bridge widths. These bridges have thus been identified as potential causes of bottlenecked traffic movement.
- (iii) It was observed that the bridges located in Dar es Salaam Region are mostly old ones. The designed loading of these old bridges do not meet the requirement of loading for large-sized heavy duty vehicles which are presently plying on parts of Trunk and Regional Roads. It is necessary to check the loading conditions as well as durability in terms of loading on all bridges.
- (vi) Almost all bridges in the region have no pedestrian sidewalks. Sidewalks should be provided for all the bridges on Trunk Roads in urbanized areas from a pedestrian safety standpoint. This should be a consideration when the replacement or reconstruction of bridges are implemented. This is especially true for new bridges on Morogoro, New Bagamoyo and Kilwa roads.

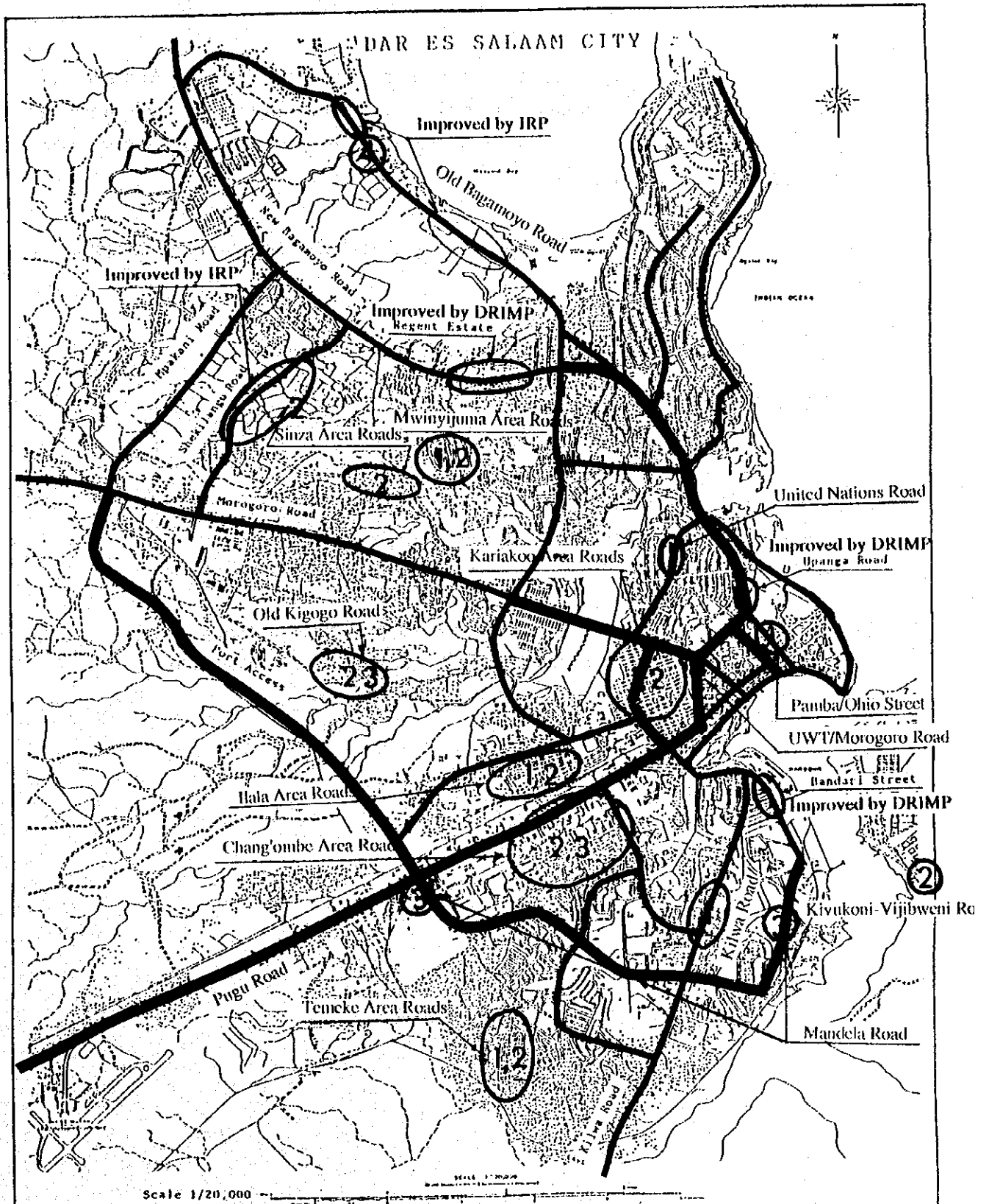


Fig.4.5 Location of Flood Areas Affecting the Road Structure

- : Location of Flood Areas identified by the Study Team
- Proposed Countermeasures
- Cleaning of Drainage ----- 1
 - Leveling of Road Surface ----- 2
 - Provision of Drainage ----- 3
 - River Improvement ----- 4

Inventory of bridges along with their location map was presented in Appendix 4.6. Conclusively speaking, there are no sound bridges on any trunk or regional roads in the Dar es Salaam Regional area. All bridges along these roads will require either urgent rehabilitation or total replacement.

Table 4.17 shows a summary of existing bridge conditions classified into three categories:

Table 4.17 Summary of Existing Bridge Conditions

	<u>Bridge Nos.</u>	<u>Total Length (m)</u>
Category A	0	0
Category B	3	80
Category C	10	234

Note: Category A; Sound bridges which require no improvement measures

Category B; Bridges which require urgent improvements or rehabilitation

Category C; Bridges requiring total re-construction

4.4 Road Network Subject to the Study

It was determined that roads to be covered under the Study are those which were classified into trunk and regional roads within the urban area in addition to some regional areas in accordance with the Minutes of Meeting for Inception Report signed by the Study Team and Ministry of Works, Communications and Transport on October 28, 1993.

Of the total road length of 1,150 km 55 potential trunk and regional routes with a total length of 458.5 km were identified by the study team, as shown in Table 4.18 below:

Table 4.18 Roads Subject to the Study

Road Subject to the Study		
	Routes	Road Length (km)
Trunk Roads	18	144.5
Regional Roads	37	314.0
Total	55	458.5

District roads which are mostly minor un-paved 1-lane roads in rural areas and not engineered roads. Therefore, these roads were excluded from the Study.

4.5 Public Transportation

Public transport in Dar es Salaam currently is provided by the public owned Company of Syhirika la Usafiri Dar es Salaam (UDA) and many small and medium scaled private operators (Daladala) and form a union called MUWADA. There is no public transportation service by rail in the city.

Bus services in Dar es Salaam was nationalized in 1970 and is at present under the joint ownership of the City Council and the National Transport Corporation. Besides providing bus services, UDA is responsible for coordination of its own operation and the operations of private bus operators.

UDA operates bus services on 59 regular routes within the city and connecting routes from the city center to densely populated areas in the city as shown in Fig. 4.6. Conversely Daladala operation is in complement to the services provided by UDA. Although the fleets used by Daladala, are not standardized and in many cases are unsafe, they are more popular among users and provide more efficient services than that of UDA.

The public transport service provided by UDA as well as Daladala is far below satisfactory levels compared with the growing demand for service. It has been estimated, from result of Person-Trip Survey conducted for this study, that more than 60% of vehicle users in the city use public transport. At present, UDA has 111 buses but only 54 buses are working, while there are 2,200 registered Daladala. Buses are usually of different sizes and capacity and of different makers. Besides these services, are an increasing number of bus services provided by un-registered private operators. They are illegally operated mainly on the routes which have high demand for public transport services.

Bus services are concentrated on major radial roads (Bagamoyo, Morogoro, Uhuru, Pugu, and Kilwa roads, and city centers bounded by UWT road. Few routes have services to newly developed residential areas in Urban fringes or in densely populated low-income residential areas. The frequencies of bus service on radial roads are as high as one bus per 1-2 minutes while that in newly developed fringe areas is as low as one bus per hour.

Most buses are over-crowded, outdated and prone to malfunctions. The increase in bus service is urgently needed in order to meet the growing demand for bus transportation.

There are still some communities which are not served by public transport routes, especially in newly developed areas of the city as shown in Fig. 4.6. This is mainly due to lack of feeder roads into these areas and the poor profitability of operating these routes.

Most bus stops and terminals are not well marked. There are many bus stops or terminals which have no bus bays, shelters, posts, benches, destination signboards, time tables, or other demarcations.

Long distance bus terminals are located along Mnazi Mmoja, Kisutu, Kariakoo and Msimbazi Street areas. The areas are generally densely populated urban areas and passage of these large buses along small urban streets having roadside parking creates traffic congestion on these roads.

In conclusion public transport in Dar es Salaam is characterized by low level service bus transport run in an inefficient manner due to some of the following problems:

- Shortage of fleets, (buses)
- Buses experience mechanical failure
- Non- systematized service routes among operators
- Poor facilities for users
- Rate of tariff incommensurate with operation cost. (flat rate system)

Table 4.19 Destination of Long-distance Bus by Bus Terminal

Bus Terminal	Mnazi Mmoja	Kisutu	Kariakoo	Msimbazi
Destination	MBEYA	MOSHI	KONDOA	MOROGORO
	LUSHOTO	ARUSHA	MAHENGE	SINGIDA
	IRINGA	NAIROBI	DODOMA	MWANZA
	TANGA	MTWARA		
	TUNDUMA	NACHINGWEA		
	SONGEA			
	S/WANGA			

Table 4.20 Public Transport Buses Available in Dar es Salaam in 1990

Standard bus	:	46.6%
Midibus	:	32.7%
Mini	:	20.7%
Standard	:	110 passengers including standees
Midibus	:	30-50 passengers including standees
Minibus	:	15-20 passengers including stand

Source: Study Team

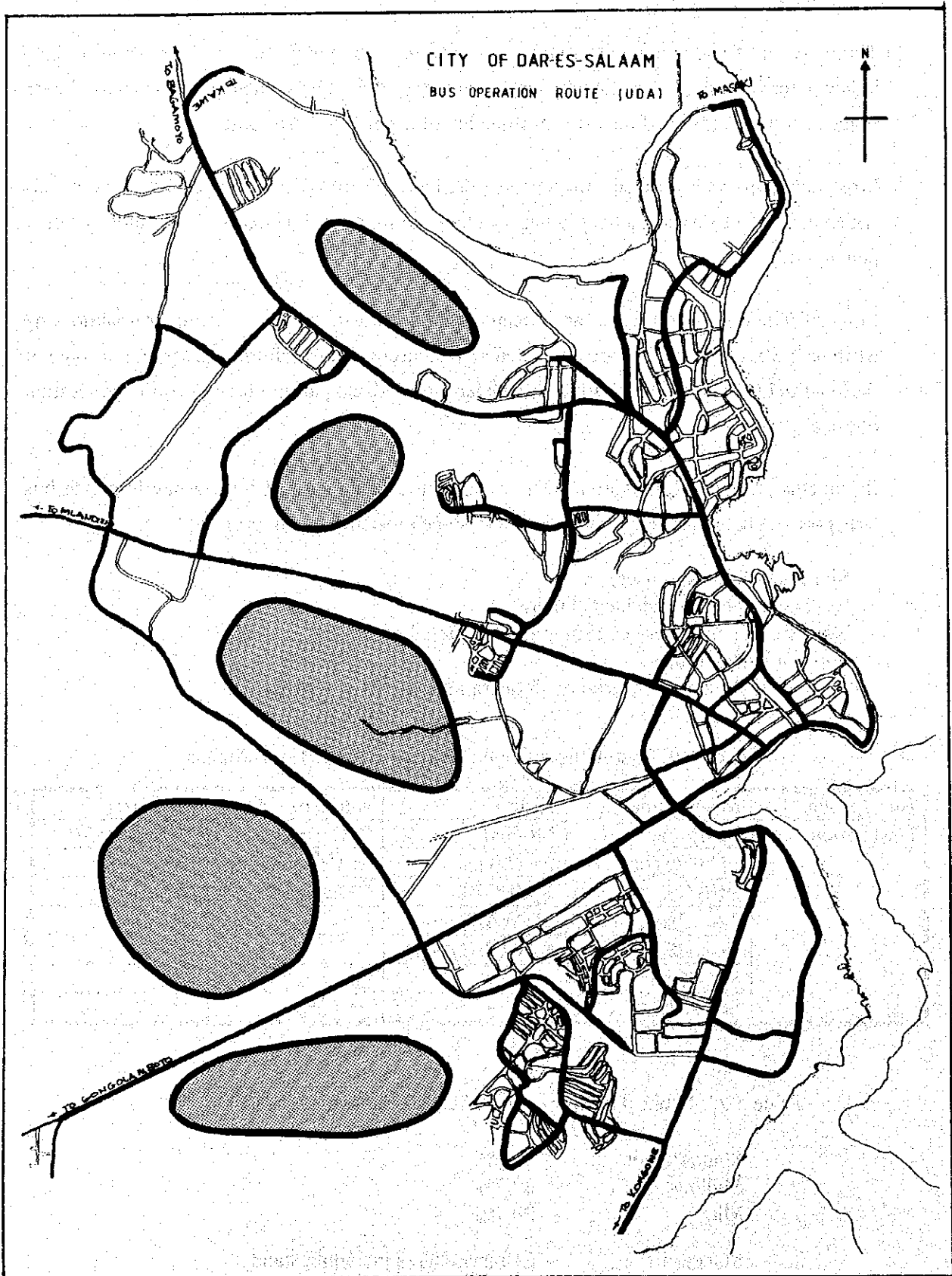


Fig. 4.6 Bus Operation Route (UDA)

 : Area of Poor Public Transport Service

4.6 Traffic Management

Traffic volume concentrated in the central area of Dar es Salaam is on the increase proportional to the rapid growth of generated/attracted traffic in whole of the city. The traffic situation in the city center and Kariakoo area is in such disorder that traffic movement and other urban activity are paralyzed.

City center traffic is characterized by a high volume of roadside parking. Congestion at intersections, and mixture of pedestrian and automobile traffic. Roadside parking is a very serious problem reducing road capacity and is becoming a major cause of traffic accidents. Most of buildings in the city, especially those in business areas have no parking of their own thus roadside parking. There are also hotels or shopping area which have no parking space as well. Most of sidewalks, if any, are full of parked vehicles disturbing the flow of pedestrians and forcing them to use carriageways to walk.

Although at present some parking control measures are being undertaken by the City Council and traffic police, the issue of roadside parking is getting worse. There is no enough public parking spaces in the downtown area and most of the designated parking spaces are along roadsides. Most spaces are inefficiently, and areas usually lack markings or parking meters.

Most of intersections in the city center are roundabouts and non-signal control except for large intersections located in the fringe of the central area i.e., Libya Street- Nkurumah Street, Morogoro Road-UWT Street, and Maktaba Street-UWT Street. These intersections are usually full with traffic, especially during the peak hours of 7:00 a.m. - 9:00 a.m. and 4:00 p.m. - 5:00 p.m.

Although the large intersection along the UWT road are signal controlled, these signals are outdated and prone to malfunction even in the peak hours of traffic. These intersections have no clearly marked lane designation and the structure of the intersection itself is not well designed, with short storage lane length and narrow intersection approach.

Passage of heavy trucks and buses along urban street is another problem in the city centers. The concentration of urban facilities including manufacturing, distribution and transportation facilities as well as shops and business office is another major cause of traffic congestion. Roads are further inundated with street vendors with carts, and auto repair shops which use thoroughfares for off loading.

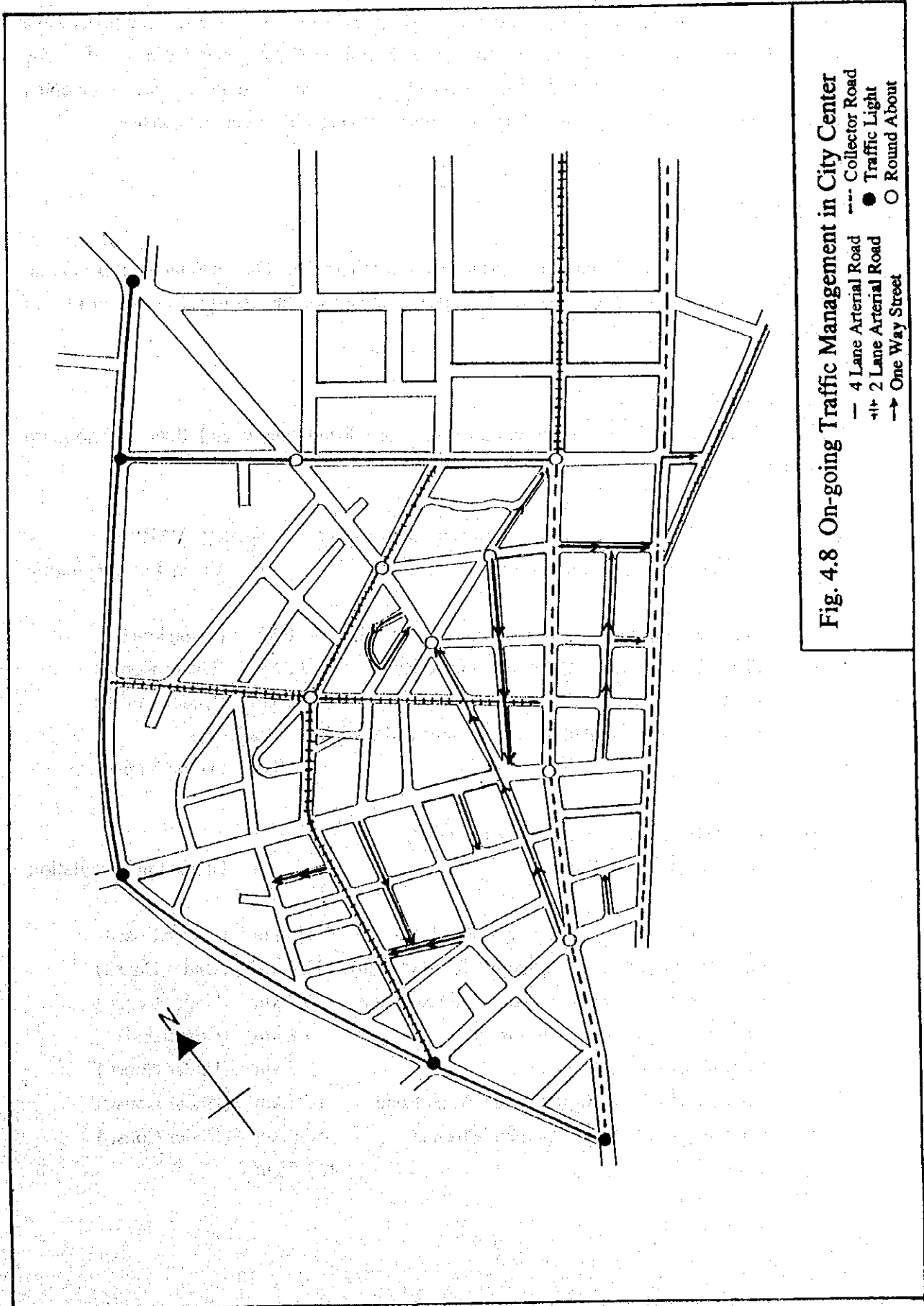


Fig. 4.8 On-going Traffic Management in City Center
 — 4 Lane Arterial Road - - - Collector Road
 = = = 2 Lane Arterial Road ● Traffic Light
 → One Way Street ○ Round About

Some traffic regulation policies, including parking restriction and one-way controls have been introduced in critical parts of urban streets, however the general effects of traffic congestion have not been reduced. Conversely the non-systematic and fragmented implementation of traffic regulations has sometimes, made traffic conditions worse.

4.7 On-going Projects

At present various road development projects proceeding in the Dar es Salaam Region area. The following are current and potential project proposal for the transport sector in Dar es Salaam.

(1) Road and Bridge Projects

Road and bridge projects currently undertaken are listed below and their location are illustrated in Fig. 4.9.

(i)	Dar es Salaam Road Rehabilitation and Improvement Projects (DRIMP)		
	Assisted by Japanese Government	---	Under Implementation
	Phase 1: Improvement of Central Areas Roads	21.0 km	(Completed)
	Phase 2: Widening of New Bagamoyo Road	9.8 km	(Under Const.)
	Phase 3: Widening of Morogoro Road	5.7 km	(Under Const.)
	Phase 4: Improvement of Chang'ombe and Kariakoo Area Roads	50.9 km	(To be improved)
(ii)	Integrated Road Projects - Phase 1 (IRP)		
	Assisted by World Bank	---	Under Implementation
	Contract No. 1: Old Bagamoyo Road	8.0 km	(Under Cost.)
	Contract No. 2: New Bagamoyo Road (North)	13.4 km	(Under Const.)
	Contract No. 3: Mpakani Road and Extension	6.3 km	(Under Const.)
	Contract No. 4: Shekilango Road	3.8 km	(Completed)
	Contract No. 6: Kilwa Road	8.5 km	(Under Const.)
	Contract No. 7: Kongowe-Mjimwema Road	17.5 km	(Under Const.)
	Contract No. 9: Pugu Chanika-Mbagala	56.0 km	(Under Const.)
	Total	113.6 km	

- (iii) **Integrated Road Project - Phase 2 (IRP)**
Assisted World Bank --- **Under Implementation**
(1994 - 1999)

- Dar es Salaam Region** **Not defined yet**

- (iv) **Feasibility Study on Kurasini Bridge Construction Project**
Assisted by --- **Study completed**

(2) Public Transport/Traffic Management

Most of proposals are under study level and there is no committed to any plan. Major studies are as follows:

- (i) **“Dar es Salaam Urban Passenger Transport Study”** prepared by National Transport Corporation, funded by IDA and IBRD. Final report was prepared in July 1991.

- (ii) **“Road Safety Development Study”**
On-going study under financing from Norwegian Government and IDA.

- (iii) **“Central Area Development Plan”**
On-going study by Ministry of Land. The study includes traffic management development in central area.

- (iv) **“Kariakoo Redevelopment Plan”**
On-going study by Ministry of Land. The study includes traffic management development in Kariakoo area.

4.8 Identification of Existing Problems and Issues

4.8.1 Road Network System

The following are the major findings of the city's network obtained through analysis of the road engineering survey. Preferred links identified by the Study Team on the basis of findings are illustrated in Fig. 4.10 and bottleneck points on the road network system in Dar es Salaam Region are shown in Fig. 4.1 respectively.

(1) Existence of Missing Link on Major Trunk Road

The route consisting of Morocco Road, New Kigogo and Chang'ombe Road, could be identified as the city's Middle Ring Road functioning as a major trunk thoroughfare. This ring road, however, does not form a complete semicircular network because of a missing link between New Kigogo Road and Chang'ombe Road, and therefore functions inefficiently as a trunk road in dispersing traffic to and from the city center. Because of this traffic congestion is evident Morogoro, UWT and Pugu Roads.

It is believed that the completion of the Middle Ring Road by constructing the missing link is essential for streamlining traffic flow on this trunk road system.

(2) Shortage of Traffic Capacity on Trunk Roads in the City Center

The traffic situation in the City Center is steadily becoming worse due to insufficient traffic capacity of roads, such as Sokoine Drive, Samora Avenue, Gerezani Street, Ohio Street, Azikiwe/Makataba Street, Zanaki Street and Morogoro road. These roads are expected to become trunk roads forming a basic frame of the City Center. According to recent traffic data obtained by the Study Team, these roads carry a traffic volume of 10,000 to 13,000 per day which is beyond the traffic capacity of 2-lane road.

The congestion of these roads could be improved in the short term by introduction of good traffic management system which is not, however, a permanent solution for the relief of congestion on arterial roads in the city. In order to maintain the function of Dar es Salaam as an administrative, economic and social center of Tanzania, it will be necessary to upgrade many roads from 2 to 4 lanes to solve the shortage of traffic capacity.

Possible roads for upgrading could be Ohio Street, Sokoine Street and Gerezani Street which will form the 4-lanes ring road surrounding the city by connecting with UWT Road. These roads could be widened to 4 lane road without much troubles in connection with buildings removal and compensation.

(3) Inefficiency in Creek Crossing Capacity between City Center and Kigamboni Area

Ferry services are operating at Kigamboni Creek with an average frequency of 3 times per hour for both directions between the city center and the northern tip of Kigamboni Peninsula. The numbers of passenger and vehicles transported by the ferry in 1992 was estimated to be about 8.1 million and 235 thousand, respectively or 22,000 persons/day and 650 vehicles/day respectively.

Ferry operation could conceivably be limited in the near future and shortage of creek crossing capacity between the City Center and Kigamboni could become drastic.

As a solution the expansion of ferry capacity would not meet anticipated traffic demands caused by development of Kigamboni, limited capacity and unreliable operation. Ferry capacity could only be expanded by increase of the ferries, however, operation difficult, from a safety stand point could prove to be an obstacle.

(4) Shortages of Collector Roads in the Sub-urban Area

As stated in section 4.3.1, road density inside Nelson Mandela Road is extremely low because of an insufficient road network system. Areas within Nelson Mandela Road are characterized as being sub-urban with steadily increasing population.

The collector road network forms a link between trunk roads and roads neighborhood areas which are directly related to local economic and social activities. Therefore, development of these roads is essential not only for facilitating anticipated traffic demands but also for promoting homogeneous urban development in such sub-urban areas.

(5) Lack of a Efficient South-westwards Pugu Road Network

It has been observed that urban expansion has been proceeding along the Pugu Road. Areas in this sector have been identified by the Government of Tanzania as potential residential and industrial development areas in the next Five Years. Unfortunately there now only exists a minor 1-lane gravel or earth road without engineering.

It will be necessary to provide an efficient all weather road network system in these areas in order to promote well-balanced and well-ordered development.

(6) Traffic Congestion of Trunk Roads

Trunk roads in Dar es Salaam Region have been upgraded under improvement projects assisted by various donor countries and international funding agencies, including the Japanese Government and World Bank. However, some trunk roads, such as Uhuru Road,

Sokoine and Gerezani Street, Bandari Road, New Bagamoyo Road between Morocco and Mpakani Road, New Kigogo Road and Mpakani Road, have remained as 2-lane roads. Traffic volume on these roads has already exceeded the capacity of these 2-lane roads which has resulted in heavy and chronic traffic congestion on a daily basis.

(7) Bottlenecks on Existing Bridges in DSM Region

It has been observed through road inventory survey that existing bridge structures are generally narrow and old which will need improvement or reconstruction. Some of these bridges are in a critical state which could require urgent rehabilitation or total replacement from a safety stand point. This is especially true for bridges on Morogoro and New Bagamoyo Road which are view as dangerous because of the narrow width where large vehicles cannot pass each other at the same time.

(8) Pavement Deterioration of Local Roads in Temeke, Ilala, Tabata, Sinza and Mwinijuma Areas

Local main roads, located in the city's urban areas are seriously deteriorated to the extent that normal routine maintenance is no longer cost effective. Of these roads located in Central area, Kariakoo Area were or will be improved under the road rehabilitation and improvement projects (DRIMP). The roads located in Temeke, Ilala, Tabata, Sinza and Mwinijuma areas still remained I poor condition.

Since these roads are directly related to the daily lives of people, living their improvement are essential as well as urgent.

(9) Poor Maintenance of Roadside Drainage Facilities

Roadside drainage systems in urban areas are generally served by lined channel and underground piped system. However, many are not working properly, or are in poor working conditions caused mainly by the long absence of proper and timely maintenance, as a result of financial constraints. The small capacity of maintenance work and inappropriate policies regarding regular maintenance and rehabilitation for drainage system is a result at these financial constraints.

Since roadside drainages are essential not only to maintain pavement life but also for ensuring traffic safety, it is essential for MWCT to strengthen maintenance capability for drainage facilities by establishing a special maintenance team in charge of roadside drainage maintenance.

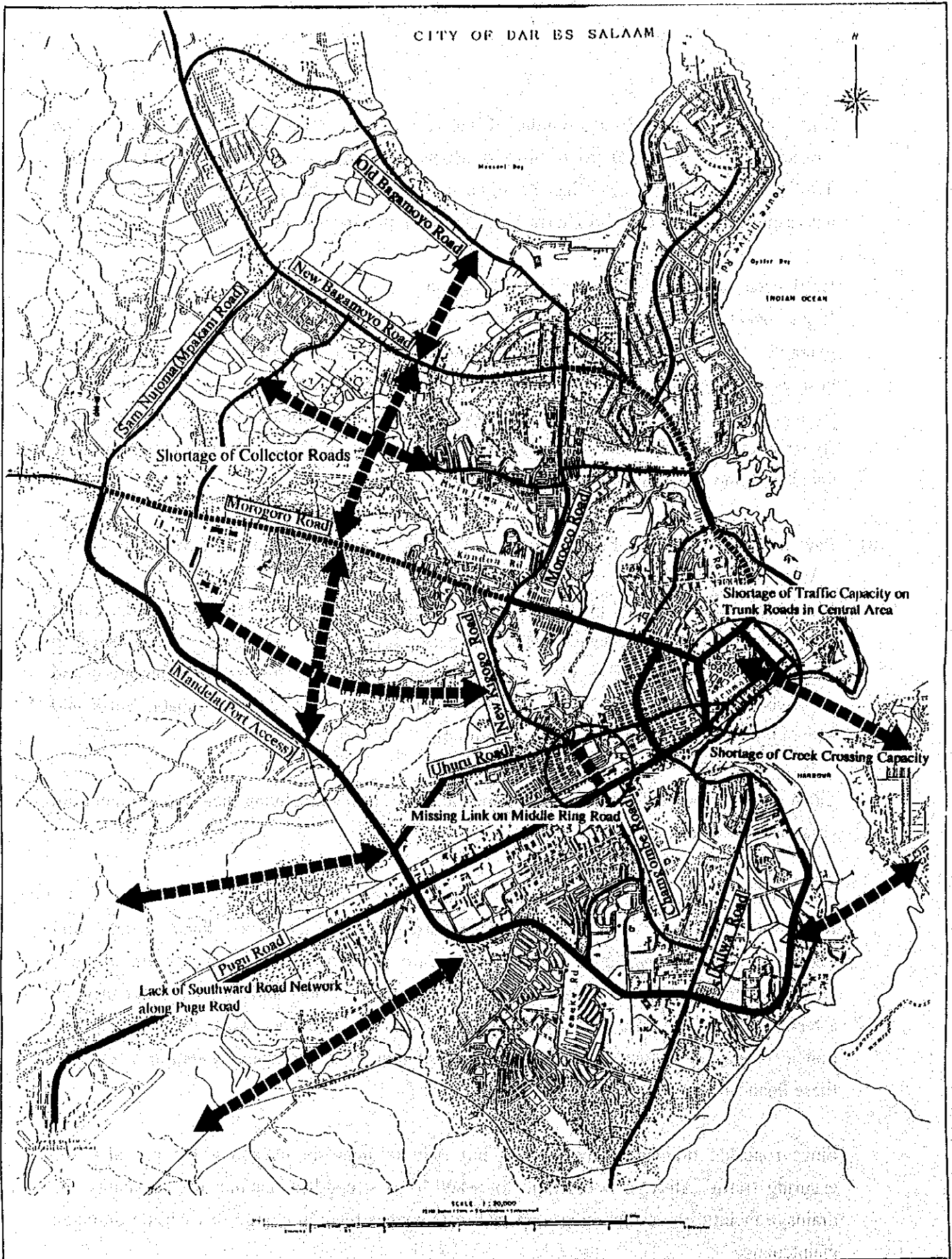


Fig. 4.10 Preferred Links in Road Network System in Dar es Salaam

- 4 Lanes Paved Roads
- 2 Lanes Paved Roads
- Under Construction for Widening (4 Lanes)
- Preferred Links :

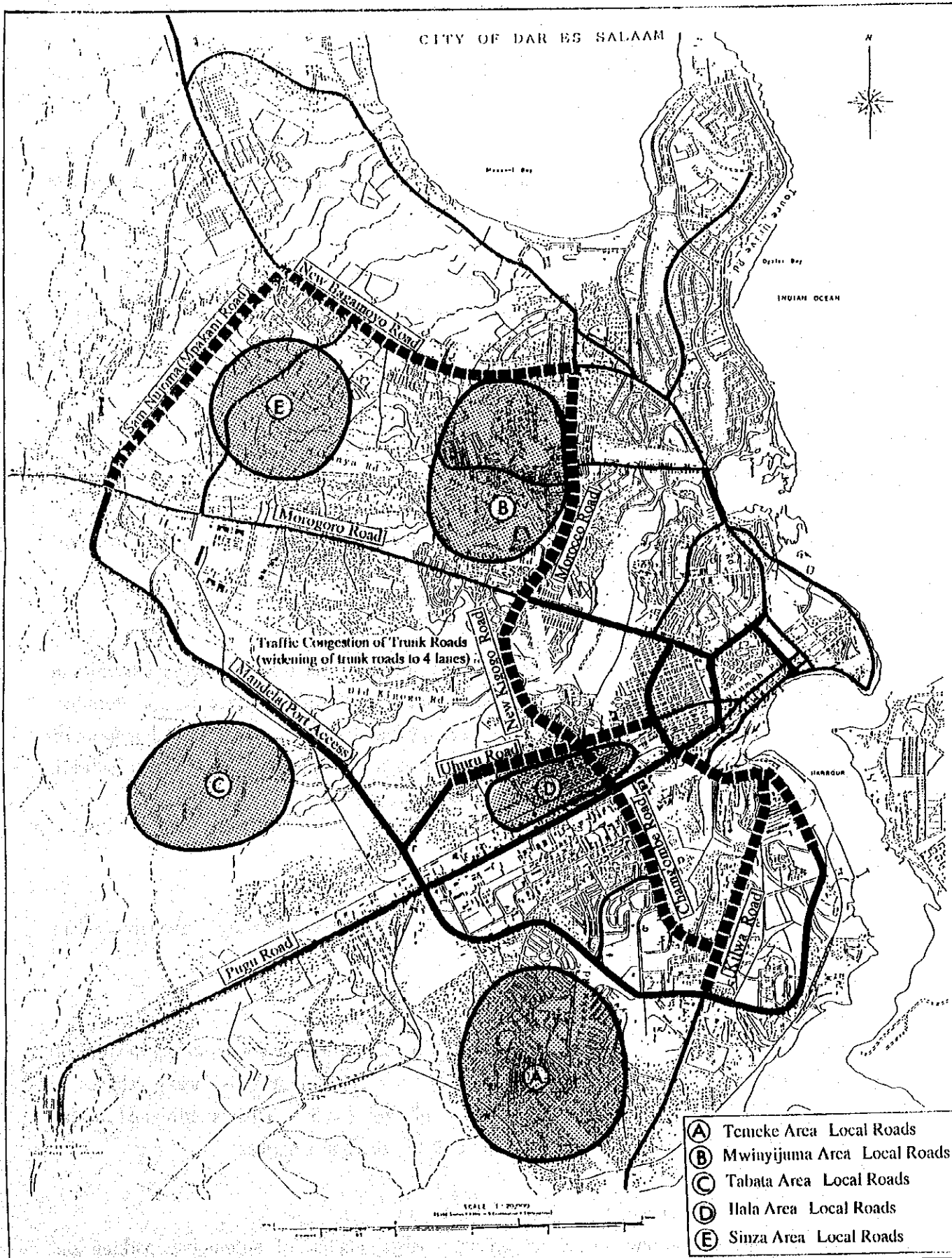




Fig. 4.11 Bottlenecks on Road Network System in Dar es Salaam

Traffic Congestion of Trunk Roads (widening of trunk roads to 4 lanes) 

Pavement Deterioration of Local Roads 

4.8.2 Public Transport System

The issues pertaining to public transport are attributed to the following nature of on-going services:

- (1) Public transport services which cannot meet the needs of growing demand.
Disruption of balance between supply and demand for public transport is one of the causes of unsatisfactory public transport services in Dar es Salaam. This is due to the shortage of the total number of buses fleets.
- (2) Public transport services which is concentrated in the city centers.
Concentration of trips into city centers due to the dense location of urban facilities, has resulted in congestion along most radial roads which are connected to the city center. This is evident in the number of overcrowded buses and long waiting times for public transport services during peak hours of traffic along these corridors.
- (3) Poor service level provided by present bus system
Poor service levels due to poor management and operation systems are lowering amenities in public transport services. This is evident the lack of information systems, poor terminal facilities, irregular operation of buses as well as the high fee levels compared with amount of services received by users. Financial constraints of bus company and shortages of subsidy provided by government is another reason behind this problem.

4.8.3 Traffic Management

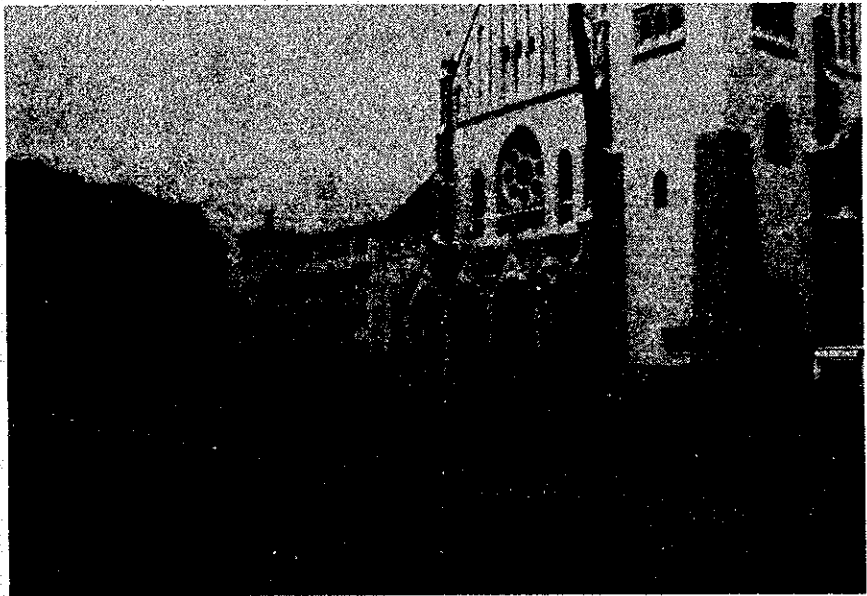
Issue pertaining to traffic management are based on the following nature of the city's urban traffic patterns:

- (1) Lack of functional hierarchy among roads in Dar es Salaam.
Most of the roads in city center are used in a disorderly fashion accommodating mixture of auto traffic, pedestrians, and mass transit vehicles. The operation of heavy vehicles is sometimes even seen on urban streets and collector roads. This is attributed to an incomplete road network and varied mixture of land-uses in urban areas.
- (2) Shortage of parking space
The shortage of parking spaces is forcing a large number of automobile parking on roadsides, which is lowers road capacities to a great extent. Roadside parking is becoming a major cause of intrusion of pedestrians into carriageways increasing accidents and lowering of drive speeds.

(3) Creation of bottleneck points in urban traffic

The lack of reliable traffic signals at intersections of urban article roads helps to increase traffic congestion. Intersections with no turning lanes, short storage length, and with no designation of pedestrian crossing lanes are bottleneck points in urban traffic in Dar es Salaam.

**CHAPTER 5 INITIAL ENVIRONMENTAL
EXAMINATION**



CHAPTER 5 INITIAL ENVIRONMENTAL EXAMINATION

5.1 General

In recent years concern for environmental issues has lead national and international efforts to consider infrastructure investment as one means for achieving sustainable community development. It has been recognized that infrastructure investment will have an impact on the living environment and as such its impact should be investigated.

It has therefore become a trend when formulating potential projects, to try to assess significant environmental changes that may occur during their implementation. In preparation for conducting the environmental assessment, initial environmental survey for the following aspects has been carried out for urban areas of Dar es Salaam region.

- Flood hazards
- Resettlement
- Flora and fauna
- Air pollution
- Noise and vibration

General assessments including physical conditions, environmental constraints and other factors are given in Appendix 5.1 - 5.5.

5.2 Flood Hazards

The following is a general description of findings for flooding conditions identified at 13 specified survey locations (see Fig. 5.1).

5.2.1 Findings

Site 1: MWENGE

The site located at the New Bagamoyo Road and Mpakani (Sam Nujoma) Road junction lies in the Mlalakuwa and Mbezi river drainage basins at an elevation of 26.0 meters above mean sea level (M.S.L.).

Severe flooding generally occurs once a year between the months of March and June inundating an area of approximately 0.5 hectares to a depth of 0.5m. Some of the effects of this flooding have been reduced after recent improvements to Sam Nujoma Road were completed.

Site 2: KIJITONYAMA

The site is located along the Shekilango Road in Kijitonyama residential area. The road is a link with Bagamoyo and Morogoro Roads serving residents of the Kijitonyama river drainage basin.

The basin at an elevation of about 23.0 meters above M.S.L. experiences flooding four to five times a year with flood waters up to 1.5 meters. Flooding has encompassed 1.0 - 1.5 hectare are along the south-eastern portion of the survey area.

Inadequate drain sizing, lack of maintenance, and adjacent construction activity are the primary causes of flooding.

Site 3: MSASANI

The area is primarily a low density housing area 1.5 km north of Morocco/New Bagamoyo intersection along Old Bagamoyo Road. The north most portion of the area is located in a depression 3.5 meters above M.S.L. The area which lies in the Kijitonyama river basin experiences flooding twice a year during the rainy seasons.



Fig. 5.1

SCALE 1:100,000

Location Map of flood Hazard
 Survey Stations
 River Basins

○ Survey Areas (13 areas)

Ⓐ Mbezi River
 Ⓑ Mlalakuwa

Ⓒ Kijitonyama
 Ⓓ Sinzo
 Ⓔ Msimbazi
 Ⓕ Mzingo

Ⓕ Ubungo
 Ⓖ Kizingo

In addition there is also a swamp in this area which is overgrown with weeds. The lack of drainage engineering and maintenance are the major causes of flooding. Furthermore where Old Bagamoyo road crosses Kijitonyama River, serious soil erosion has occurred due to poor river drainage arrangements resulting in road culverts being blocked with soil and debris.

Site 4: REGENT ESTATE

This area is located in a depression one kilometer in length starting at 'Chato' street along New Bagamoyo Road. The area lies in the Sinza and Kijitonyama river basins and has an elevation of about 10 m above M.S.L.

The area experiences flooding usually once a year between the months of April and June due to the existing topography and inadequate residential drainage systems.

Site 5: NAMANGA

The area is located at the busy junction of New Bagamoyo and Old Bagamoyo roads which has recently been rehabilitated. To the east, is a rapidly growing commercial area located in a depression which could be prone to flooding. The area also lies in Kijitonyama and Sinza river basins where the soil is predominantly sandy-silt.

Site 6: MWANANYAMALA

The site is located in the high density Kinondoni district which lies in the Sinza river basin.

Because of the low-lying topography, the area experiences flooding four or five times a year during both the long and short rainy seasons. Houses along the Mwananyamala Road have been inundated during seasonal rains.

Site 7: UPANGA

The United Nations road passes through this area linking Muhimbili Referral Hospital to the rest of the city. The area is relatively low lying and lies within the Msimbazi river basin.

The survey indicates that the area floods three to four times a year probably due to inadequate sewer sizing, blockage of storm water intake grates, and low lying topography.

Site 8: MABIBO

The survey area is located in a high density, unplanned, 'squatter residential area', where many structures are situated along the Ubungo river valley. Many of these structures experience flooding three to four times a year inundating structures with up to 0.45 meter flood waters. Adjacent construction currently under way will probably effect future flooding, due to increasing total runoff amounts.

Ubungo stream collects effluents from the Ubungo waste stabilization ponds together with other sewage along the course of the stream. The stream is highly overgrown with weeds and many areas are potential mosquito breeding sites.

At present road drainage does not exist and storm water drains directly onto roads causing road surface damage.

Site 9: KARIAKOO

This area is located along Msimbazi road about 50 meters North-West of Msimbazi/Uhuru road junction. The area is a dense residential and commercial area lying in the Msimbazi river basin. Flooding occurs twice a year generally once in both rainy seasons.

The incidence of water borne diseases have been prevalent during the rainy season, due to inadequate storm sewers, blocked inlet grates causing road surface damage. Msimbazi road is served by a 400 mm diameter concrete culvert which has become ineffective due to accumulated sand deposits.

Site 10: ILALA

The area lies South-West of the Central Business District in the Mzimbazi river basin. Uhuru road transverses the area in a North-East to South-West direction.

The road at the northern portion of the survey area has a triangular open drainage ditch system which has helped to relieve some past flooding problems. Inadequate drain maintenance has been reported to be the major cause of flooding which has, however, recurred recently.

Site 11: CHANG'OMBE

This site is primarily located between Pugu Road and Chang'ombe Road in an industrial area. The major road crossing the area is Mbozi road, which serves as a main feeder road to the area.

The area especially around Mbozi road is relatively low lying and experiences flooding four to five times a year. Lack of planning of storm water drainage appears to be the main cause of flooding.

The South-Western portion of the area is also relatively low-lying having swamp area overgrown with weeds and standing water of approx. 0.8m in depth. Structures located near swamp areas experience frequent flooding which has caused extensive property damage.

SITE 12: SHIMO LA UDONGO

This area is located in the South-Eastern part of the City Center, along Bandari road. The area is generally well built up with industries, offices, garages, and industrial complexes approximately 200 meters from the water front. The road has recently been re-paved but has no storm sewers on either side. The frequency of flooding has been reported to occur once a year between the months of April and June.

Site 13: MVINJENI

The area along Kilwa road to the city Police barracks near Chang'ombe intersection to the south is lined with industrial and residential establishments to the east and west respectively. Residential areas consist primarily of densely packed 'squatter houses' located in a depression 2.5 meters lower than the industrial area. Structures at the lowest point along the roadway are subject to flooding two to three times a year due to inadequate drainage.

5.3 Resettlement

The goal of this survey was to identify issues associated with residential resettlement and compensation due to displacement caused by road construction. Information reported in this section was obtained from secondary sources pertaining to major rehabilitation work along the 17 major trunk roads in the Dar es Salaam urban regional area.

5.3.1 Findings

(1) New Bagamoyo/Upanga Road

During the widening of New Bagamoyo road, three structures including one gasoline station which was located between the junction of Kinondoni Road and Morocco roads, were setback from the road to accommodate new road width construction. These changes were made at no cost to Dar es Salaam Roads Improvements and Maintenance Project (DRIMP) since building owners had erected their structures, illegally on road reserve (right-of-way).

Further improvements are being made to a 1.8km section of Upanga and Bagamoyo road south of the Wazo Hill Factory Road. Demolition of structures along these two roads will not take place, although a few fences and numerous makeshift structures encroaching on road reserves will be removed at no cost to DRIMP.

(2) Morogoro Road

A 2.7 km stretch of Morogoro Road, between Morocco and UWT Roads was improved between 1985 and 1987. A number of houses were demolished, compensation paid and owners relocated to an area between the junction of United Nations and Lumumba roads.

The section of road between the junction of Morocco and Port Access (Nelson Mandela) Road is slated for improvements under the DRIMP program which will require house demolition, compensation and relocation of resident owners. The road-width required for new improvements is 72.5 meters which is attainable for most of the road section without house demolition. For the stretches between Kagera and National Institute of Transport road junction, removal of structures will be required to accommodate new road widths.

This section crosses the Manzese area which is unplanned and numerous permanent and temporary structures have encroached on road reserve.

Of these structures, 111 houses will be demolished after compensation and relocation has taken place. Owners will be allocated a plot of serviced land in Ukonga or Temeke areas, all of which will fall under the responsibility of (DRIMP), on behalf of the Government.

(3) Port Access (Nelson Mandela), Pugu and New Kigogo Roads

Approximately 15.6 km of the Port Access (Nelson Mandela) road was constructed between 1978 to 1980. Construction involved house demolition, compensation and relocation of residents of the Ubungo, Buguruni, Temeke and Kurasini areas. Pugu road, which intersects with the Nelson Mandela road had major improvements made to it between 1975 and 1977.

These improvements involved house demolition, compensation and relocation of residents along Nkrumah street.

New Kigogo Road which was constructed in 1985 involved extensive house demolition, compensation and relocation of residents in the Magomeni Area.

(4) Old Bagamoyo, Mpakani (Sam Nujoma), Shekilango, Ohio, Uhuru, Sokoine (City Drive), Bandari, Gerezani Roads

Improvements to several of these roads involved overlay construction which did not require house demolition or relocation. At present Mpakani (Sam Nujoma) road is being extended from New Bagamoyo road to Old Bagamoyo Road. This extension requires the use of road reserve which has been encroached on by fences and portions of building structures. These structures will need to be removed at no cost to Government.

(5) Chang'ombe Road

The improvements to Chang'ombe road are scheduled to be effected during the 3rd Phase of the Dar es Salaam Roads Improvement and Maintenance project. The repair of this road will involve over-lay construction to the existing road surface and hence house demolition, and resettlement of residents is not expected.