3.2.3 Gross Regional Product

The Gross Domestic Product (GDP) of Tanzania was in the order of 198.1 billion shillings with a per capita GDP of ab out 8,800 shillings in 1987.

The real GDP grew by an average of 2.0% per annum between 1977 and 1987 and a High annual growth rate of 3.9% is fore-casted as about 4% in 1988. The annual economic growth rate between 1984 and 1987 was slightly higher than the annual population growth rate of 2.8%.

As in the previous years, agriculture was the main source of GDP consisting 42% of total GDP with an average annual growth rate of 2.8% between 1977 and 1987 counted. Despite the manufacuturing sector has remained depressed with the accounting for only 4.4% of the GDP in 1987, its' growth rate of 4.2% was registered in 1987 due to the recovery of the Tanzanian economy. (see Table 3.5)

3.2.4 Present Land Use

Based on the present and former land-use map shown in Fig. 3.1 and 3.2 respectively, the current urbanizations are summarized as follows:

- Extension of planned residential area along Bagamoyo Road, Kilwa Road and in the Tabata area.

- Extension of unplanned residential area along Morogoro Road, Pugu Road and Kilwa Road.

- Extension of Industrial areas along Bagamoyo Road, Port Access Road, Pugu Road and part of the Kinondoni area.

Table 3.5 Annual Growth Rate of GDP by Economic Activity, 1976 prices

(%)

Economic Activity	'78	'79	'80	'81	'82	'83	'84	'85	'86	'87	'88	Ave. Annual Growth Rate 1977-87
1. Agriculture, Forestry, Fishing and Hunting	-1.7	0.8	3.9	1.0	1.3	2.9	4.0	6.0	5.7	4.4	-	2.8
2. Mining and Quarrying	-18.2	5.8	-5.5	2.1	-	-9.8	6.9	-6.5	-4.0	-1.2	-	-3.3
3. Manufacturing	3.4	3.3	-4.9	-11.2	-3.3	-8.7	2.7	-3.9	-4.0	4.2	-	-2.4
4. Electricity and Water	17.2	11.1	25.8	4.3	0.7	-1.7	6.3	5.0	18.0	7.5	-	9.1
5. Construction	-14.4	12.3	6.0	-4.5	4.5	-41.0	20.2	-8.9	25.1	2.9	-	-1.7
6. Whole sale and retail, trade, hotels and restrants	5.4	1.5	-	-4.0	-2.1	-2.1	1.1	0.8	10.9	4.5	-	1.0
7. Transport and Communication	2.8	-3.8	11.1	-9.1	2.5	-13.0	0.6	1.8	0.3	4.5	-	-0.4
8. Finance, Insurance, Real Estate and Business services	5.7	5.9	6.2	1.9	6.8	4.3	5.9	2.1	7.8	2.4	-	4.9
9. Public Administration and other services	20.0	8.6	-2.1	11.1	0.1	-0.4	0.2	1.9	-9.2	0.8	-	2.9
Total Industries	2.2	2.9	2.6	-0.4	1.1	-2.1	3.4	2.7	3.9	4.0	-	2.0

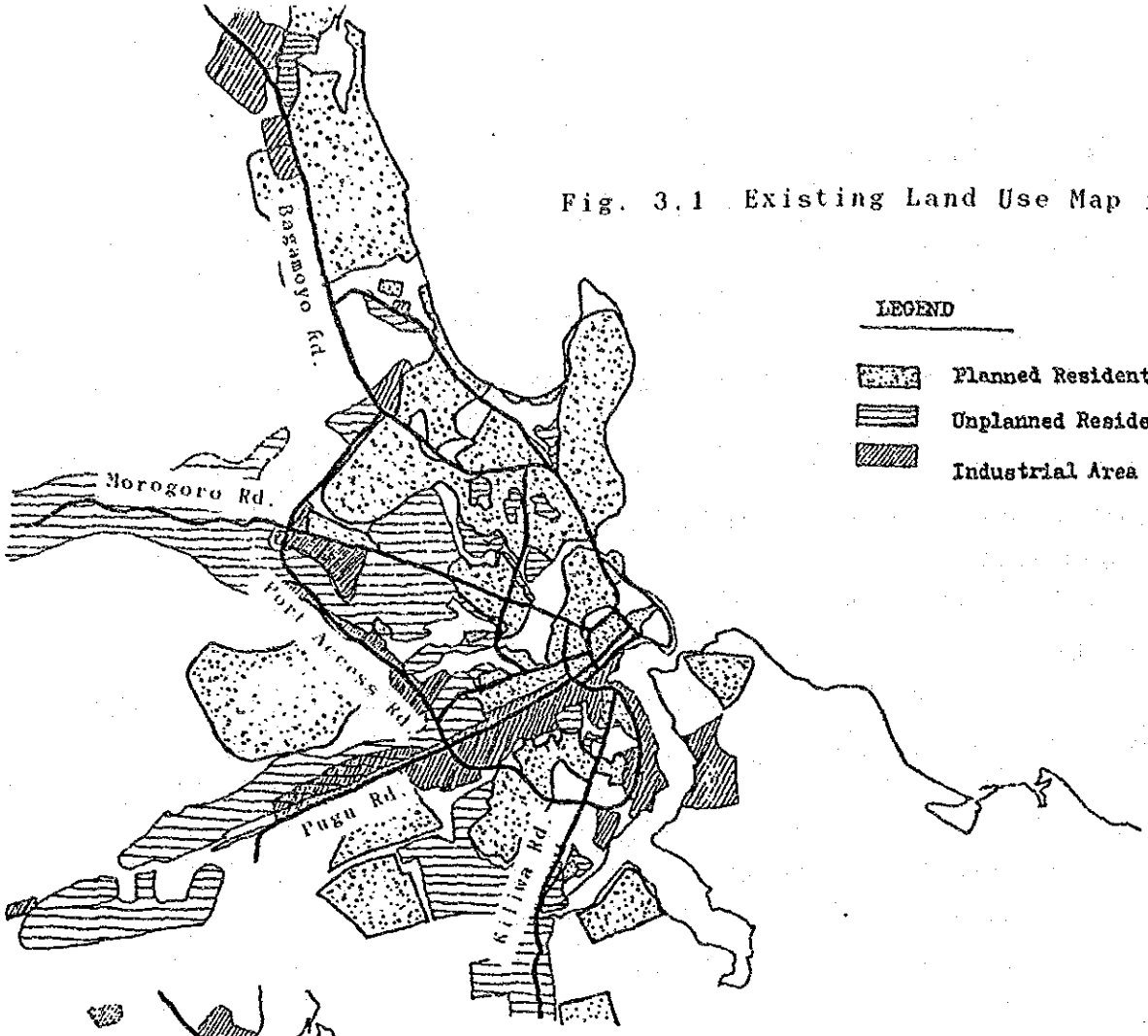


Fig. 3.1 Existing Land Use Map in 1989

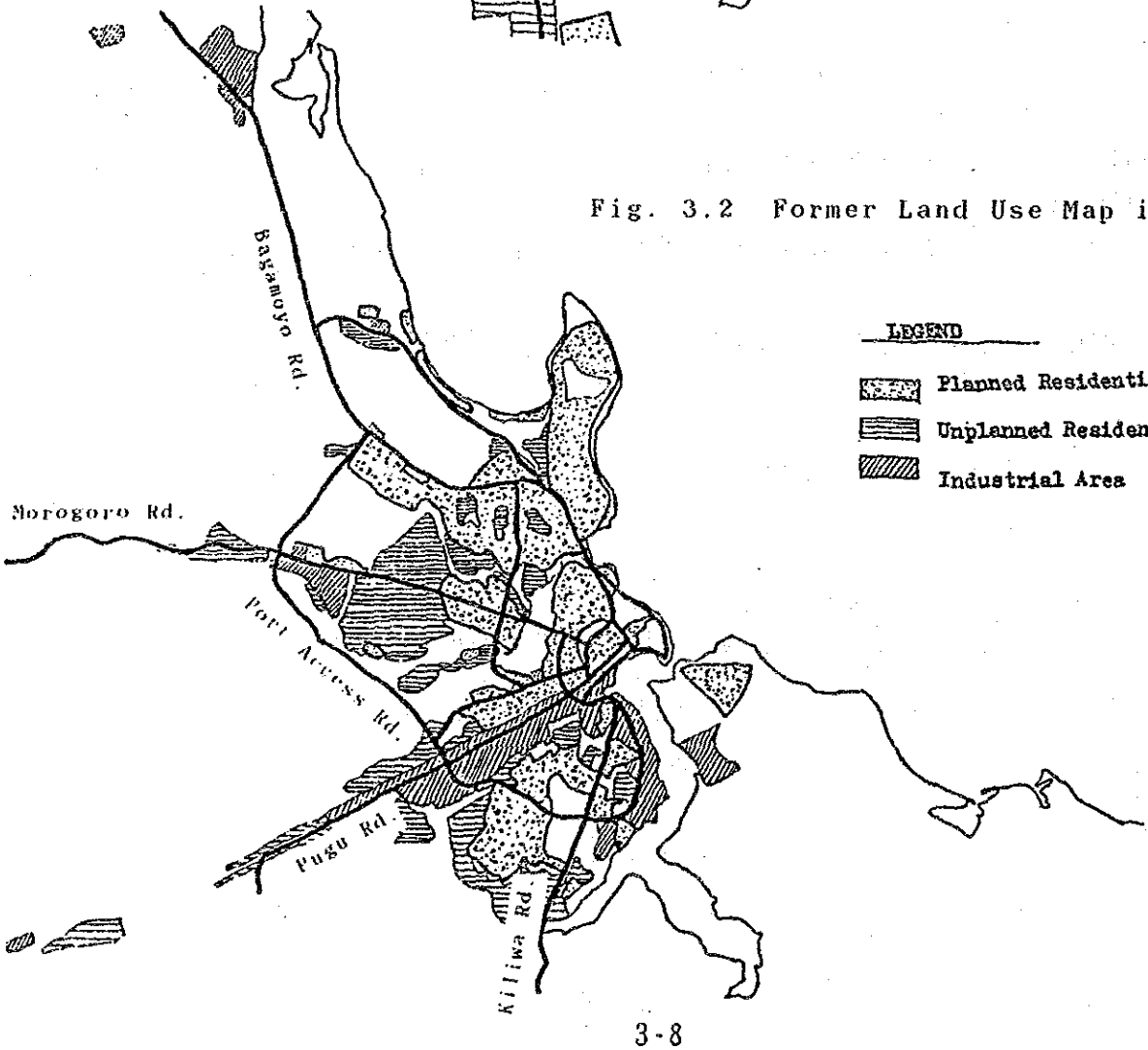


Fig. 3.2 Former Land Use Map in 1978

3.3 Transport Facilities

3.3.1 Road Transportation

Public bus transportation within the urban area of Dar es Salaam is provided by the UDA (Shirikala Usafiri Dar es Salaam Ltd.). At present the bus company KAMATA (Kampuniya Mabasi ya Taifa) assists the UDA along a few routes.

The UDA planned to operate 59 bus routes, most of which link the various sections of the city to the city centre. The major terminals in the city centre are Kariakoo, Post, Station and Sh/Uhuru shown in Fig.3.3.

On May 19,1989, the UDA was serving its routes usinga nominal bus fleet of:

- -50 ordinary buses on average. (51% of 1982 ordinary bus fleet)
- -2 articulated Ikarus buses. (4% of 1982 articulated bus fleet)
- -2 minibuses. (11% of 1982 minibus fleet)

Furthermore, the planned fleet for 1988/89 was proposed as 111 buses totally and total actual fleet was provided as 49% of the planned fleet required.

The ordinary and the articulated buses are allocated to a specific route. Before March 1982 the minibuses did not operate on fixed routes but were assigned to routes according to demand.

In addition, there are 150 private buses operating on May 3,'89 but 186 private buses operating on March 1,'89. On average there are about 150 officially registered private buses presently.

Moreover, a number of private vehicles operate as Dala-Dala's and anything from a passenger car or pick-up to a Volks-wagen minibus is used. The vehicles stop at UDA's bus stops and pick up passengers illegally.

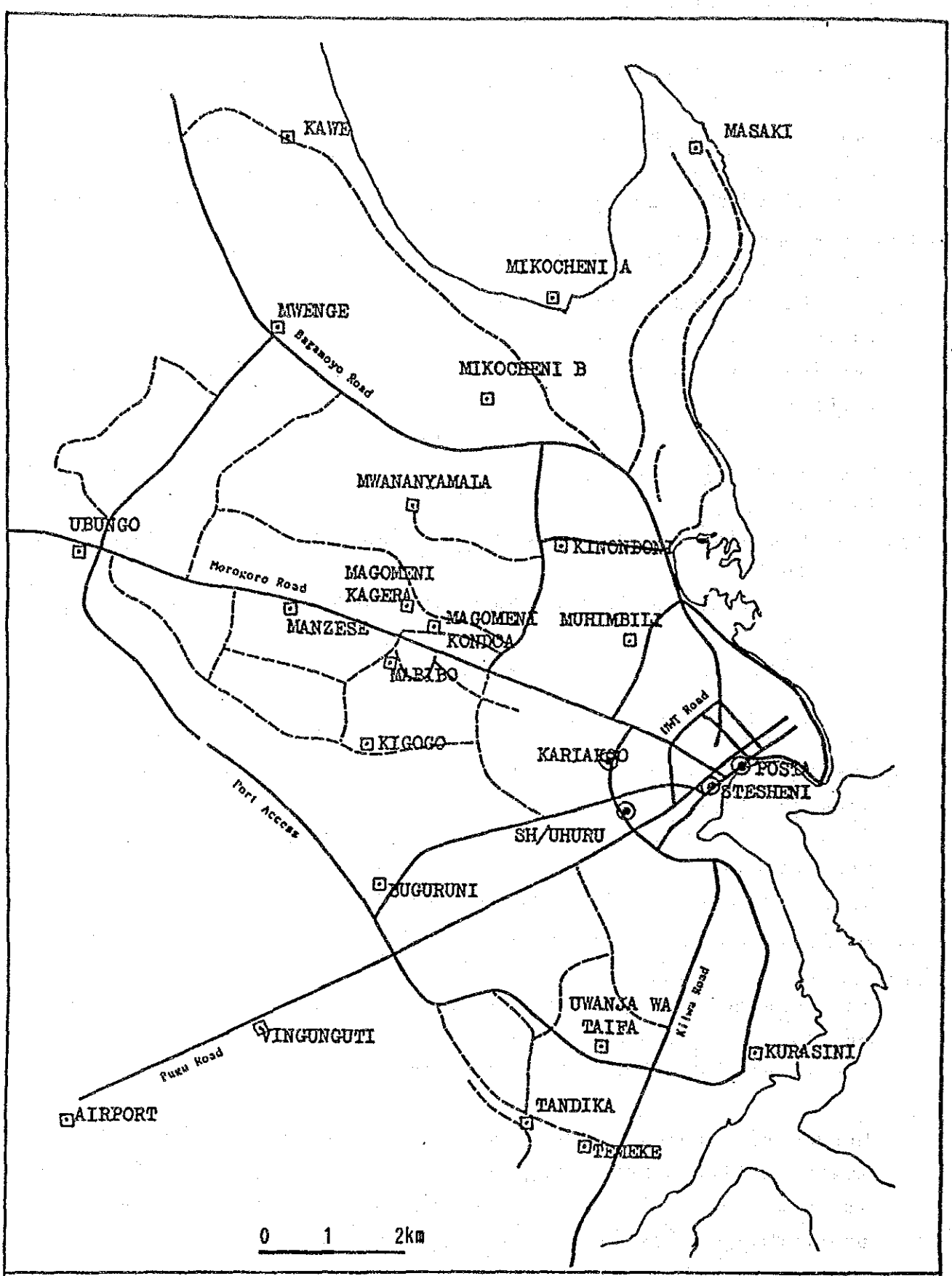


Fig. 3.3 Location Map of Bus Routes and Bus Terminals

◉ Central Terminal

⊡ Outer Terminal

3.3.2 Dar es Salaam Port

The deepsea facilities are relatively modern and, with the exception of the container terminal which is constrained with respect to yard storage area, they have adequate berth length and depth and adequate support land to service the needs of modern cargo handling operations.

The annual increasing rate of cargo handled was counted as 2.4% during 1978 and 1987.

The physical configaration of port facilities is considered to be adequate for the handling of the future traffic to the year 1992. In addition to the event that paving of the second phase planning of the container yard construction is completed, it is pointed that the capacity of the port will be adequate to the future traffic demand in 2000.

3.3.3 Dar es Salaam International Airport

Dar es Salaam International Airport has a 3000m long and 60mwide runway with a new passenger terminal building and has an additional crossrunway of 1000m long and 30m wide.

The passenger and freight traffic handled by Dar es Salaam International Airport has generally been increasing with 7.8% of average annual increase rate of passengers during 1982 and 1987. This trend thus indicates that by the year 2000 traffic will have grown to around double the amount in 1987 i.e. around 1,500,000 passengers per year.

Considering the existing trend of average annual increasing,it is pointed that the Dar es Salaam Airport facility will be adequate to the demand in 2000.

3.3.4 Railway Transportation

Dar es Salaam City is a terminal for two railway lines, namely the Central line served by Railway corporation (TRC) and Tanzania - Zambia line served by Tanzania - Zambia Railway Authority (TAZARA).

The Central line of TRC passes to Kigoma & Mwanza in the west and it branches to Tanga in the east and to Moshi & Arusha in the north. Its passenger terminal in Dar es Salaam is located in the center of Dar es Salaam while its freight terminals are located at Ilala and Its industrial lines serve the both of Pugu road and Ubungo industrial areas.

The freight volume in general have decreased since 1981.
The passenger terminal of TAZARA in Dar es Salaam is locatedat the junction of Port access road and Pugu road and its freight terminal at the port.

The freight volume indicate a trend of general increase while the passengers carried shows a sharp decrease during 1980 and 1983 and after that a general increase to a level of 1980 was counted.

3.4 Present Road and Traffic Conditions

3.4.1 Existing Road Surface Conditions in Dar es Salaam

The city of Dar es Salaam is served by 1,150 km approx. of the existing roads network system of a hierarcy of arterial, collector and local roads as shown in Fig. 3.4 and in Table 3.6.

Table 3.6 Existing Classified Roads

Classification	Total Length(km)	
1. Arterial Roads	148	(13%)
4-lanes paved roads	35	
2-lanes paved roads	113	
2. Collector Roads	65	(6%)
2-lanes paved roads	52	
2-lanes unpaved roads	13	
3. Local Roads	933	(81%)
2-lanes paved roads	251	
Minor unpaved roads	695	
Total	1,146	(100%)
Paved roads	451	(39%)
Unpaved roads	695	(61%)

Existing surface conditions of the roads which cover all arterial and collector roads in the city and important local roads in 8 areas proposed by DCC as shown in Fig.3.5 are summerized in Table 3.7.

Presently most of the roads in Dar es Salaam with the exception of a few trunk and arterial roads have deteriorated to a level where normal routine maintenance is not cost effective.

These excessive damages have been occurred not only on main roads and streets in the city center but also on the local roads in the industrial and residential areas, especially the roads in the following area are of quite serious conditions.

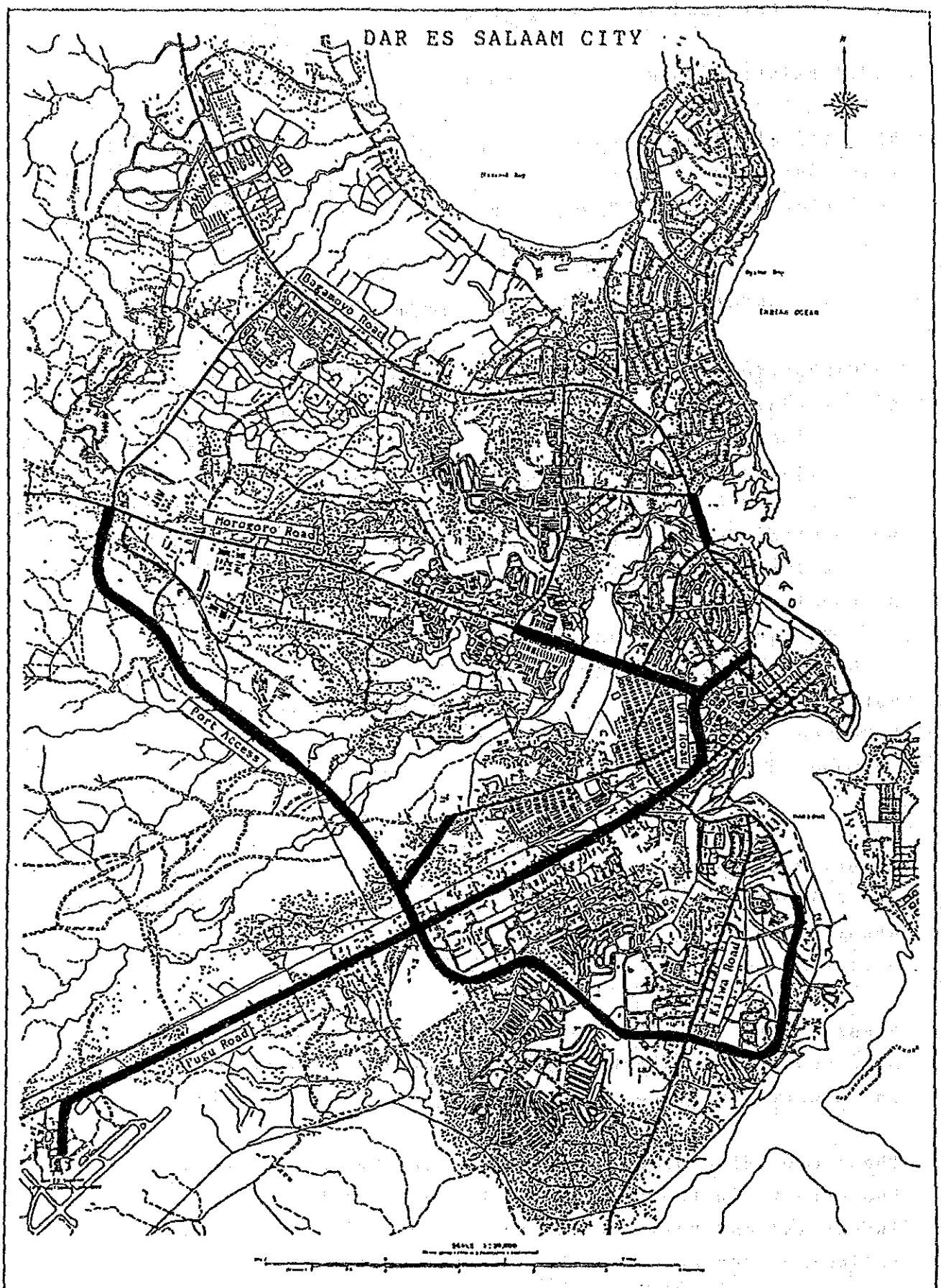


Fig. 3.4 Existing Classified Road System in Dar es Salaam

Arterial Roads
4 lanes paved roads:
2 lanes paved roads:
Collector Roads
2 Lanes paved roads:
2 Lanes unpaved roads:
Local Roads
Key plan not applicable

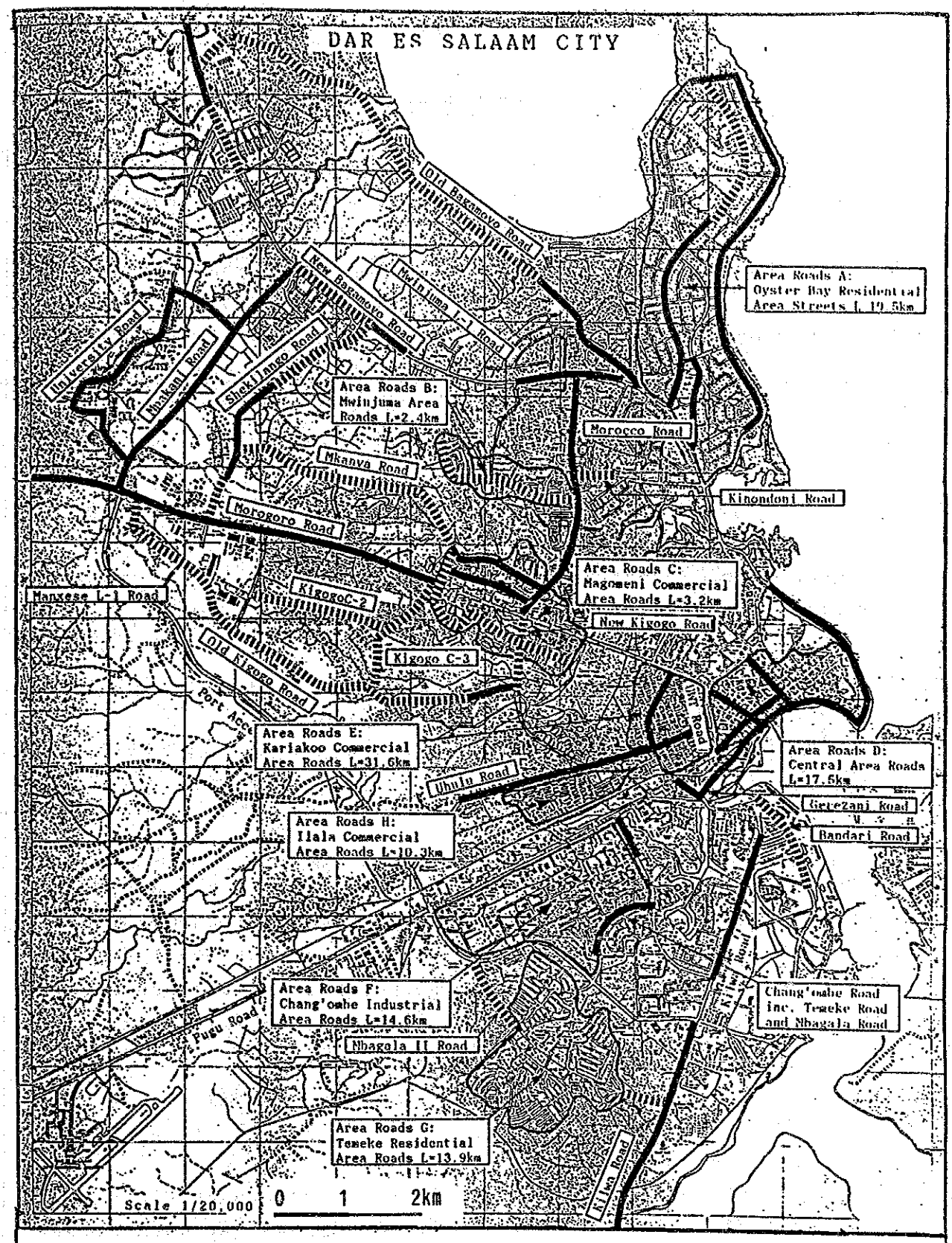


Fig.3.5 Results of PSI Survey on Arterial/ Collector Roads

1.4PSI<2.5 :

0.0<PSI<1.5 :

Table 3.7 Road Section by PSI Value

PSI Value	Read condi-tions	Length of Roads Arter. Roads	Collec. Roads	Local Roads	Total (km)	Counter-measures to be taken
0.0 - 1.5	Very Bad	14.7	31.6	58.9	105.2	Reconst-
		(9.8%)	(48.2%)	(64.6%)	(34.5%)	ruction
1.5 - 2.5	Bad	81.3	22.3	32.3	135.9	Overlay
		(54.7%)	(34.0%)	(35.4%)	(44.5%)	
2.5 - 5.0	Poor/Fair	52.5	11.6	0.0	64.1	Maintenance
		(35.3%)	(17.7%)	(0.0%)	(21.0%)	
Total		148.5	65.5	91.2	305.2	
		(100.0%)	(100.0%)	(100.0%)	(100.0%)	

- Kariakoo commercial area.
- Chang'ombe industrial area.
- Illa industrial and residential area.
- Temeke residential area.
- Magomeni commercial area.
- Mwananyamala residential area (Mwinjuma Road).
- Kigogo and Mburahati residential area.
- Oyster bay residential area.
- Sinza residential area.

The deterioration has been caused mainly by a long absence of proper and timely maintenance due to inadequacy of funds, small maintenance capacity caused by the shortage of equipment for road maintenance and rehabilitation and inappropriate policies for regular and periodic maintenance as well as rehabilitation.

3.4.2 Existing Traffic Conditions in Dar es Salaam

The existing Average Daily Traffic (ADT) in passenger car unit (p.c.u.) calculated in the Feasibility Study and the Congestion Rate (C.R.= ADT/Capacity) on the objective roads are shown in Fig.3.6 and Table 3.9. Fig. 3.6 makes clear that almost all of the arterial roads sustain more than 10,000 p.c.u./day traffic. Furthermore the radial arterial roas, such as Bagamoyo Road,

Fig. 3.6 Present Traffic Volume and Congestion Ratio

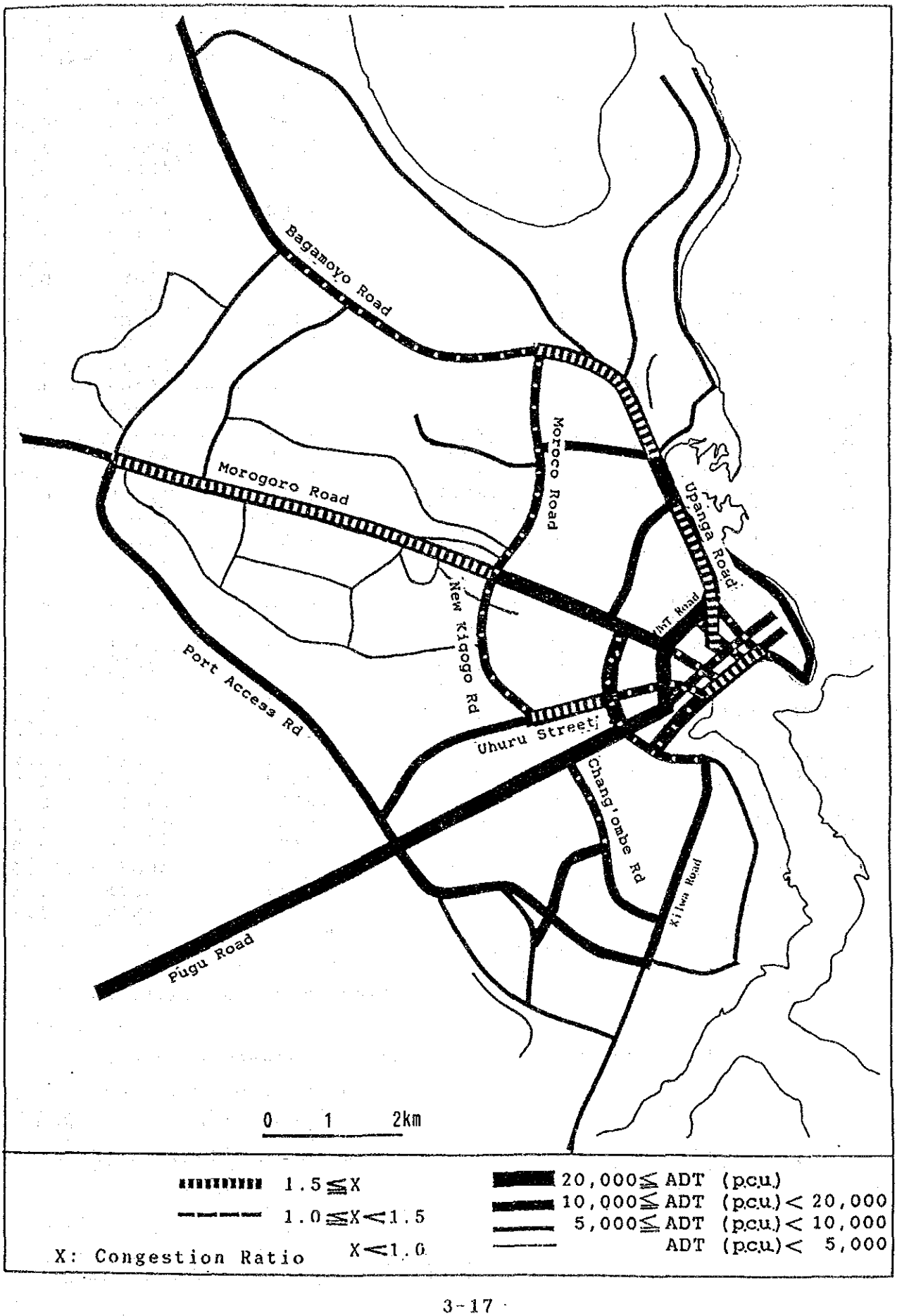


Table 3.9 Present Traffic Volume(ADT) and Congestion Ratio on each Survey Stations

Station No.	RoadName	Lane	Classification	12hr Trffic Volume Counted	12hr Traffic Volume (p.c.u.)	ADT (p.c.u.)	Congestion Ratio
1	Ocean Road	2	A	9841	10629	13680	0.76
2	Upanga Road	2	A	13108	15410	20410	1.52
3	UnitedNationRd	2	A	7274	8186	10690	0.62
4	Uhuru Street	2	A	14810	20464	25642	1.91
5	Pugu Road	4	A	26791	33379	42640	0.81
6	Bandari Street	2	A	11433	14854	18683	1.27
7	Moroco Road	2	A	7728	9480	12408	1.02
8	Morogoro Road	2	A	13100	19734	24719	1.68
9	Port Access Rd	4	A	9533	13479	16689	0.28
10	-ditto-	4	A	6214	9222	11854	0.20
11	Kilwa Road	2	A	3821	5935	7636	0.36
12	Samora Avenue	2	A	3877	3125	5258	0.42
13	Ohio Street	2	A	9960	11949	15169	1.12
14	Maktaba Street	2	A	12276	15338	19329	1.26
15	Samora Avenue	2	A	9917	10533	13480	1.07
16	Morogoro Road	2	A	8465	9137	11947	1.01
17	UWT Street	4	A	15747	18217	23693	0.39
18	Gerezani Str	2	A	14550	18714	23646	1.88
19	Uhuru Street	2	A	11290	14257	17917	1.34
20	Morogoro Road	4	A	18367	26290	33097	0.63
21	Msimbazi Str	2	A	10614	17002	21333	1.30
22	Gerezani Str	2	A	9374	12119	15241	1.17
23	Bagamoyo Road	2	A	14618	16260	21312	1.64
24	HaileselasieRd	2	C	5511	6229	8109	0.71
25	Old BagamoyoRd	2	C	4844	5370	6817	0.55
26	Konondoni Road	2	A	7818	10002	13485	0.83
27	Mwinjuma Road	2	C	3628	4533	8674	0.85
28	Bagamoyo Road	2	A	8478	11350	13629	0.50
29	Toure Drive	2	C	3874	4048	5292	0.46
30	Shekilango Rd	2	C	4522	5313	6982	0.66
31	Mpakani Road	2	A	4434	6245	7735	0.34
32	Mobibo Road	2	C	1344	1965	2510	0.22
33	Old Kigogo Rd	2	C	1818	2572	3482	0.30
34	Pugu Road	4	A	12411	16825	20907	0.40
35	Chang'ombe Rd	2	C	9735	12890	17072	1.21
36	Chang'ombe Rd	2	C	5711	8477	11244	0.80
37	Mbagala Road	2	C	3349	5462	6837	0.59
38	Port Acces Rd	4	A	3784	6284	8171	0.14
39	New Kigogo Rd	2	C	6500	9195	11889	1.13

A: Arterial Road
C: Collector Road

Morogoro Road, Pugu Road,Uhuru Street, and the streets in the City-center, such as U.W.T. Road and Sokoine Drive sustain over 20,000 p.c.u./day traffic.

Referring to Fig.3.6, it can be concluded that roads which experience a high congestion ratio over 1.5 are Bagamoyo Road, Morogoro Road, Uhuru Street, Upanga Road and Sokoine Drive, while Morocco Road, New kigogo Road, Chang'ombe Road, Msimbazi Street, Gerezani Street, Bandari Street and some streets within the City Center, are experiencing a congestion ratio of more than 1.0.

Table 3.8 Summary of Existing ADT and Congestion Rate on the Classified Roads

Road class	Lane No.	ADT(p.c.u./day)			Congestion rate(per day)		
		Max.	Min.	Ave.	Max.	Min.	Ave.
Arterial	4	42,6	8,2	22,4	0.8	0.1	0.4
	2	25,6	7,6	15,5	1.9	0.3	1.1
Collector	2	17,1	2,5	8,1	1.2	0.2	0.7

The following classification is applied for the understanding of the congestion level in Japan, according to the "Traffic Capacity of Roads".

Congestion ratio less than 1.0:
Traffic can run smoothly without road congestion throughout the 12 hours of daytime. There are also no traffic jams or delays in the traffic flow.

Congestion ratio 1.0-1.25:
There is a time zone of 1-2 hours (peak time) in which there is a possibility of road congestion, during the 12 hours of daytime, and a very small possibility that congestion may continue for many hours.

Congestion ratio 1.25-1.5:
Congested condition, from congestion at peak time to continuous daytime congestion.

Congestion ratio over 1.5:
Road traffic shows a chronically congested situation.

The following are the main problems and issues which have been identified in the Feasibility Study on the existing roads in Dar es Salaam City.

(1) Situation of Road Congestion

Congestion levels on the existing roads were examined applying the congestion ratio (C.R.) on the basis of road inventory and present traffic volume counted.

The study revealed that the following five (5) roads have very high levels of C.R. over 1.5 which identifies them as being heavily congested throughout the day. These roads urgently require improvement measures through widening from 2 to 4 lanes.

Congested Roads	C.R.	Length	Section
1. Uhuru Road	1.91	0.9 km	From Msinbazi to New Kigogo Rd.
2. Sokoine Road	1.88	0.8 km	Central Area
3. Morogoro Road	1.68	4.8 km	From Morocco to Port Access
4. Bagamoyo Road	1.60	3.0 km	From Upanga to Morocco Road
5. Upanga Road	1.52	1.8 km	Tanganika Mtr. to Selender Br.

(2) Improvement of Intersections

The intersections controlled by roundabouts have become over-loaded in the central area due to an increase of traffic in recent years. The folloing two (2) intersections should be upgraded to signal controlled intersections in order to meet the peak flows:

- Tanganyika Motor Roundabout at Upanga Road
- Junction at Uhulu and Mwinzima Roads

Another three(3) roundabouts in the city center area may also be in need of improvement, however, they must be improved simultaneously along with traffic devices, parking lots and bus bays so as to maximize the effect of investments.

(3) Provision of Bus Bay

Due to the inappropriate location of bus stops and insufficient numbers of bus bays for passengers, main roads often experience serious traffic congestion in the morning and evening peak hours. In order to improve the situation, bus bays with sufficient space should be provided at appropriate locations, particularly on the following roads where daily traffic volume have exceeded 10,000 per day: (See Fig. 3.6)

- Uhuru Road (Msimbazi Junction - 4 lanes Section)
- Morogoro Road (Morocco Junction - Port Access Junction)
- Morocco Road (New Bagamoyo Junction - Morogoro Junction)
- New Bagamoyo Road (Slender Br. - Mpakani Junction)

(4) Pavement Condition of Roads in the City

A PSI survey was conducted on all arterial and collector roads and partial local roads which have been proposed by DCC as the priority roads to identify the deterioration level of the pavement of each road.

The survey revealed that almost 80 % of roads have been deteriorated to the level where overlay or reconstruction measures are required as shown in Table 3.7 before. Especially the pavement on collector and local roads has deteriorated more seriously than that of arterial roads.

The excessive damage of these roads has been caused mainly by the following reasons:

- Increase of overloaded heavy vehicles
- Poor maintenance of roadside and storm drainage structures
- Unsuitable materials used in pavement structures
- Inadequate pavement design and construction
- Small maintenenace capacity due to shortage of funds and equipment which has accelerated yearly damages on pavement

(5) Roadside and Storm Drainage Structures

Lack of proper maintenance of roadside drainage is one of the major causes of pavement deterioration. Since pavement durability is greatly affected by water, so the maintenance of drainage structures is essential for the extension of the pavement life.

Most of the roads located in the urban areas are properly served by lined channels or underground pipe drainage system, with the exception of the roads which have been constructed without any development plan. All the entrances of gullies should be removed of soil and debris by routine maintenance to ensure the discharge of surface water and to minimize troubles for road users.

Many sections of road have been blocked and damaged by floodings occured frequently during rainy seasons. These floodings have been caused mainly by poor drainage maintenance. The programme of renewal and improvement on storm drainage systems is expected to be implemented as soon as possible.

CHAPTER 4 OUTLINE OF THE PROJECT

Chapter 4 Outline of the Project

4.1 Objectives of the Project

The objectives of the Project aim at improvement of road network and maintenance systems to remove the bottle-neck of transport sector and to stumulate and enhance the city's as well as the nation-wide's economic, social and administrative activities. Works involved are;

1) to improve the road condtions by overlay, reconstruction and widening of the existing roads to maintain effectively the function of road network in the City, and

2) to improve the road maintenance and operation system of the Dar es Salaam City by procurement of equipment.

4.2 Study and Examination of the Request

4.2.1 Necessity of the Project

The project requested by the government of Tanzania was reviewed making reference to the feasibility study report on "Road Improvement and Maintenance in Dar es Salaam City" prepared by JICA in July 1990.

The project consists of three (3) categories of improvement measures as shown below:

Category A: Improvement of Road Structures for the selected 5 packages of road with a total length of 87.4 km.
Category B: Urgent Repair for Selected Roads of Morocco, Kinondoni and Mwinjuma Roads (6.4 km)
Category C: Improvement of Road Maintenance System by provision of road equipment

The road network of Dar es Salaam had a total road network of 1,150 km, of which 450 km are butuminoused roads and 700 km are gravel and earth roads. Due to higher rate of City expansion as well as recent accute increase in vehicle demand accompanying the recovery of economic situation in Tanzania, the traffic flows on the city roads have greatly increased.

At the sametime, most of the present city roads have deteriorated seriousely to the level where normal routine maintenance is no longer effective which have caused by the long absence of proper and timely maintenance due to the shortage of funds and inappropriate road maintenance system. Because of deteriorated and narrow road, there is heavey damage of the motor vehicles and heavy traffic jums in the city.

As the result, the country is loosing heavily in terms of foreign exchange for maintaining the motor vehicles to order spare parts and also the country is loosing so much of its productive time because of traffic jams.

Since the city roads in Dar es Salaam are vital important to the capital's economic, social and administrative activities, the urgent rehabilitation and improvement measures are necessary in order to facilitate smooth and safe traffic.

4.2.2 Related Plans and Aid Programmes

The improvement measures to be conducted under this Project does not overlap with the plans and aid programme assisted by other donor countries and international financial agencies.

It was confirmed in the Minutes mutually signed by JICA study team and Tanzanian Government in March 23, 1990 in connection with the draft final report on feasibility study that Upanga Road (1.8 km) and a part of New Bagamoyo Road from Selender Bridge to the junction of Mpakani Road (8.0 km) shall be excluded from the list of proposal sent to Italian Government and be included in this Project instead.

4.2.3 Assessment of the Project

The content of the Request made by the government of Tanzania has been assessed taking into account the conditions of Japan's grant aid programme as follows:

(1) Category A "Improvement of Road Structures" for the following five (5) packages:

1)	New Bagamoyo/Upanga Roads	9.8 km
2)	Morogoro Road	5.7 km
3)	Chan'gombe Area Road	19.2 km
4)	Kariakoo Area Road	31.7 km
5)	Central Area Road	21.0 km
	Total	87.4 km

The pavement condition as well as the traffic conditions of these roads are seriously deteriorated and congested resulting in the bottle-neck of transport sector in the City. Since the project roads are located in the center of City, the improvement of the roads is an urgent subject and essential for economic, administrative and social activities in Dar es Salaam. Therefore, the request made by the Government of Tanzania is acceptable in principle for Japan's grant aid programme.

However, as the result of cost survey in the Basic Design Study, the project length of Kariakoo Area Road was decreased from 31.7 km to 21.5 km.

(2) Category B "Urgent Repair for Selected Roads"

The government of Tanzania has requested to conduct the urgent repair to the following selected roads:

- Morocco Road	3.6 km
- Kinondoni Road	0.7 km
- Mwinjuma Road	2.1 km
Total	6.4 km

Pavement of the above three roads has been seriousely deteriorated resulting in the serious hindrance to the traffic flow and safety of the vehicles. The urgent repair of pavement is therefore essential to facilitate smooth and safe traffic.

(3) Category C "Provision of Road Maintenance Equipment"

Cause of pavement deterioration is mainly due to lack of road maintenace equipment in the Maitenance Division of DCC so that the provision of equipment is indispensable for maintaining function of city road effectively. However, since there is no sufficient engineering and technical staff in DCC for operating those equipment properly, number and type of equipment to be provided under the Project shall be the level of minimum requirement for conducting daily and routine maintenance.

Type and number of equipment to be supplied under the Category C are summarized in Table 4.1 below:

Table 4.1 List of Road Maintenance Equipment

	Equipment	Specifications	Quantity
1.	Dump truck	4 ton	5 nos.
2.	Cargo truck	4 ton with crane	2 nos.
3.	Pick up	1 ton	4 nos.
4.	Bitumen Sprayer	30 l/min.	2 nos.
5.	Hand roller	600 kg	2 nos.
6.	Plate compactor	50 - 60 kg	4 nos.
7.	Wheel loader	0.4 m3, WS200A	1 no.
8.	Motor cycle	120 cc	4 nos.
9.	Asphalt cutter	100 mm depth	2 nos.
10.	Road Blower	280 l	2 nos.
11.	Mini. backhoe	0.1 m3	1 no.
12.	Hand breaker	1.3 m3/min.	2 nos.
13.	Tool box	Large	1 no.
14.	Tool box	Small	5 nos.
	Spare parts for Existing Motor Grader at DCC (GD600R)		1 lot

Summary of the assessment made on the Request is presented in Table 4.2.

Table 4.2 Summary of Assessment of the Project

Work Items	Request by Tanzanian Government	Result of Basic Design Study
1. Category A:"Road Improvement		
(1) New Bagamoyo Road	9.8 km	9.8 km
(2) Morogoro Road	5.7 km	5.7 km
(3) Chan'gombe Area Road	19.2 km	19.2 km
(4) Kariakoo Area Road	31.7 km	21.5 km
(5) Cantral Area Road	21.0 km	21.0 km
Total	87.4 km	77.2 km
2. Category B:"Urgent Repair for Selected Road of Morocco, Kinondoni and Mwinjuma Roads	6.4 km	6.4 km
3. Category C:"Improvement of Maintenance and Operation" by Provision of Equipment	Sum	Sum

Fig. 4.1 shows the location of the project roads to be implemented under Category A and B of this Project.

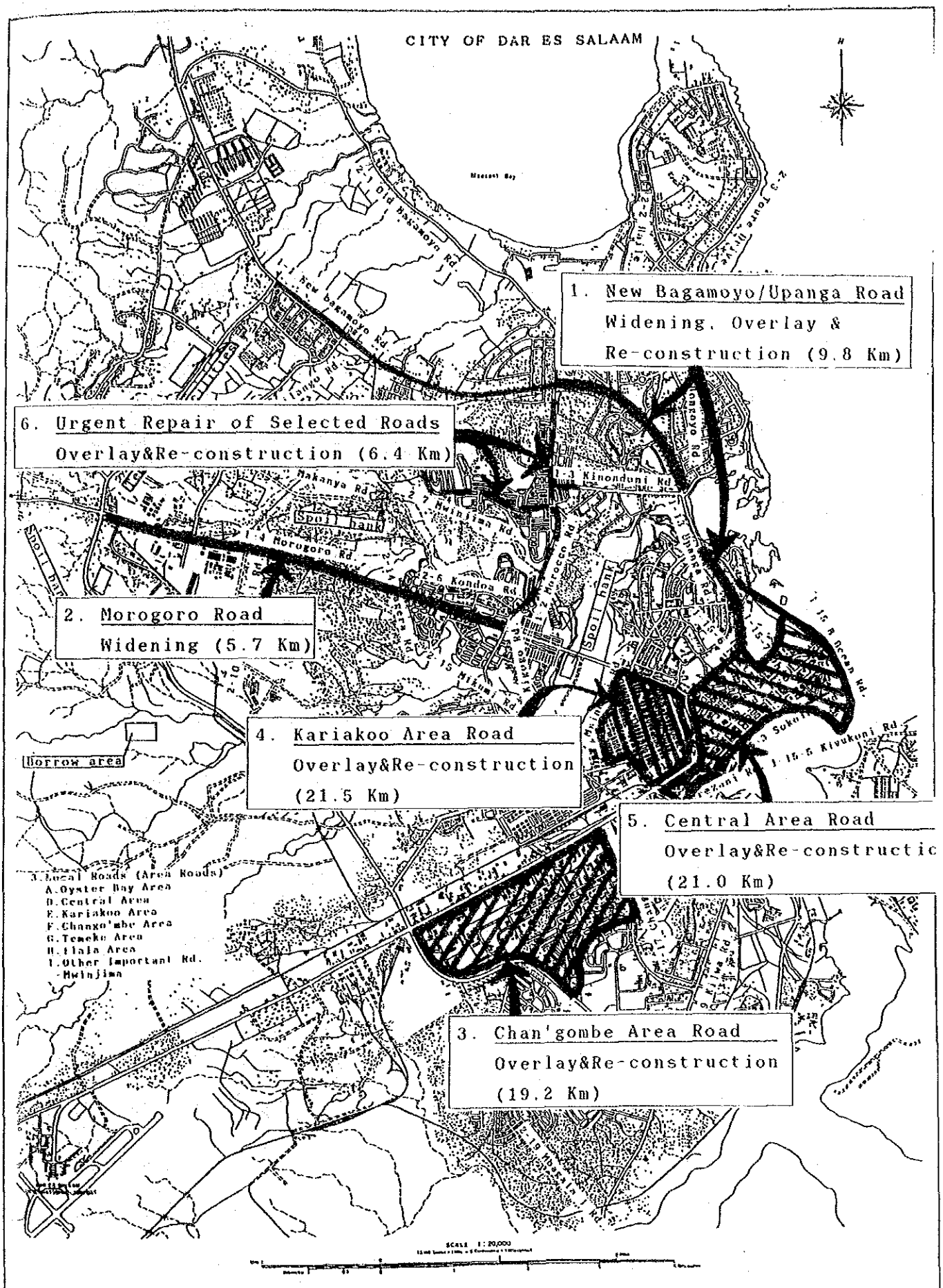


Fig. 4.1 Location of Project Roads

4.2.4 Implementation Agency and the Road Maintenance

(1) Project Implementation Agency

Dar es Salaam City Council (DCC) under the Ministry of Regional Administration and Local Government will be responsible for the implementation of the Project and will act as the executing Agency of the Project in cooperation with Ministry of Works (MOW) as a Technical Ministry.

The Engineering Department of DCC is responsible for the administration, planning, construction, management, operation and maintenance of the city roads. The head of Engineering Department is the City Engineer. Under the City Engineer, there are 9 engineering sections and the Road Section is one of the 9 engineering sections. The Road Section has two divisions, namely Road Maintenance Division, and Road Design, Planning and Construction Division. The organization chart of the Engineering Department is as shown in Fig. 4.2.

Road Maintenance Division in the Road Section will be in charge of maintenance of the objected roads upon completion of the improvement. There are four (4) maintenance depots under the Road Maintenance Division. These depots are located in each district of the City.

The maintenance works is being conducted in cooperation with the DCC's Mechanical Workshop Section in the Engineering Department, since all equipment required for road maintenance are kept and maintained in the said mechanical workshop.

The City Council has 14,000 employees out of which 2,045 are of the Engineering Department and is responsible for provision of all required services, facilities and infrustrctures to the residents of the City. These include; Health Services, Roads, Drainage, Sanitation, Cultural Services, Market Facilities, Site and Services, Primary Education.

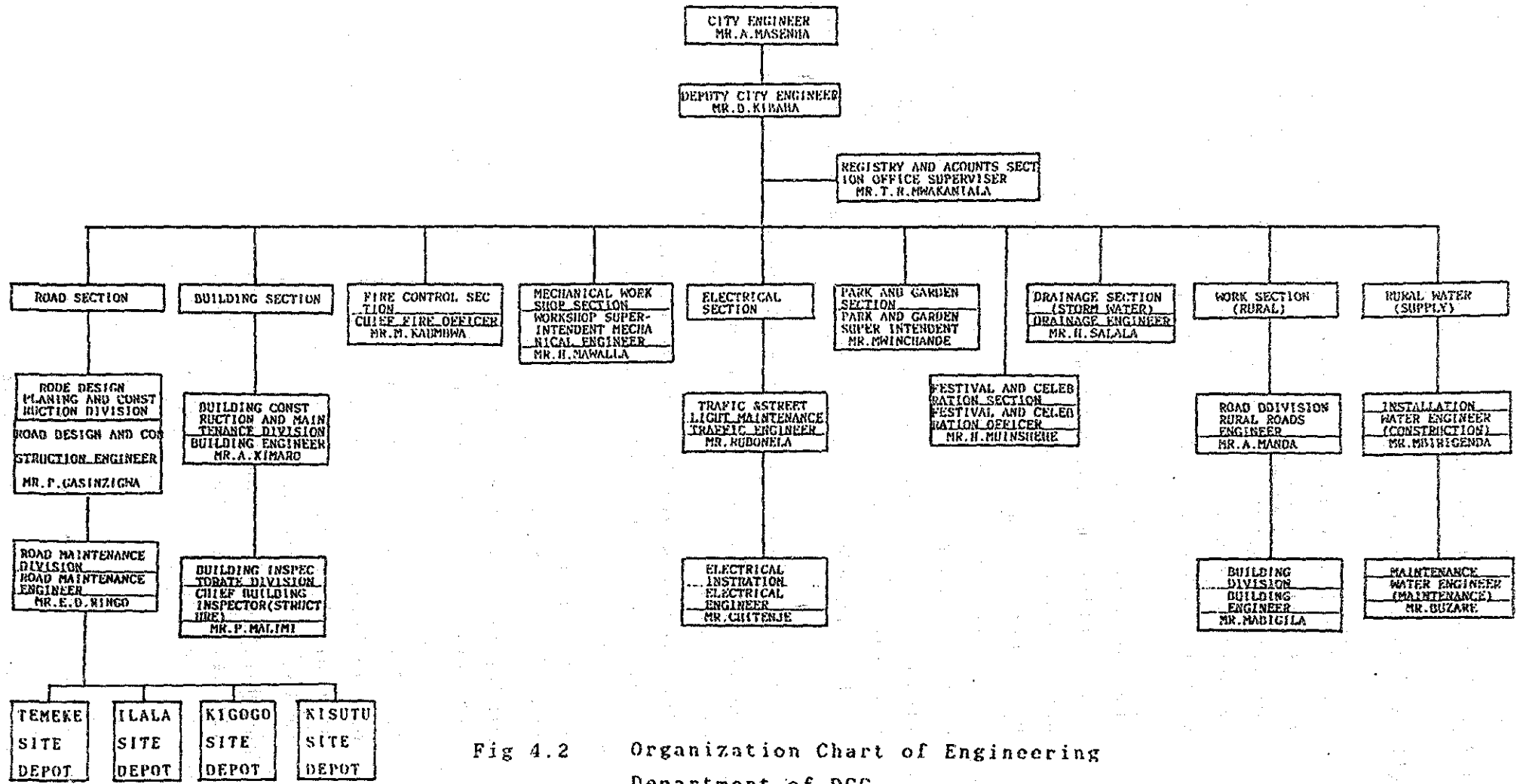


Fig 4.2 Organization Chart of Engineering Department of DCC

(2) Organization of the Project Office

The road maintenance equipment will be supplied under the Category C of this Project in order to strengthen the capability of road maintenance operation. These equipment will be kept and maintained at the site depots under the road maintenance division.

As stated above, there are four(4) site depots under the road maintenance division. Out of which, Ilala site depot is very specious and has a good access to the project sites. DCC, therefore, has determined to keep and maintain the road maintenance equipment to be procured under the Category C of this Project.

Since the present facilities at Ilala site depot are small and old, it is necessary to improve and reconstruct the existing facilities. DCC has decided to establish new office and workwhop for the Project at the Ilala site depot at their own cost for smooth operation of the maintenance and construction of the Project. Appendix 4.1 shows the layout plan of new Ilala site depot prepared by the study team.

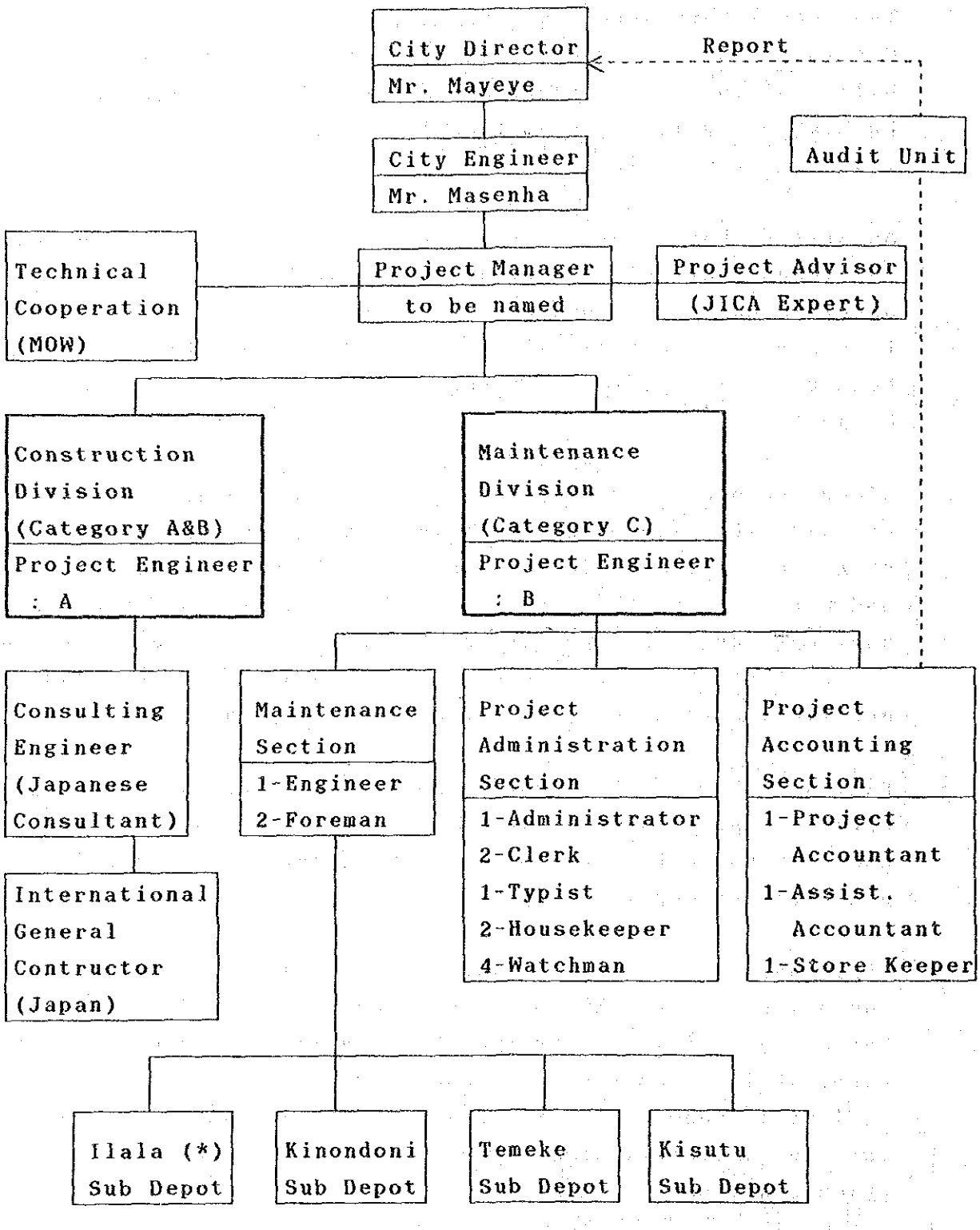
Fig. 4.3 shows the proposed organization chart of the project office. The project office is divided into two divisions, namely Construction Division for Category A & B and Maintenance Division for Category C.

It is advised for DCC to recruit senior administrative staffs and engineers from MOW or other agency concerned to establish the project office. For smooth operation of the project office, it is recommended for DCC to employ experts whose speciality is done in the field of road maintenance and operation, for instance, from Japan under Japan's technical cooperation programme.

(3) Maintenance Work to be done

In view of the difficulty of funds and shortage of staff for road maintenance, the type and number of equipment to be pro-

Fig. 4.3 Project Organization Chart



*: Ilala Sub Depot shall be improved so that the equipments to be provided under Category C of the Project will be kept and maintained properly. Proposed Plan of Ilala Road Maintenance Office is Attached in Appendix as reference.

vided under the Category C should be small and minimum level so as to meet the requirment of routine and periodic maintenance. The heavy equipment to be used for the earthwork and reconstruction of pavement are not necessary for the time being.

The following is the summary of the maintenance works to be conducted by DCC:

- Routin Maintenance:
  Repair of sign and road marker, signal, lighting facilities grass cutting, bush cleaning, ditch cleaning, gravel patching, dragging, pot-hole patching and grading

- Periodic Maintenance:
  Regravelling, repair of rut dragging, repair of road edge, resealing of cracks, surface dressing, grading

- Urgent Repiar:
  Repair of road divices broken due to traffic accidents

Daily patrol is important to identify the existing situation and problems on the roads. The report of daily patrol will be useful for timely repair and maintenance. These data should be included as inventory of road facilities, traffic volume, accident, repair and maitenance work, etc in the records.

(4) Funds to be allocated to the Road Maintenance

The Project Office to be established at Ilala Site Depot will functione as the main office for road maintenance activities in the City. The budget to be allocated for road maintenance in the City shall be managed by the Porject Office so as to carry out the maintenance work adequately.

4.3 Project Description

4.3.1 Project Site Location and Conditions

The project roads are located in urban and sub-urban areas of Dar es Salaam City. The project roads requested by the government consist of the following six (6) packages:

1) New Bagamoyo Road/Upanga Road
2) Morogoro Road
3) Chan'gombe Area Road
4) Kariakoo Area Road
5) Central Area Road

The following is the outline of each project road:

(1) New Bagamoyo Road/Upanga Road L= 9.8 km

The project length of Upanga and New Bagamoyo Roads is 1.8 km and 8.0 km respectively. Upanga road starting from Tanganyka Motor roundabout and ending at the junction of United Nation Road, is heavily congested with congestion ratio of more than 1.5 which is the level of chronocally congested situation at daytime. The ADT on the Upanga Road counted by JICA study team in the feasibility study was 20,400 p.c.u.

Width of existing road reserve on Upanga and New Bagamoyo road is sufficiently enough for widening from 2 to 4 lanes, no compensation and land aquisition might be required. However, there are many public utilities installed along the road including water mains, telephone cables, electric wire and pole, road lighting columes, etc. which may interfere with the road construction. The intersection of Tanganyka Motor should be carefully designed taking into consideration the traffic movement into the City.

(2) Morogoro Road L= 5.7 km

The Morogoro Road is one of the most important trunk road not only for the City but also for the nation. The ADT counted by JICA was 33,100 p.c.u. which is the 2nd largest traffic volume in the city. The first 2.4 km of Morogoro Road from

the city center was already widened to 4 lanes with the financial assistance of Japanese Government in 1985/1987, however, the remaining section up to the junction of Port Access has been remained without widening until now, resulting in the heavy traffic congestion for whole daytime.

There is a sufficient width of right-of-way reserved along Morogoro Road, however, some houses and lands located in Manzese area, where new on/off bays for goods and passenger are planned under this project, should be removed and acquired.

In addition, there are many public utilities laied along the project road including water mains, telephone cables, electric wire and pole, road lighting columes, etc. These utilities should be protected or relocated properly at the cost of Tanzanian government.

Since large number of traffic flows on the Morogoro Road in the daytime, traffic management during the construction should be carefully taken without causing any inconvenient to the public traffic.

(3) Chan'gombe Area Road L= 19.2 km

Chan'gombe area has been recently developed and has become one of the most important industrial area in the City because of good access to Pugu Road and Port Access. The road network in this area has been developed systematically in accord -ance with the scheme of new industrial estate, however, long absence of maintenance for road and draiange structures has made the road network in the worst conditions.

The pavement and drainage system were deteriorated seriously, so that the roads in the city are frequently blocked by flood in the rainy season. Surface water on the road in the estate has been collected by means of gullies and discharged through a piped draiange system, however, these are not working well now due to the blocking by debris and silting.

The pavement condition in this Area is summarized as follows:

Pavement Condition	Length
- Section where reconstruction of pavement is required	9.0 km
- Section where overlay of pavement is required	4.8 km
- Section where no improvement is required (Maintenance only)	5.4 km
Total Length	19.2 km

(4) Kariakoo Area Road L= 31.7km

Kariakoo is defined as the commercial and residential area which is one of the most swarmed and populated area in the City. Shops are concentrated along the Msimbazi Street and the side streets around the major market.

Due to long absence of road maintenance and inadequate drainage system in the area, the roads have been deteriorated seriousely, however, project road length to be improved was assessed by the Team on the basis of the cost analysis under the Basic Design Study as shown below:

Pavement Condition	Proposed Length	Project Length
- Section where reconstruction of pavement is required	24.7 km	15.3 km
- Section where overlay of pavement is required	3.7 km	3.7 km
- Section where no improvement is required (Maintenance only)	3.3 km	2.5 km
Total Length	31.7 km	21.5 km

(5) Central Area Road L= 21.0 km

The Central area is the main focus of commercial, political and cultural activities in the City. The traffic in the area is very congested due to accute increase of traffic demand accompanying with the economic recovery.

Roadside drainage system in the Central Area seems to be working well generally if the brocking of gully entrance by debris, soil and vegetation could be removed by the routine

maintenance work.

The present conditions of the existing road are as shown below:

Pavement Condition	Length
- Section where reconstruction of pavement is required	3.7 km
- Section where overlay of pavement is required	17.1 km
- Section where no improvement is required (Maintenance only)	0.2 km
Total Length	21.0 km

4.4 Technical Cooperation

Although the characteristic of the Project is mainly pavement rehabilitation and reconstruction of the city roads as well as drainage system, DCC, however, does not have a sufficient enough experience and know-how in the field of road maintenance.

Therefore, it is recommended to recruite necessary staff and engineers from MOW and other agency concerened.

CHAPTER 5 BASIC DESIGN OF THE PROJECT

CHAPTER 5 BASIC DESIGN OF THE PROJECT

5.1 Design Concept

The basic design was conducted on the baisis of the result of feasibility study made by JICA in July, 1990, empolying the following design concept:

1) The appropriate design criteria to meet the road classification and its function expected in each road viz. arterial, collector and rural road.

2) Optimum design of road structures paying due attention to the drainage system.

3) Economy in construction and maintenance cost

5.2 Design Criteria

(1) Geometric Design Criteria

"Road Design Standards" prepared by MOCW (present MOW) in July 1984 was applied for construction and improvment of the Project roads. For design criteria not covered by MOCW's standards, either Japan Road Standards or AASHTO's Design Standards was adopted for the Basic Design.

The proposed Morogoro, Upanga and New Bagamoyo Roads are expected to be functioned as an arterial and major radial roads which focus on the Central Area of the City. The design criteria to be applied for these project roads, therefore, shall be a high standard to meet the requirement of function as shown in Table 5.1.

No major change in alignment and width of the existing area road has been considered in principle, since the main objective of rural road is to improve the pavement condition with minor drainage improvement.

Table 5.1 Design Criteria for Widening Sections

Design	Morogoro Road	Upanga Road	New Bagamoyo Road
Design Speed	80 km/hr	60 km/hr	80 km/hr
Minimum Radius	300 m	150 m	300 m
Maximum Gradient	5 %	6 %	5 %
Pavement Width	4 lanes (2x2x3.75m)	4 lanes (2x2x3.50m)	4 lanes (2x2x3.75m)
Shoulder	1.50-2.50m	0.50 m	1.50-2.50m
Median Strip	7.50 m	0.50 m	7.50-10.0m
Sidewalk	2x3.50 m	2x3.00 m	2x3.50 m
Minimum Sight Distance	115 m	75 m	115 m

(2) Pavement Design

The design method adoped for the pavement design was the pavement component analysis developed by the Asphalt Institue in 1987 taking into consideration the characteristics of the Project, viz overlay and reconstruction of the existing pavement.

5.3 Basic Design

5.3.1 Identification of Necessary Improvement Measures

(1) Subject Roads

The project roads by improvement measures were reviewed on the basis of the assessment of the Request made in paragraph 4.3.2 of this Report.

The location and length of project roads by improvement were was presented in Table 5.2 and Fig. 5.1 respectively.

(2) Morogoro, Upanga and New Bagamoyo Roads

The alignments of these existing roads is generally good and

Table 5.2 Summary of Project Length by Improvement Measures

Name of Roads	Total Length (km)	Maintenance (km)	Overlay (km)	Reconstruction (km)	Widening (km)
1) New Bagamoyo road	9.79	2.45	0.90	2.58	3.86
Upanga road	1.86	-	0.30	0.23	1.33
New Bagamoyo road	7.93	2.45	0.60	2.35	2.53
- Up to Morocco J.	3.53	1.00	-	-	2.53
- Beyond Morocco J.	4.40	1.45	0.60	2.35	-
2) Morogoro road	5.72	-	-	-	5.72
- Up to Morocco J.	5.72	-	-	-	5.72
3) Chango'mbe Area Group	19.20	5.38	4.78	9.04	-
Chango'mbe Area roads	14.60	2.55	3.01	9.04	-
Chango'mbe road	4.60	2.83	1.77	-	-
4) Kariakoo Area Group	21.49	2.49	3.70	15.30	-
Kariakoo Area roads	19.81	2.49	2.02	15.30	-
Msimbazi road	1.68	-	1.68	-	-
5) Central Area Group	20.98	0.20	17.08	3.70	-
Central Area roads	9.80	-	6.10	3.70	-
Bandari road	2.20	0.20	2.00	-	-
Nkrumah road	0.36	-	0.36	-	-
Sokoine road	0.82	-	0.82	-	-
Gerezani road	1.39	-	1.39	-	-
Kivukoni road	1.22	-	1.22	-	-
Makutaba road	0.93	-	0.93	-	-
Ohio road	0.96	-	0.96	-	-
Ocean road	3.30	-	3.30	-	-
6) Mwinjuma Area Group	6.43	0.35	3.53	2.55	-
Morocco road	3.58	-	2.78	0.80	-
Kinondoni road	0.70	0.35	-	0.35	-
Mwinjuma area road	2.15	-	0.75	1.40	-
Total	83.61	10.87	29.99	33.17	9.58

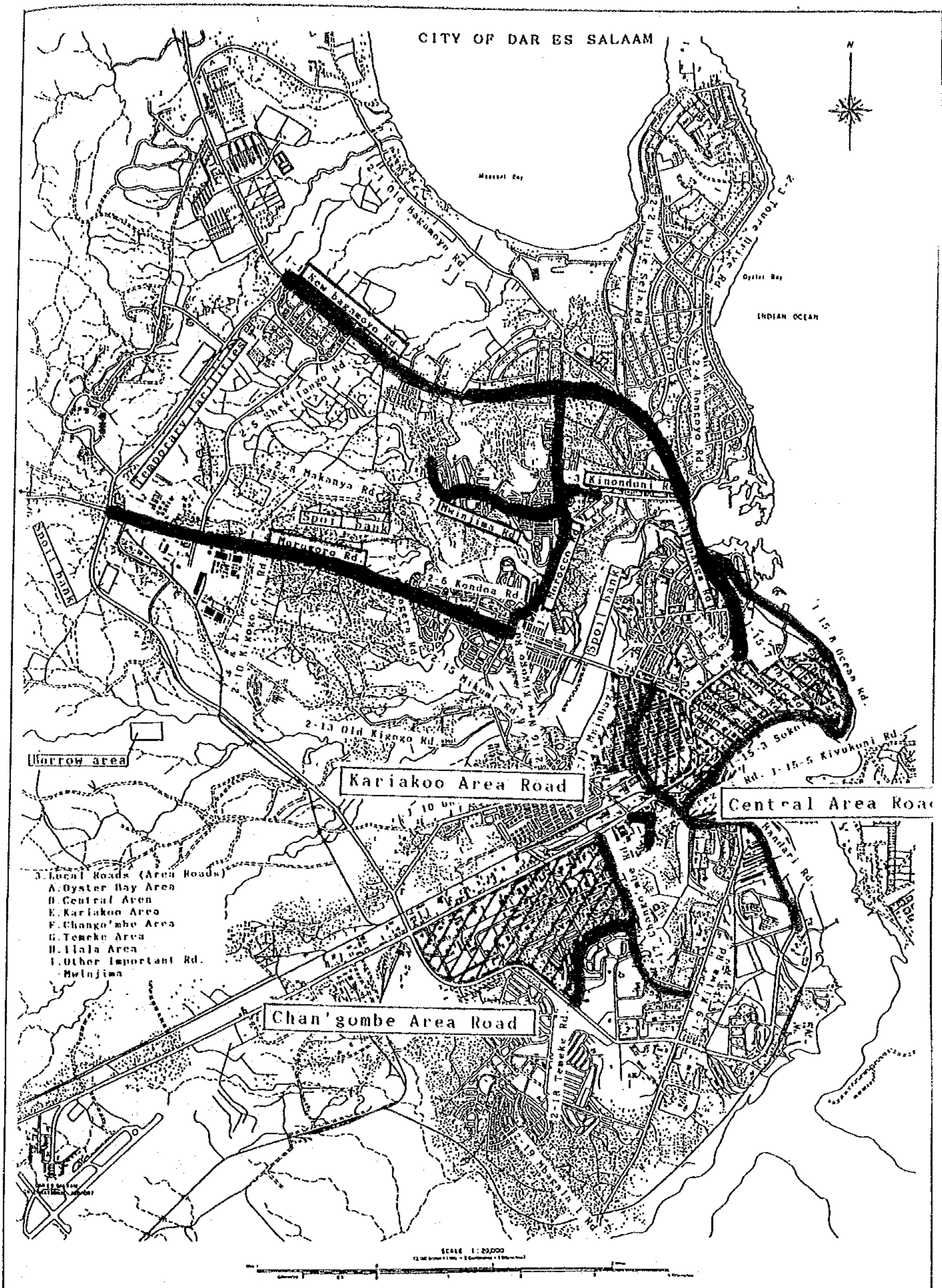


Fig. 5.1 Project Roads by Improvement Measures

adopted to the Road Design Standards, so that no major improvment on alignment was considered. The existing pavement will be totally reconstructed by construction of widening.

(3) Area Road including Chan'gombe, Kariakoo and Central Area

Pavement condition of area roads was evaluated by means of the Present Serviceability Index (PSI) method using visual assessment which was developed in accordance with the Manual Srevices No.17, "Asphalt Overlay and Pavement Rehabilitation", published by the Asphalt Insitutue, U.S.A.

The existing condition of pavement in each section of road was evaluated and identified in accordance with the criteria as shown below:

Criteria on Evaluation of Pavement Deterioration

PSI Value	Evaluation of Pavement Condition	Improvement Measures to be taken
$0.0 < PSI \leq 1.5$	Very Bad	Reconstruction
$1.5 < PSI \leq 2.5$	Bad	Overlay
$2.5 < PSI < 5.0$	Poor/Fair	Maintenance

The result of PSI survey and analysis were presented in detail in Appendix of Feasibility Study Report made by JICA Study Team in July, 1990 and summarized in Appendix 5.1 of this report.

5.3.2 Geometric Design

Since the Project aimes at improvement of the existing roads with overalay, reconstruction and widening, no major change of alignments were proposed in the Project. However, a portion of New Bagamoyo and Morogogo Roads shall be improved with minor change in alignments to obtain proper sight and stopping distances.

The median strips with a sufficinet width (7.5m to 10m) were provided for Morogoro and New Bagamoyo Roads to separate the oppositing traffic stream taking into account the high design speed of 80 km/hr. No land aquisition will be required additionally because there is a road reserve sufficient enough to provide for median strips.

Typical cross sections to be applied for the project were presented in Fig. 5.2.

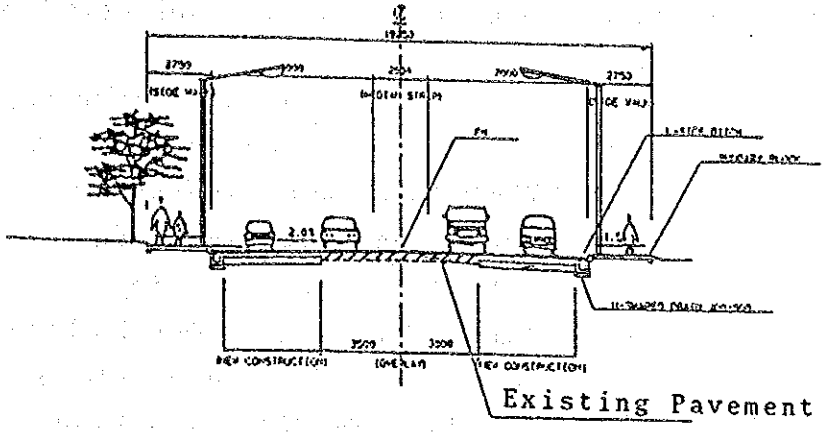
5.3.3 Intersection Design

Intersections were designed on the baisis of the future traffic volume paying attention to the right-turnning traffic.

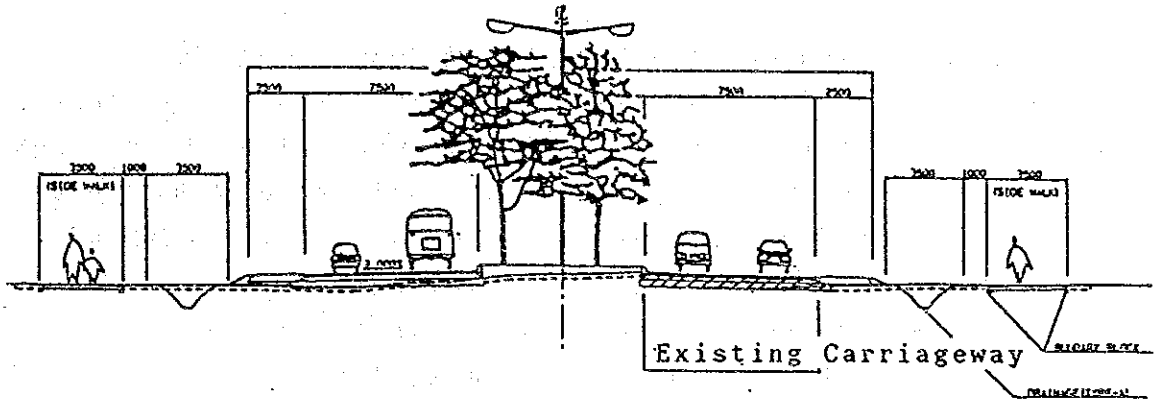
Priority intersections controlled with a traffic signpost or road marking were provided where the project roads cross the minor roads.

The storage lanes for right-turning traffic were provided within the width of the median strip proposed on Morogoro and New Bagamoyo Roads for safety of the vehicles for right-turning.

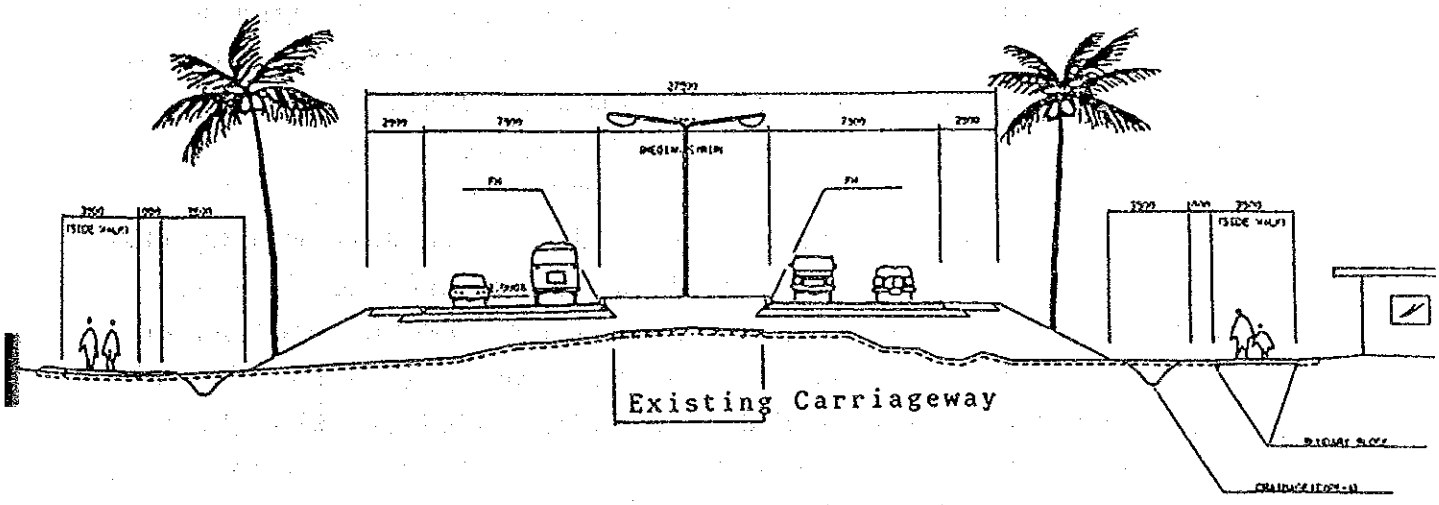
Where the project roads cross over the major roads (collector roads) or the heavily trafficked roads, intersections were designed with the facilities of traffic signals. Junction at Tanganika Motor on Upanga Road controlled by roundabout shall be improved to the signal contolled intersection.



Upanga Road



New Bagamoyo Road



Morogoro Road

Fig. 5.2 Typical Cross Sections of Proposed Roads

The signal controlled intersections shall be provided at the following ten (10) junctions:

Morogoro Road	; 1.	Port Access Junction
	2.	Shekilango Road Junction
	3.	New Kigogo Road Junction
Upanga Road	; 4.	Maktaba Street Junction
	5.	Tanganika Motor Junction
New Bagamoyo Road	; 6.	Haile Selasie Road Junction
	7.	Old Bagamoyo Road Junction
	8.	Morocco Road Junction
	9.	Shekilamgo Road Junction
	10.	Mpakani Road Junction

Improvement of Tanganika Motors Roundabout

Improvement plan for Tanganika Motors Junction was presented in the Feasibility Report. The improvement plan allows right-turning traffic from UWT street into Ohio street and left-turning traffic from Ohio Street into UWT stret. Instead, the entrance of Upanga Road at Tanganika Motors roundabout will be closed so as to obtain smooth traffic flow in the new intersection controlled by traffic signals.

5.3.4 Bus Bay and On/Off Loading Bay for Goods at Manzese

Bus service is one of the most important public transportation services in Dar es Salaam, so that location and space of bus bays and on/off loading bay should be design carefully in the design of widening of the project roads.

Bus bays were located where they might not interfere with the flow of traffic or restrict visibility on bends or at junctions. As for Morogoro Road, special type of bus bay and on/off loading bay was considered at Manzese area to cope with large number of passengers and goods and products brought into the nearby market.

5.3.5 Pavement Design

The pavement design made in the Feasibility Study was reviewed. The result of basic design was almost same as the one prepared in the Feasibility Study.

Type of pavement structure was determined taking into account the availability of suitable aggregate for pavement in terms of production, quality and prices. The following are the materials to be used for the pavement structures:

- Surface course ; Pre-mixes Asphalt Concrete, t=5.0cm)
- Base course ; Mechanically Stabilized Gravel, 2 in. - dust, CBR value more than 80%
- Sub-base course; Crusher run, 3 in. - dust, CBR value more than 30 %

Required thickness of pavement overlay was calcultated in accordance with the pavement component analysis developed by the Asphalt Institute in U.S.A. in 1977. The result of calculation was given in Appendix 5.2.

Following is the calculation method employed for pavement design made on New Bagamoyo Road for reference:

(1) Overlay Design

<u>New Bagamoyo Road</u>

1. Initial Daily Traffic (IDT) in 1994 = 1,429 vehicle/day
   (Numbers of Heavey/Medium/Bus Traffic)
2. Estimated average gross mass of heavey trucks = 18,000 kg
3. Single-axle load limit = 8,165 kg
4. Initial Traffic Number (ITN) = 481
5. Design Period = 10 years
6. Traffic growth rate Heavey/Medium = 2.0 %
   Bus = 5.0 %
7. Initial Traffic Number adjustment factor
   Heavey/Medium = 0.55
   Bus = 0.80
8. Design Traffic Number (DTN) = 413 x 0.55 + 68 x 0.80 = 284

9. Design Subgrade Strength Value = CBR 8
10. Full-depth Asphalt Pavement Thickness, Ta = 200 mm
11. Effective Thickness, Te = 100 mm
12. Overlay Thickness, To=Ta - Te = 100 mm

(2) Reconstruction/Widening Design

Same calculation method of overlay was applied for the design of reconstruction and widening of pavements as follow:

New Bagamoyo Road

1. Initial Daily Traffic (IDT) in 1994 = 1,429 vehicle/day
   (Numbers of Heavey/Medium/Bus Traffic)
2. Estimated average gross mass of heavey trucks = 18,000 kg
3. Single-axle load limit = 8,165 kg
4. Initial Traffic Number (ITN) = 481
5. Design Period = 20 years
6. Traffic growth rate Heavey/Medium = 2.0 %
   Bus = 5.0 %
7. Initial Traffic Number adjustment factor
   Heavey/Medium = 1.21
   Bus = 2.86
8. DTN = 413 x 1.21 + 68 x 2.86 = 696
9. Design Subgrade Strength Value = CBR 8
10. Full-depth Asphalt Pavement Thickness, Ta = 245 mm
11. Coefficients of Each Structural Component
    Surface course e1 = 1.0
    Base course e2 = 0.35
    Sub-base course e3 = 0.25
12. Thickness of Each Strctutal Components
    Surface course Te1= 10 cm
    Base course Te2= 20 cm
    Sub-base course Te3= 30 cm

Calculation of pavement thickness on each project roads are summarized in Appendix 5.3.

5.3.6 Drainage Design

Drainage structures are one of the most important factors to keep the road in safe condition for traffic and to extend the life of road structures, especially pavement.

Superelevation (or crossfalls) of carriageways, footways, etc. should be sufficient to ensure the rapid drainage of surface water without causing any discomfort and danger of road users. Minimum superelevation of carriageway applied for the project is 2.0 %. Surface water will be collected by means of side-ditch and discharged through a piped drainage to the existing storm drainage system.

Since most of the exsiting area roads are served by lined channel and underground piped systems, these existing drainage systems should be used as they are as much as possible without no major improvement.

Drainage design was conducted employing the following criteria:

(1) Culvert Design
- Minimum dimension of pipe culvert shall be 600 mm for ease of maintenance.
- Pipe culvert shall be designed using concrete headwalls, wing walls, protective aprons and toes.

(2) Ditches
- Roadside ditch should be covered with grouted riprap to prevent erosion of road structures and cut slope.
- Minimum dimention of roadside ditch should be 40cm x 50cm (Width x Height)

5.3.7 Utilities Relocationa and Protection

The existing utility which may be affected by construction of the Project should be relocated or protected properly. These utilities should be designed taking into account the

operations and maintenance for the services after open to traffic so that it may not hinder traffic and accelerate the deterioration of the road structures.

Water Mains

Water mains laid along the proposed widening sections of Upanga, New Bagamoyo and Morogoro roads are mostly laid beneath the existing footways at 2 meters in depth approxi., so that the construction of widening may not interfere with these water mains.

Some of the hydrants located along roadside with protection of concrete walls may be affected by the road construction so that they must be relocated by the agency concerned to the suitable place outside of proposed carriageway before commencing the widening works.

Telephone Cables

The existing underground telephone cables laid along Upanga and New Bagamoyo Roads will be affected by the construction of widening, however, these old cables are being replaced by new telephone cable with a financial asistance of Japanese Government and instalation of new cable will be completed in sometime end of this year 1990.

The Team confirmed that new cables are laid neaby the road boundary so as not to disturbe the construction of widening work.

Electric Wires and Poles

There are plenty electric wires and poles located along roadside and cross the existing roads where widening works are proposed. The following numbers of poles should be relocated to outside the carriageway:

Approx. Numbers of Electric Wire/Poles to be Relocated

- Morogoro Road 70 nos.
- Upanga Road 25 nos.
- New Bagamoyo Road 40 nos.

5.3.8 Road Lighting and Other Facilities

Road Lighting Columns

Since the function of proposed roads are classified into arterial road with a high design standards, lighting will be required to facilitate the safe of traffic movements including pedestrians. It will be efficient by night and should look well by day.

Lighting columns should be installed within the median strips or footways of Upanga, New Bagamoyo and Morogoro Roads. The columns should be sited to minimize the obstruction of footway and ensure the necessary clearances.

Lighting columns should be installed with a interval ranging from 40 m to 60 m depending on road side conditions.

Traffic Signs

On heavily trafficked urban roads like Upanga, New Bagamoyo and Morogoro roads, traffic signs are essential to prevent congestion and danger. Warning, restriction and information signs should be installed at proper location so as to allow ample time for any necessary actions.

Type and dimention of signs should conform to the statutory instruments and regulations of authority concerned.

Carriageway Marking

Carriageway marking will be used not only to define traffic lanes but also to guide vehicles at junction and indicate the position of stop and waiting lanes.

To maintain the smooth and safe flows in the city roads, Carriageway marking should be provided.

Trees

There are grown-up trees planted on both side along Upanga and New Bagamoyo Roads. They should be retained as they are as much as possible so as to keep better environment along the project roads.

5.3.9 Pedestrian Bridge

The pedestorian bridge, the first pedestrian bridge in Dar es Salaam, will be constructed across Morogor Road at Manzese market area. Since the bridge is located where many people and drivers are focusing to the market everyday, it will be the object of public attention.

Therefore the bridge should be designed taking into consideration not only the economic and structural aspects but also aethethic point of view.

Feature of the proposed bridge are as shown below:

- Location : Proposed Bus Terminal at Manzese
- Purpose : Pedestrian bridge
- Type of Bridge : Prestressed Hollow Slab Concrete (PC)
- Bridge Length : 48 m
- Span Arrangement: 10.1 x 2@12.25 x 10.1
- Bridge Width : 5 m
- Step Width : 3 m

Bridge design was conducted in accordance with Road Bridge Design Mannual published by Japan Road Association with design conditions as shown below:

- Live load (Pedestrian load): 350 kg/sq.m
- Earthquake load : Not applicable

Vertical clearance applied for the bridge was 5.0m in minimum, taking into account the large country buses carrying goods and products on their top.

The following alternative bridges were considered:

Alternative 1 : Prestresses Concrete Hollow Slab Bridge
Alternative 2 : Metal Plate Floor Bridge

The result of comparative study was presented in Appendix 5.4.

5.3.10 Traffic Signal Design

Signal installations should be designed to meet peak conditions with appropriate reserve capacity taking into account the trafffic volume, turning movements for each peak priod and estimated rate of growth.

The signal controled intersections should be provided at two (2) places on Upanga, five (5) on New Bagamoyo and three (3) on Morogoro Roads. Since these roads are heavily conjested with an ADT of more than 15,000 vehicles, the linking signal system should be introducted to minimize the intereference to the through traffic stream. This sytem is quite effective when intersections are very close to each other.

5.3.11 Buildings/Houses to be Removed

The buildings and houses irregularly occupied within the road reserve are not so many with the exception of Morogoro Road.

The government should compensate and demolish the following numberes of buildings and houses before commencing the pro jects:

<u>Morogoro Road</u>

Private houses

Type A: House built of concrete (Large)	5 Nos.
Type B: House built of bricks (Small)	13 Nos.