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ANALYTICAL METHODS FOR THE STUDY
OF
CARBON NANOTUBE GROWTH AND EXPANSION
IN
THE PRESENCE OF A POLYMER MATRIX

BY
[Name]

1998

RESEARCH REPORT
[Title]

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JAPAN INTERNATIONAL COOPERATION AGENCY
THE UNITED REPUBLIC OF TANZANIA
TANZANIA ELECTRIC SUPPLY CO.,LTD.

**MASTER PLAN STUDY AND PRE-FEASIBILITY STUDY
ON
DAR ES SALAAM POWER SUPPLY SYSTEM EXPANSION
IN
THE UNITED REPUBLIC OF TANZANIA**

FINAL REPORT

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VOLUME III

(APPENDIX)

MARCH, 1994

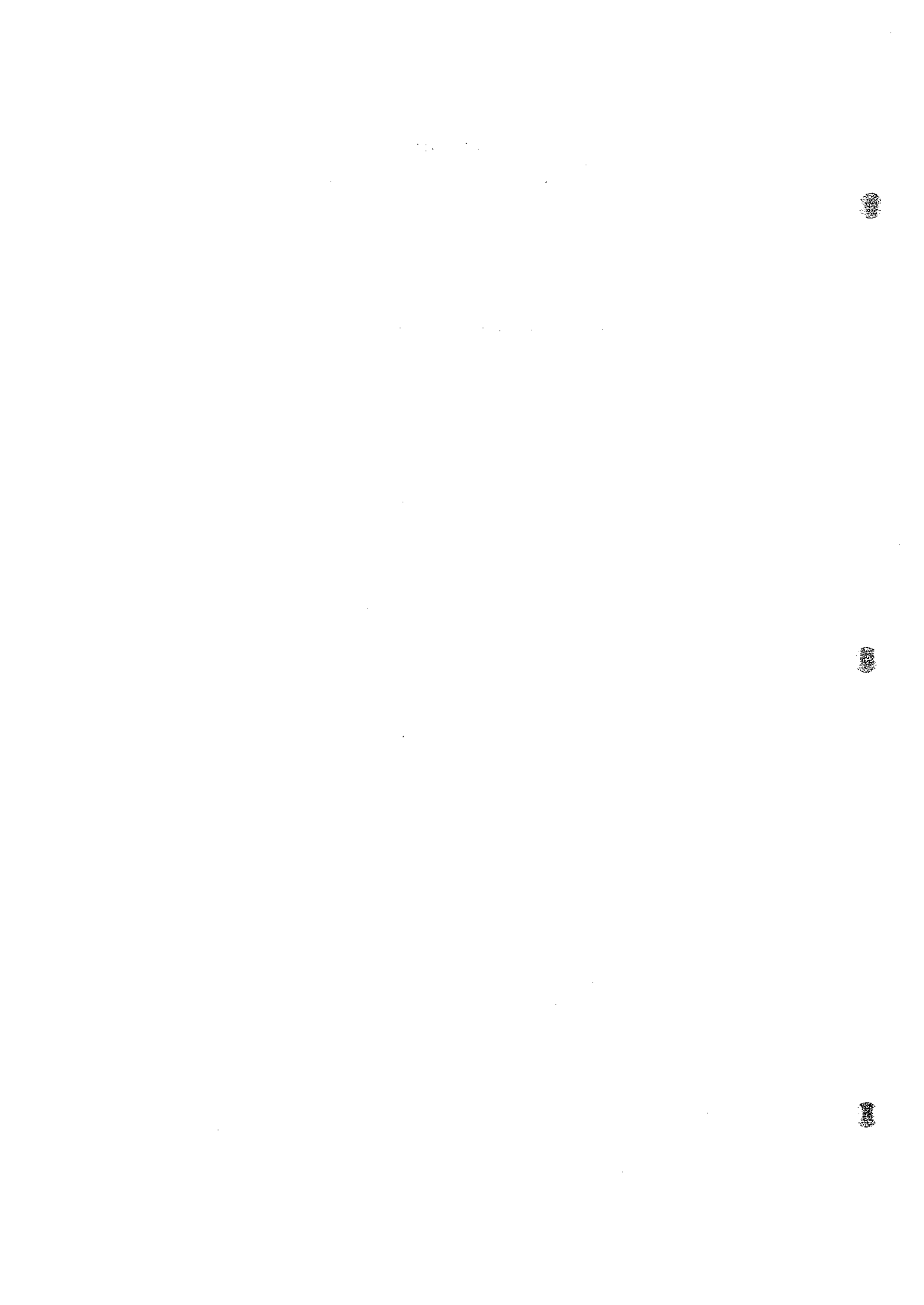
**ELECTRIC POWER DEVELOPMENT CO.,LTD.
TOKYO, JAPAN**



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A. MINUTES OF MEETING

A. Minutes of Meeting

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August 10, 1993 A-1

2. Minutes of Meeting for Master Plan Study on Dar Es Salaam Power Supply Expansion in the United Republic of Tanzania

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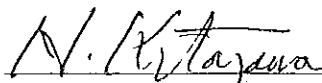
MINUTES OF MEETING
FOR
MASTER PLAN STUDY
ON
DAR ES SALAAM POWER SUPPLY EXPANSION
IN
THE UNITED REPUBLIC OF TANZANIA

DAR ES SALAAM, SEPTEMBER 10, 1993



MR. S. L. MHAVILLE

MANAGING DIRECTOR
TANZANIA ELECTRIC SUPPLY
COMPANY LIMITED



MR. HITOSHI KITAZAWA

LEADER OF STUDY TEAM
JAPAN INTERNATIONAL
COOPERATION AGENCY

The Master Plan Study Team (the TEAM) despatched by the Japan International Cooperation Agency (JICA), headed by Mr. Hitoshi Kitazawa visited the United Republic of Tanzania on August 3, 1993 for the purpose of explanation and discussion on the Interim Report and conducting the Pre-Feasibility Study on the Short-term Master Plan of the Dar es Salaam Power Supply System Expansion.

The Interim Report prepared by the TEAM was explained to TANESCO and both parties agreed to the plan as shown in the Minutes of Meeting No.1 signed on August 10, 1993.

Depending on the agreed Short-term Master Plan covering for five (5) years, the TEAM held a series of meeting with TANESCO people concerned and conducted field surveys on the planned sites for the Pre-Feasibility Study from August 18 to September 12, 1993 together with additional members arrived at Dar es Salaam on August 18 and September 2, 1993.

The TEAM will complete the Pre-Feasibility Study in Japan and prepare the Draft Final Report by the end of January 1994. After approval by JICA, the TEAM will visit Tanzania and explain the Report to TANESCO in February 1994.

Followings are the main items of discussion and field survey confirmed by both parties for the Pre-Feasibility Study:

1. 11 kV Feeder Arrangement

New 11 kV feeders from new substations and expanded existing substations are shown in Appendix-1. New 33 kV transmission line to the new substations are also included.

2. 132 kV Transmission Line

132 kV Transmission line route of UBUNGO-ILALA and UBUNGO-F.Z.-3 was surveyed. Line route drawings will be sent to the TEAM after completion in TANESCO.

3. 33 kV Transmission Line

33 kV transmission line route to the New Substations was surveyed and line route maps of the line will be sent to the TEAM after finalization.

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in TANESCO. Some comments on the route are shown in Appendix-2.

4. Required Area for New Substations

Required area for the new substations was surveyed and summarized in Appendix-3. Finalization and acquisition of the area will be done by TANESCO.

5. Designing of Substation

Designing of the new substations will follow the design criteria for MUSASANI and SOKOINE fundamentally and grounding system of the new station will be designed according to the measured specific resistivity summarized in Appendix-4 which shows no problem for actual application. Expansion designing for existing stations will be improved one as much as possible considering good conformity with existings.

6. Telecommunication

For designing of the radio link, the TEAM measured field intensity of the signal for ILALA. Designing of telecommunication radio link for the new substations can be done based on the data shown in Appendix-5 which shows no remarkable problem except KUNDUCHI.

7. Civil

The result of bearing test in the proposed site is summarized in Appendix-6. In the case of 132 kV transmission line, there are some problem and special consideration should be given to designing of the tower foundation but no problem for substation.

8. Environmental Survey

Environmental survey report will be completed by TANESCO and will be sent to the TEAM as soon as possible.

9. Economic Analysis

The TEAM collected data related to the economic analysis and further data, if required, will be sent to the TEAM by TANESCO.

10. TANESCO's Scope

At the actual construction of the power system expansion, followings are considered to belong to TANESCO's scope.

- (1) Acquisition of area for substations and transmission lines
- (2) Construction of civil works including foundation of equipment, cable duct, etc.
- (3) Replacement of pole transformers from 33/0.4 kV to 11/0.4 kV
- (4) Installation of new feeders from TEGETA 132/33 kV substation except for KUNDUCHI new substation
- (5) Construction of transmission lines with supervisors from consultants or contractors

11. Voltage Recording

Voltage Recording in the following 11 kV feeders were planned but not finished. After completion of record, data will be sent to the TEAM. Kunduchi feeder (MBEZI), Industrial feeder (KURASINI), 0-2 and 0-4 feeders (OYSTER-BAY), MK-2 feeder (MIKOCHEMI)

12. Fault Record of 132 kV T/L

Fault record of 132 kV transmission lines will be sent to the TEAM after checking the records in the computer.

13. Cost Estimation of 132 kV T/L

Construction cost estimation of the following 132 kV transmission lines in the local currency will be informed to the TEAM.

UBUNGO - ILALA (7.5 km, 25 towers)

UBUNGO - F.Z.3 (8.5 km, 30 towers)

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14. List of Appendix

- (1) Appendix-1: 11 kV Feeder Arrangement
- (2) Appendix-2: 33 kV Transmission Lines
- (3) Appendix-3: Required Area for New Substations
- (4) Appendix-4: Soil Resistivity Measurement
- (5) Appendix-5: Result of the telecommunication site survey
- (6) Appendix-6: Result of Bearing Capacity Test

11 KV FEEDER ARRANGEMENT

(Sept. 5, 1993)

ILALA S.S.	Underground Cable (km)	Overhead Line (km)	Load Interrupter (Pcs)
11 kV D 4	0.2 (0.1)	—	2
D 8	0.2 (0.1)	1.0	2
D 10 (Existing)	—	0.6	2
33 kV	—	—	—

TANDALE S.S.	Underground Cable (km)	Overhead Line (km)	Load Interrupter (Pcs)
11 kV TA 1	— (0.1)	1.3	1
TA 2	— (0.1)	3.3	3
TA 3	— (0.1)	0.4	1
TA 4	— (0.1)	—	—
33 kV	—	3.3 + 1.2 Con- ductor Upgrade	1

CHANG'OMBE S/S	Underground Cable (km)	Overhead Line (km)	Load Interrupter (Pcs)
11 kV CH 1	— (0.1)	0.3	2
CH 2 (K100)	0.2 (0.1)	—	—
CH 3	— (0.1)	1.0	1
CH 4	— (0.1)	1.0	1
33 kV		1.1 + 0.9 = 2	3 (including KURASINI ACB)

MBEZI S.S.	Underground Cable (km)	Overhead Line (km)	Load Interrupter (Pcs)
11 kV			
33 kV			

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KUNDUCHI S.S.	Underground Cable (km)	Overhead Line (km)	Load Interrupter (Pcs)
11 kV KU 1	— (0.1)	1.0	1
KU 2	— (0.1)	1.0	1
KU 3	— (0.1)	1.3	1
KU 4	— (0.1)	1.3	1
33 kV		2.8	(Total 6)

KARIAKOO S.S.	Underground Cable (km)	Overhead Line (km)	Load Interrupter (Pcs)
11 kV KA 1	— (0.1)	0.9	1
KA 2	— (0.1)	1.1	1
KA 3	— (0.1)	0.3	1
KA 4	— (0.1)	0.4	1
33 kV	0.5	1.6	1

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MBAGALA S.S.	Underground Cable (km)	Overhead Line (km)	Load Interrupter (Pcs)
11 kV MB 1	— (0.1)	1.4	2
MB 2	— (0.1)	1.4	2
MB 3 (Glass Factory)	0.3 (0.1)	—	1
MB 4	— (0.1)	0.5	1
33 kV	—	8.5	(Total 8)

TABATA S.S.	Underground Cable (km)	Overhead Line (km)	Load Interrupter (Pcs)
11 kV TB 1	0.1 (0.1)	—	2
TB 2	0.1	—	2
			(Total 5)
33 kV TB 33-1	—	0.1	
TB 33-2	—	0.1	

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33KV.SAM

Appendix-2 : 33kV Transmission Lines

The following items will be confirmed/collected for the design of 33kV transmission lines.

1. Tandale Line

- a. This line will be branched from the pole located near tower No. 21 of existing 132kV transmission line.
- b. Line length : overhead 3.3km
- c. Number of circuit : 1 cct.
- d. Line length of existing 33kV line of which conductor is to be replaced : 1.2km
- e. Present condition of existing 33kV line from which new line will be branched.
 - support : wooden pole
 - conductor : ACSR 50sqmm
 - number of circuit : 2cct
- f. Clarification for the scope of this line
 - How many circuits are to be replaced : two circuits
 - Study of strength of wooden pole will be required, data/study sheet of existing line will be provided.
- g. Route map

2. Chang'ombe Line

- a. FZ-1 ~ Chang'ombe ~ Kurasini (π -connection)
- b. Line length : overhead 2.0km (1.1 + 0.9)
- c. Number of circuit : 1 cct.
- d. Present condition of existing 33kV line for which new substation will be connected.
 - support : wooden pole
 - conductor : ACSR 120sqmm
 - number of circuit : 1cct

e. Route map

3. Kunduchi Line

- a. Name of substations
 - 132/33kV S/S : Tegeta S/S
 - 33/11kV S/S : Kunduchi S/S

- b. Location of planned 132/33kV substation : near tower No. 51 of Ubungo-Zanzibar line
- c. New 33kV line will be constructed parallel to 132kV existing line.
- d. Line length : 2.8km (1.5 + 1.3)
300m x 5 span (132kV line) = 1.5km
- e. Number of circuit : 1cct.
- f. Route map

4. Kariakoo Line

- a. This line will connect Ilala S/S and new Kariakoo substation.
- b. Line length : overhead 1.6km. cable 0.5km
- c. Number of circuit : 1 cct.
- d. Route map

5. Mbagala Line


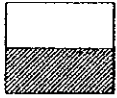




- a. This line will connect Kurasini S/S and new Mbagala substation.
- b. Line length : will be informed later.
- c. Number of circuit : 1 cct.
- d. Route map


6. Tabata Line

- a. Ubungo ~ Tabata ~ FZ-3 (π -connection for one circuit)
- b. Line length : π -connection only
- c. Number of circuit : 1cct
- d. Present condition of existing 33kV line for which new substation will be connected.
 - support : wooden pole
 - conductor : ACSR 120sqmm
 - number of circuit : 1cct (double conductor)

REQUIRED AREA FOR NEW SUBSTATIONS (AUG.1993)

After discussion and site survey, following areas are confirmed by TANESCO and Study Team.

NEW SUBSTATION	CAPACITY (No. x MVA)	JICA'S REQUEST (m x m)	TANESCO (m x m)
TANDALE S.S. 	1 x 15 MVA 2 x 15	20m x 20m 24 x 24	<u>30 x 40</u>
CHANG'MBE S.S. 	1 x 15 2 x 15	20 x 20 24 x 24	<u>40 x 30</u>
KUNDUCHI S.S. 	1 x 15 2 x 15	20 x 20 24 x 24	<u>40 x 20</u>
KARIAKOO S.S. 	1 x 15 2 x 15	20 x 20 24 x 24	<u>40 x 50</u>
MBAGALA S.S. 	1 x 15 2 x 15	20 x 20 24 x 24	<u>40 x 80</u>
TABATA S.S. 	1 x 5 2 x 5	15 x 15 18 x 18	<u>35 x 30</u>

Note:  = for future use

SOIL RESISTIVITY MEASUREMENT

Specific resistivity of the soil in proposed new substions was measured for designing of grounding system by the study team and the result are as follows.

Date: Aug. 27, Sep. 2, 1993

Equipment: SPECIFIC RESISTANCE TESTER Type 3244 YEW

Result: Resistance measuring was done normally twice in different directions and higher, lower values are shown bellow.

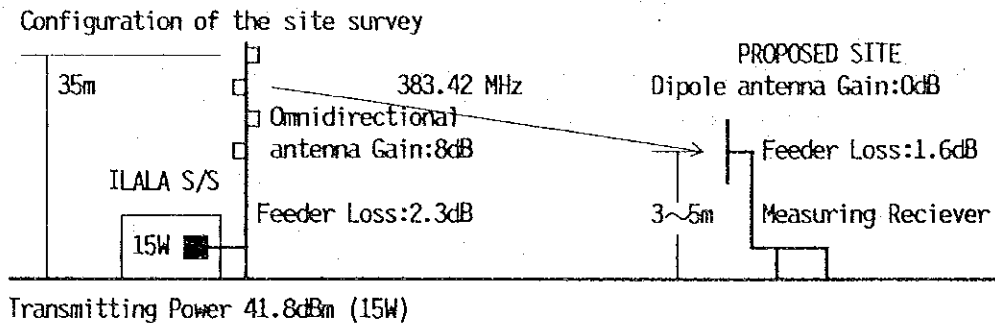
Substation Site	Specific Resistivity (Ohm-m)
TANDALE	15.7 - 25.12
CHANG'OMBE	72.22 - 131.88
KUNDUCHI	4.71 - 5.652
KARIAKOO	53.38 - 60.916
MBAGALA	94.2 - 309.72
TABATA	10.99 - 15.7

Evaluation: Measured data show that normal design of grounding system can be applied without any additional electrode.

Result of the telecommunication site survey

The study team conducted the site survey on KARIAKOO, CHANG'OMBE, TABATA, TANDALE, MBAGALA and KUNDUCHI. While observing the condition of the surroundings, we measured the field intensity which comes from ILALA S/S and also confirmed the possibility of the SCADA System in ILALA S/S regarding the expansion of this project.

The result and our comments are as follows:



KARIAKOO	field intensity: Good condition (measured data av.47dB μ V) site condition : Wide area in the city. High buildings stand next to the proposed site. comment : It considered to be no problem.
CHANG'OMBE	field intensity: Good condition (measured data av.55dB μ V) site condition : It's surrounded by the factories. comment : It considered to be no problem.
TABATA	field intensity: Good condition (measured data av.33dB μ V) site condition : Residential area. TPTC's subscriber is located near the site. comment : It considered to be no problem.
TANDALE	field intensity: Good condition (measured data av.34dB μ V) site condition : Residential area. comment : It considered to be no problem.
MBAGALA	field intensity: Good condition (measured data av.26dB μ V) site condition : It's located next to the factory. comment : It considered to be no problem.
KUNDUCHI	field intensity: Low level (measured data av.13dB μ V) site condition : It's in the farm. There is a gentle hill coming up in front of the proposed site. comment : High outgoing power transmitter such as 10W, 8-element YAGI antenna, over 20m antenna height are suitable. (the existing transmitter for RTU is 6W.)
SCADA System in ILALA S/S	Adopting the existing SCADA System to each proposed substation. Hardware: The system has some space for the expansion. It's possible to add the necessary parts to the equipment. Software: It's possible to allocate the memory capacity for the proposed substation of the above, but version up is needed for the expansion.

Result of Bearing Capacity Test
for proposed site of Substations and Transmission lines

Substations

Depth Site	2.0 m	2.5 m	3.0 m	Remarks
Tandale	18.0 ton/m ² < (1.0 m)	---	---	Good condition
Chang'ombe	12.0 " <	15.0 " <	15.0 " <	Good condition
Kunduchi	15.0 " <	15.0 " <	15.0 " <	G.W.L. 0.75 m Good condition
Kariakoo	15.0 " <	15.0 " <	15.0 " <	Good condition
Mbagala	15.0 " <	15.0 " <	15.0 " <	Good condition
Tabata	15.0 " <	15.0 " <	15.0 " <	G.W.L. 0.90 m Good condition

Transmission Lines

Ubungo-Ilala Tower No. 2	2.5 - 4.0 "	2.5 - 4.0 "	2.5 - 4.0 "	Should be considered special countermeasure for the foundation
Tower No. 7-8	15.0 " <	15.0 " <	15.0 " <	Good condition
Ubungo- FZ III WP 32	15.0 " <	15.0 " <	15.0 " <	G.W.L. 0.70 m Good condition
WP 39 - 40	15.0 " <	15.0 " <	15.0 " <	Good condition

MINUTES OF MEETING NO. 1
FOR
MASTER PLAN STUDY
ON
DAR ES SALAAM POWER SUPPLY SYSTEM EXPANSION
IN
THE UNITED REPUBLIC OF TANZANIA

The Master Plan Study Team (the TEAM) of JICA, headed by Mr. Hitoshi Kitazawa visited the United Republic of Tanzania on August 3, 1993 for the purpose of explanation and discussion on the interim report and conducting the Feasibility Study on the Short-term Master Plan covering five(5) years.

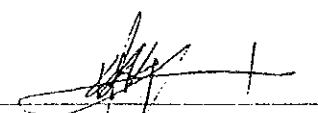
The Interim Report prepared by the TEAM was explained to TANESCO and has been discussed from August 4 to August 9, 1993, and both parties have agreed to the attached "THE MASTER PLAN FOR ELECTRIC POWER SYSTEM EXPANSION IN DAR ES SALAAM" as the final plan.

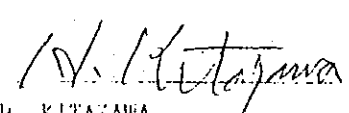
Both parties also agreed to proceed the feasibility Study on the Short-term Master Plan of five(5) years included in the said Long-term Master Plan as soon as arriving of the other members of the TEAM in the middle of August to Dar es Salaam.

This minutes of meeting is prepared to confirm the basis of the study, and shall not be changed until the end of the study without proper notices to each other.

Attachment : *THE MASTER PLAN FOR ELECTRIC POWER SYSTEM EXPANSION
IN DAR ES SALAAM*

AUGUST 10, 1993 DAR ES SALAAM


K. K. IRANGA
DEPUTY MANAGING DIRECTOR (Op.)
TANZANIA ELECTRIC SUPPLY
COMPANY LIMITED (TANESCO)


H. KITAZAWA
LEADER OF STUDY TEAM
JAPAN INTERNATIONAL
COOPERATION AGENCY (JICA)

THE MASTER PLAN
FOR
ELECTRIC POWER SYSTEM EXPANSION IN DAK ES SALAAM

Year	Name of S/S & Line	Transformer Voltage Transmission Line	Status	Trans. Capacity No. of CCT.
1994:	① ILALA S/S	33/11 KV Tr.	Expan.	1 x 15 MVA
		132/33 KV Tr.	Expan.	1 x 45 MVA
	ILALA LINE	UBUNGO-ILALA	New	132 KV x 1cct.
	② TANDALE S/S	33/11 KV Tr.	New	1 x 15 MVA
	TANDALE LINE	Branch from MIKUCHENI - OYSTERBAY Line	New	33 KV x 1cct.
	③ CHANGOMBE S/S	33/11 KV Tr.	New	1 x 15 MVA
	CHANGOMBE LINE	Branch from FZ-1 - KURASINI Line	New	33 KV x 1cct.
	④ MBEZI S/S	33/11 KV Tr.	Expan.	1 x 15 MVA
1996:	⑤ TEGETA S/S	33/11 KV Tr.	New	1 x 15 MVA
	TEGETA LINE	TEGETA-New S/S	New	33 KV x 1cct.
	⑥ FZ-3 S/S	132/33 KV Tr.	Expan.	2 x 45 MVA
	FZ-3 LINE	UBUNGO-FZ-3	New	132 KV x 1cct.
	⑦ KARIAKOO S/S	33/11 KV Tr.	New	1 x 15 MVA
	KARIAKOO LINE	ILALA-KARIAKOO	New	33 KV x 1cct.
	⑧ MBAGALA S/S	33/11 KV Tr.	New	1 x 15 MVA
	MBAGALA LINE	KURASINI-MBAGALA	New	33 KV x 1cct.
	⑨ TABATA S/S	33/11 KV Tr.	New	1 x 5 MVA
	TABATA LINE	Branch from UBUNGO - FZ-3 Line	New	33 KV x 1cct.

Year	Name of S/S & Line	Transformer Voltage Transmission Line	Status	Trans. Capacity No. of UCI.
1998:	MIKOCHENI S/S	33/11 KV Ir.	Expan.	1 x 15 MVA
	KIGANBONI S/S	33/11 KV Ir.	Expan.	1 x 5 MVA
2000:	TEMEKE S/S	33/11 kv Ir.	New	1 x 15 MVA
	TEMEKE LINE	YOMBO-TEMEKE	New	33 KV x lcct.
	MBURAHATI S/S	33/11 KV Ir.	New	1 x 15 MVA
	MBURAHATI LINE	Branch from UBUNGU - ILALA	New	33 KV x lcct.
	KITUNDA S/S	33/11 KV Ir.	New	1 x 5 MVA
	KITUNDA LINE	YOMBO-KITUNDA	New	33 KV x lcct.
	YOMBO S/S	132/33 KV Ir.	New	1 x 45 MVA
	YOMBO LINE	FZ-3-YOMBU	New	132 KV x lcct.
	FZ-2 S/S	33/11 kv Ir.	Expan.	1 x 5 MVA
	OYSTERBAY S/S	132/33 KV Ir.	Expan.	1 x 45 MVA
OYSTERBAY LINE	UBUNGO-OYSTERBAY	New	132 KV x lcct.	
2002:	KARIAKOO S/S	33/11 KV Ir.	Expan.	1 x 15 MVA
	KIGANBONI S/S	33/11 KV Ir.	Expan.	1 x 5 MVA
	KURASINI S/S	132/33 KV Ir.	Expan.	1 x 45 MVA
KURASINI LINE	YOMBO-KURASINI	New	132 KV x lcct.	
2003:	OYSTERBAY S/S	33/11 kv Ir.	Expan.	1 x 15 MVA

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Year	Name of S/S & Line	Transformer Voltage Transmission Line	Status	Trans. Capacity No. of CCL.
2004:	MBEZI S/S	33/11 KV tr.	Expan.	1 x 15 MVA
		132/33 KV tr.	Expan.	1 x 45 MVA
	MBEZI LINE	ZANZIBAR Line-MBEZI	New	132 KV x 1cct.
	MIKOCHENI S/S	33/11 KV tr.	Expan.	1 x 15 MVA
	CITY CENTER S/S	132/33 KV tr.	Expan.	1 x 45 MVA
	CITY CENTER LINE	ILALA-CITY CENTER	New	132 KV x 1cct.
	UPANGA S/S	33/11 KV tr.	New	1 x 15 MVA
	UPANGA LINE	CITY CENTER-UPANGA	New	33 KV x 1cct.

2005: FZ-3 S/S 33/11 KV tr. Expan. 1 x 15 MVA

2006: MSASANI S/S 33/11 KV tr. Expan. 1 x 15 MVA

MBAGALA S/S 132/33 KV tr. Expan. 1 x 45 MVA

MBAGALA LINE YOMBO-MBAGALA New 132 KV x 1cct.

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B. CHAPTER 5 RELATED DRAWING AND DOCUMENTS

B. Chapter 5 Related Drawing and Documents

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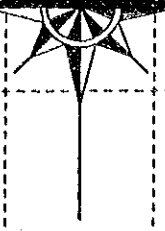








Tegeta



Mbozi

Mikocheni

Msasani

OB

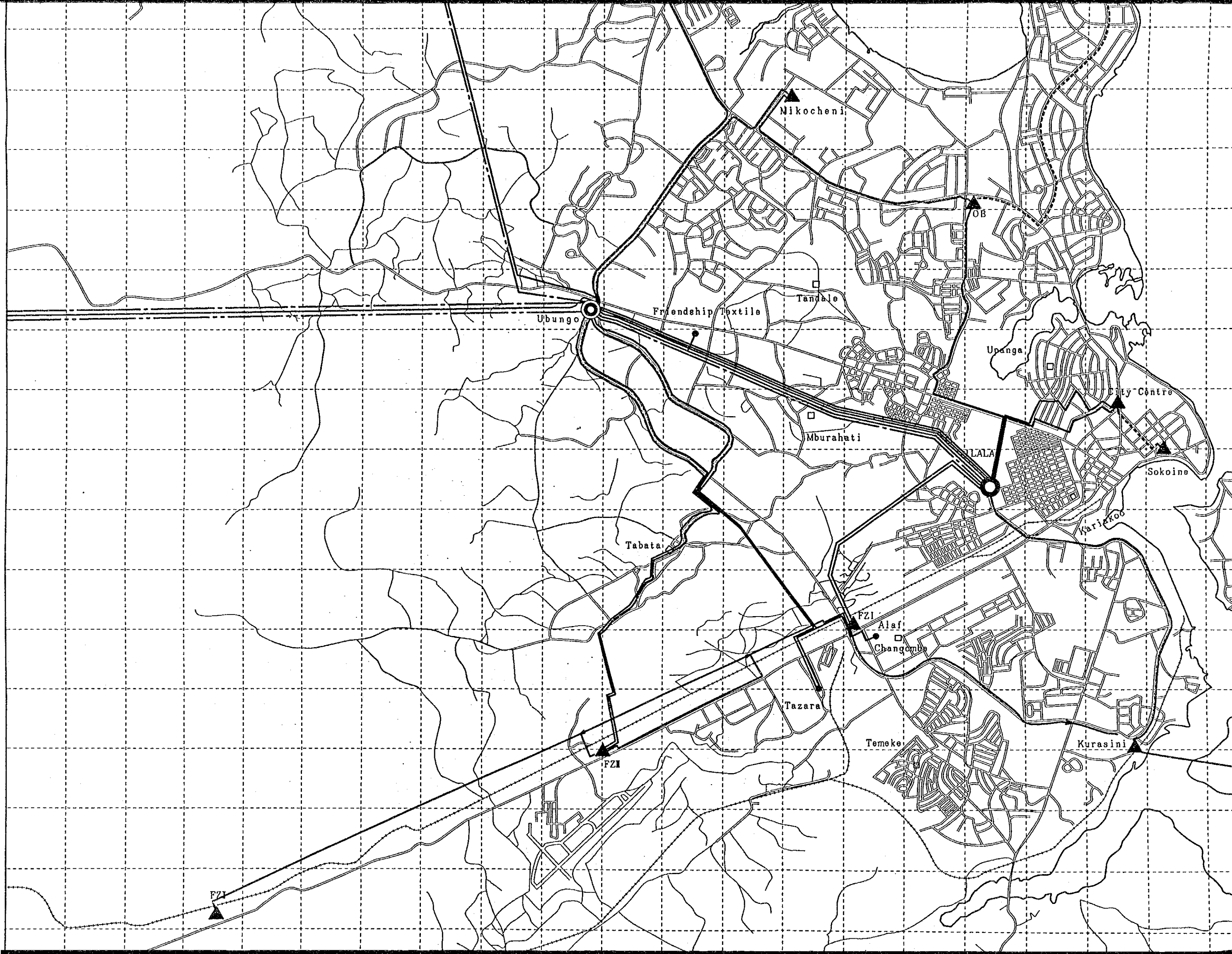
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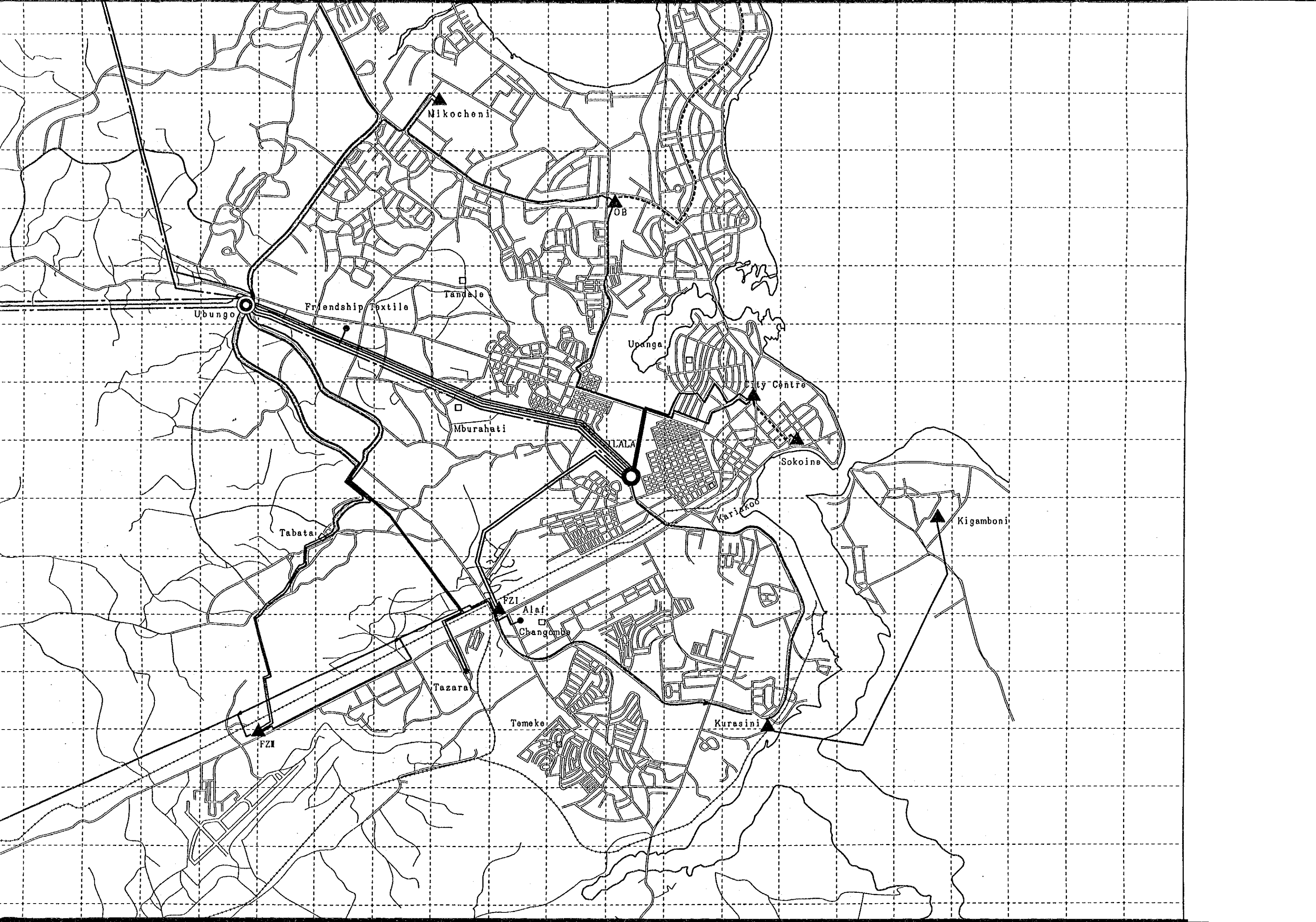
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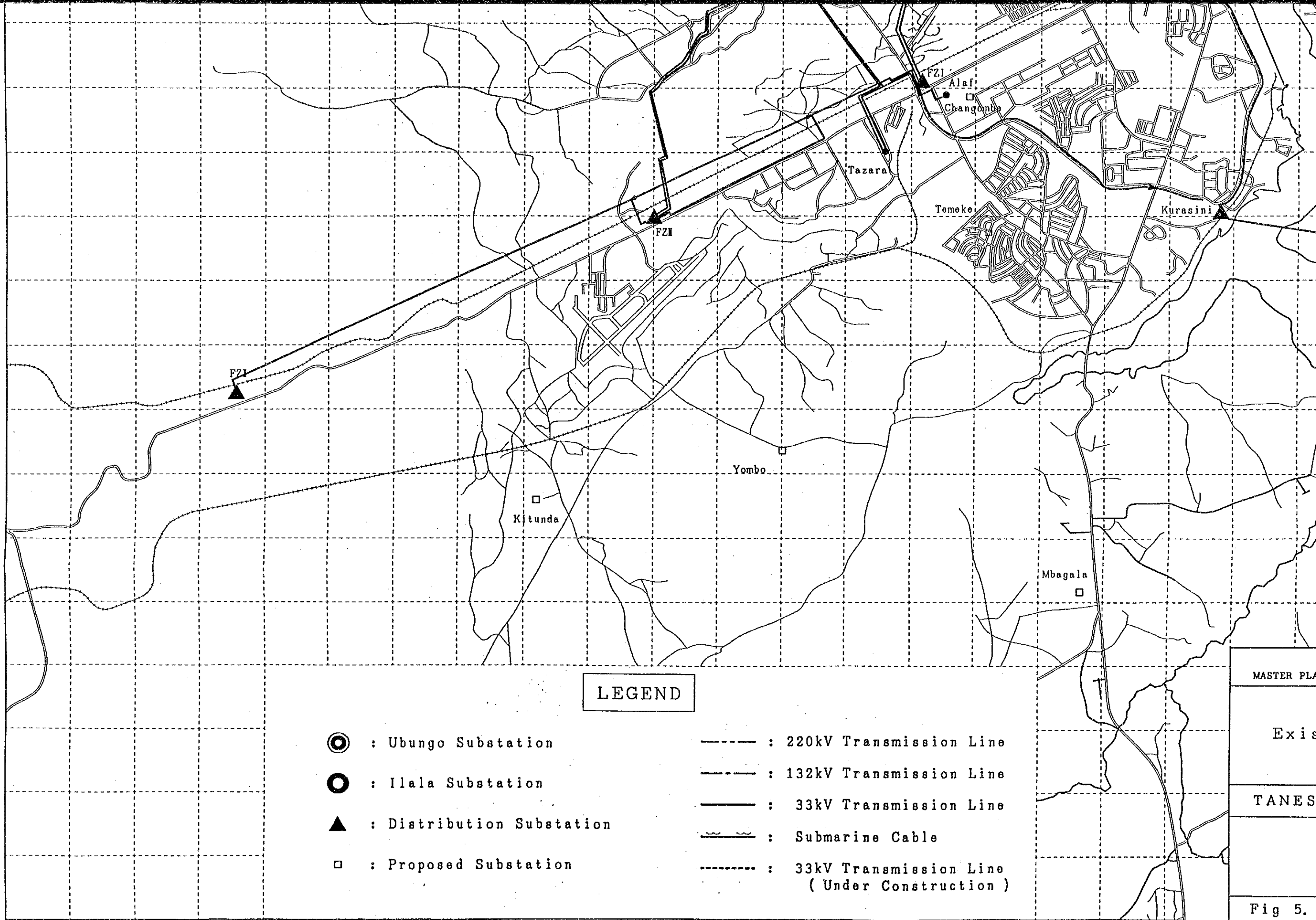
Tandale

Upanga

City Centre







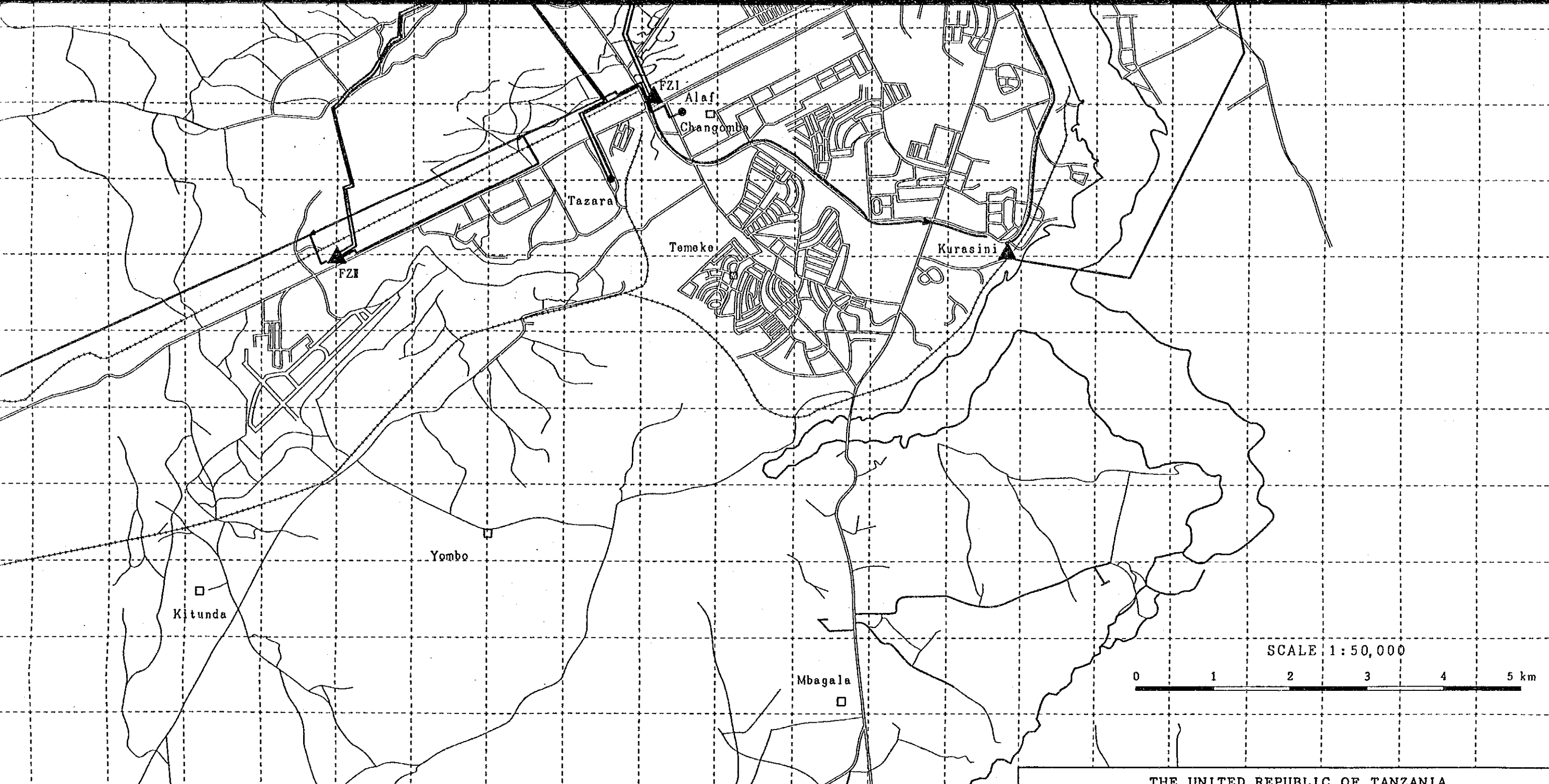
LEGEND

- ⊙ : Ubungo Substation
- : Ilala Substation
- ▲ : Distribution Substation
- : Proposed Substation

- : 220kV Transmission Line
- · — : 132kV Transmission Line
- — — : 33kV Transmission Line
- : Submarine Cable
- · · · · : 33kV Transmission Line (Under Construction)

MASTER PLAN
 Existing
 TANES

Fig 5.



LEGEND

- : Ubungo Substation
- : Ilala Substation
- : Distribution Substation
- : Proposed Substation
- : 220kV Transmission Line
- : 132kV Transmission Line
- : 33kV Transmission Line
- ~~~~~ : Submarine Cable
- : 33kV Transmission Line (Under Construction)

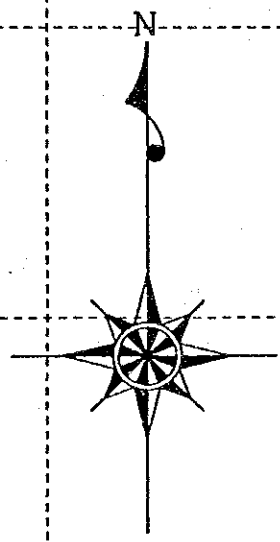
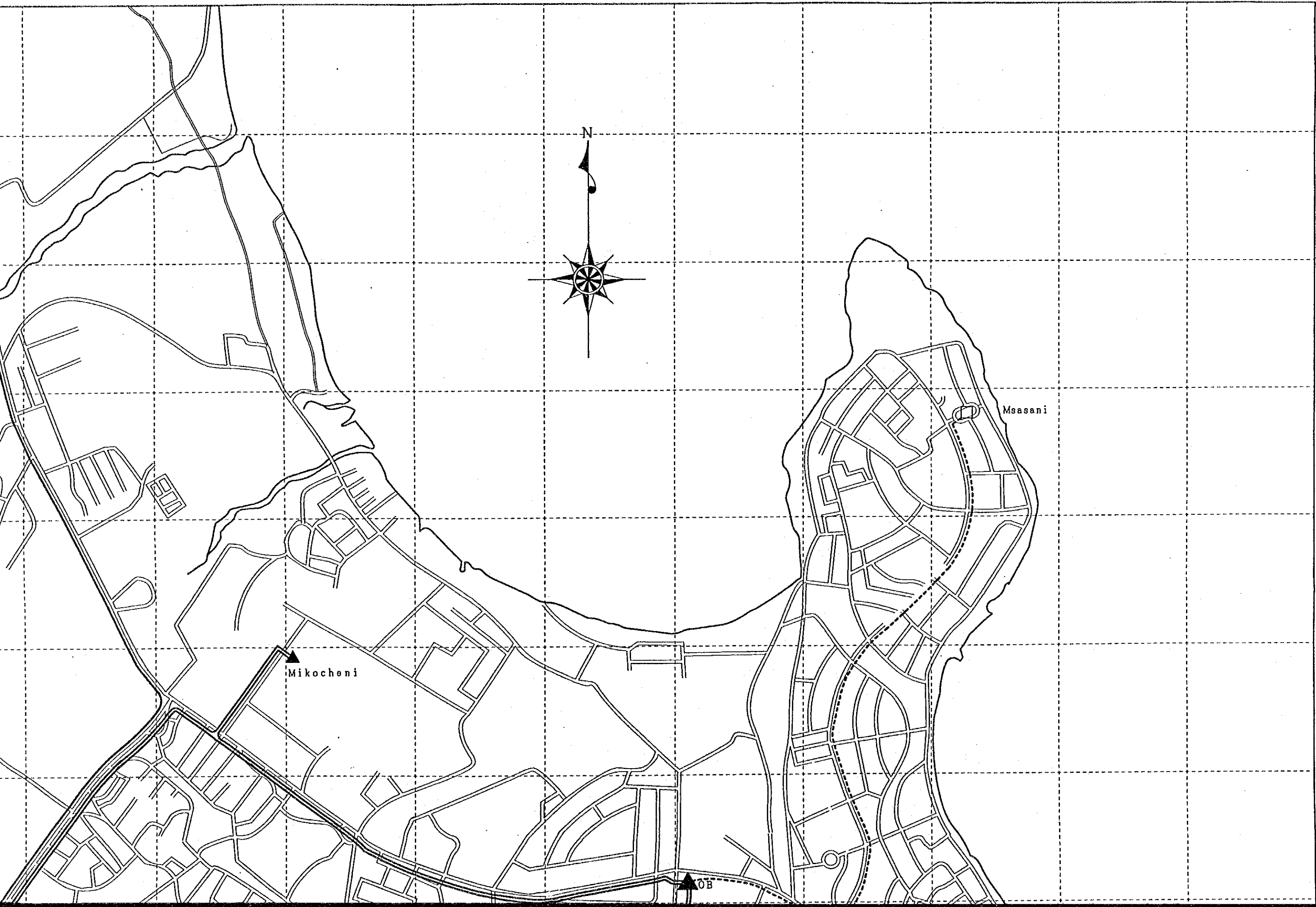
THE UNITED REPUBLIC OF TANZANIA MASTER PLAN STUDY ON DAR ES SALAAM POWER SUPPLY SYSTEM EXPANSION		
Dar Es Salaam Area Existing Transmission Lines (1) (As of August, 1993)		
TANESCO	ELECTRIC POWER DEVELOPMENT CO., LTD. TOKYO, JAPAN	
DR. :	SUBMITTED :	
TR. :	RECOMMENDED :	
CK. :	APPROVED :	
Fig 5. 3-1	- - -	SCALE 1:50,000



Mbezi

Mikochoeni

OB



Mikocheni

Msasani

0B



Mikocheni

OB

Ubungo

Friendship
Textile

Tandale

Mburahati

Upanga

Ilala



Mikocheni

OB

Tandale

Friendship
Textile

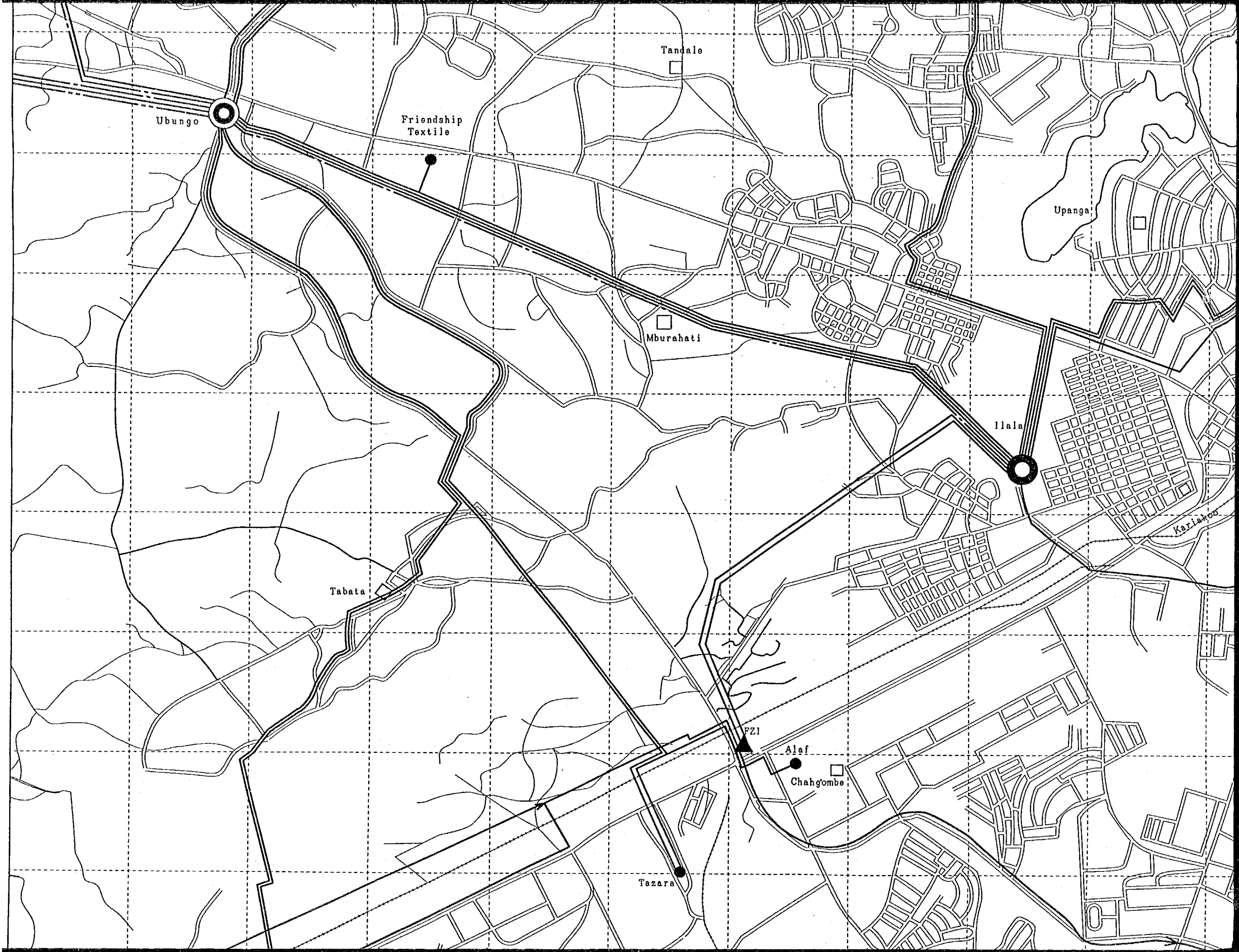
Mburahati

Ilala

Upanga

City Center

Sokoine



Ubungo

Friendship
Textile

Tandalo

Upanga

Mburahati

Ilala

Tabata

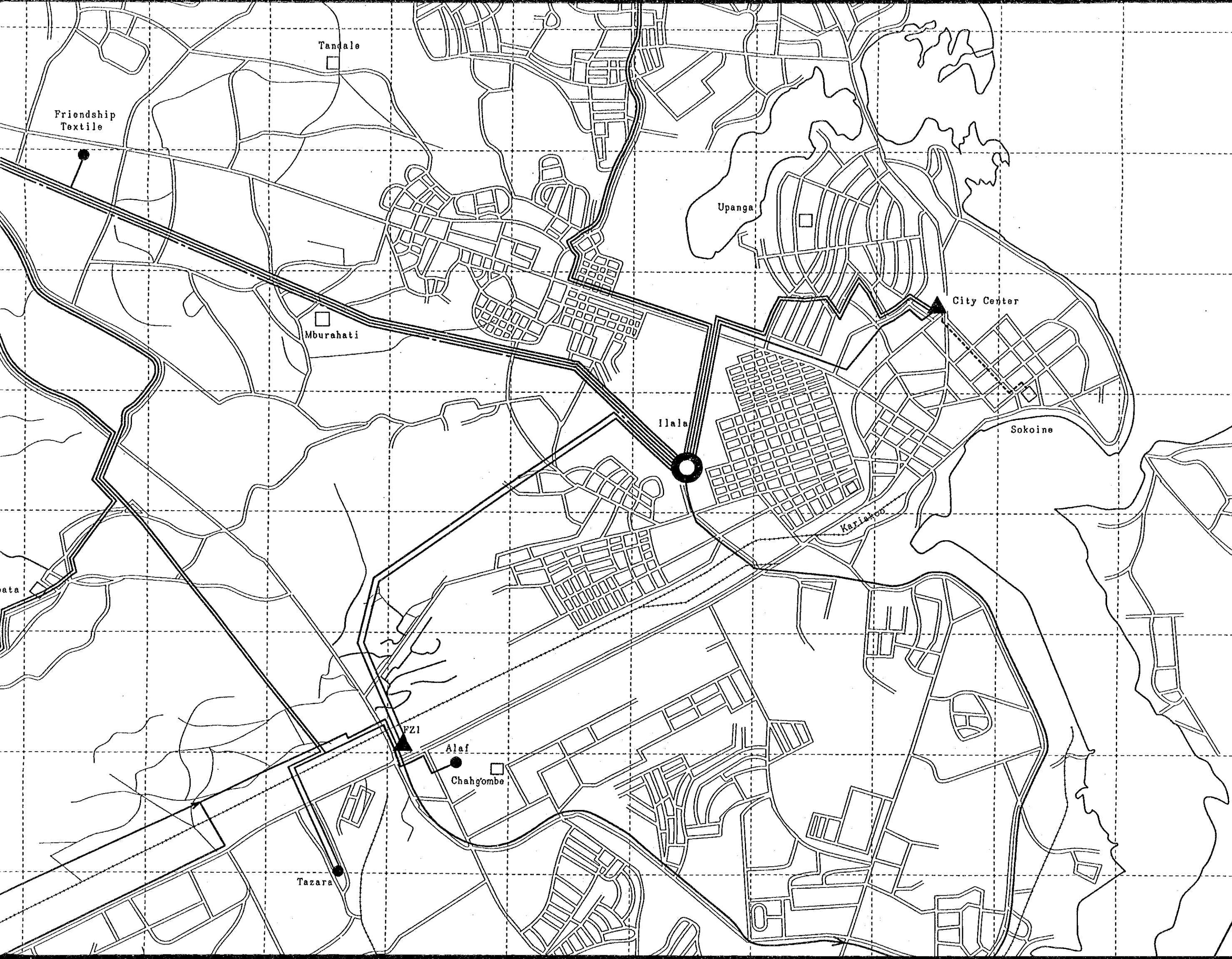
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Alaf

Chahgombe

Tazara

Kariakoo



Tandale

Friendship
Textile

Upanga

Mburahati

City Center

Ilala

Sokoine

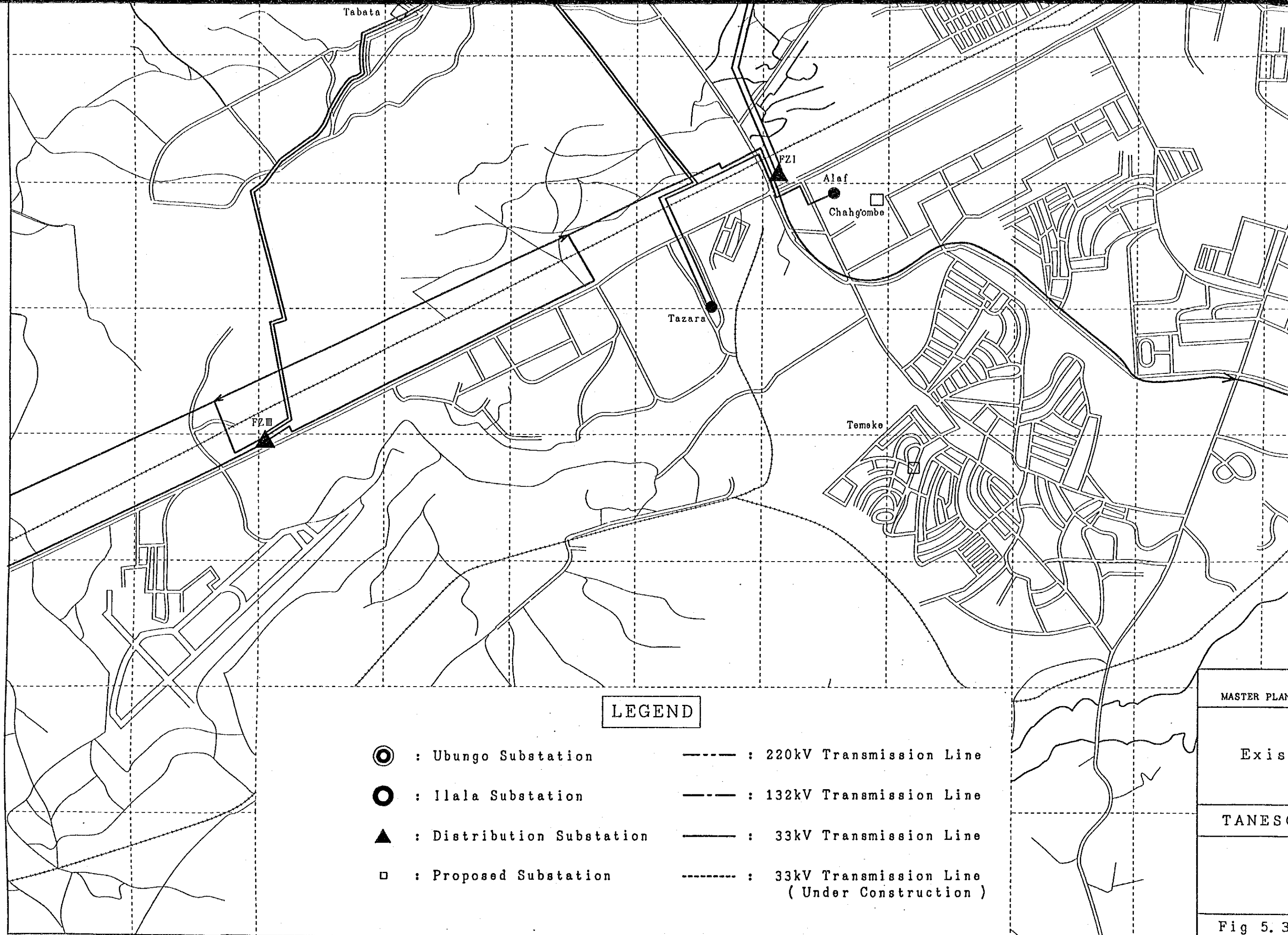
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FZ1

Alaf

Chah'ombe

Tazara



Tabata

FZI

Alaf

Chahgombe

Tazara

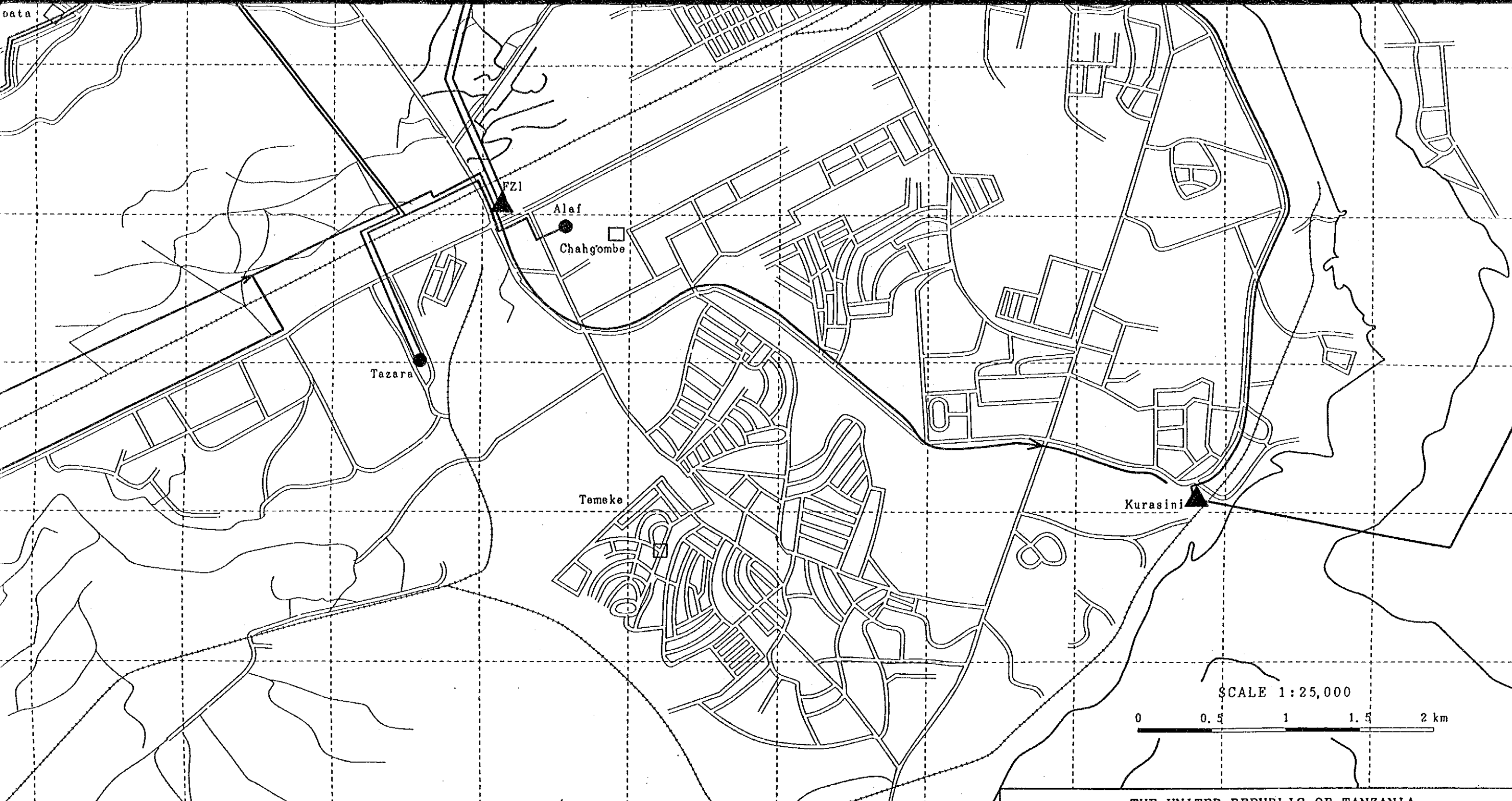
FZ III

Temeke

LEGEND

- ⊙ : Ubungo Substation
- : Ilala Substation
- ▲ : Distribution Substation
- : Proposed Substation
- : 220kV Transmission Line
- : 132kV Transmission Line
- : 33kV Transmission Line
- : 33kV Transmission Line (Under Construction)

MASTER PLAN
Exis
TANES
Fig 5.3



LEGEND

- ⊙ : Ubungo Substation
- : Ilala Substation
- ▲ : Distribution Substation
- : Proposed Substation
- : 220kV Transmission Line
- : 132kV Transmission Line
- : 33kV Transmission Line
- : 33kV Transmission Line (Under Construction)

THE UNITED REPUBLIC OF TANZANIA
 MASTER PLAN STUDY ON DAR ES SALAAM POWER SUPPLY SYSTEM EXPANSION

Dar Es Salaam Area
 Existing Transmission Lines (2)
 (As of August, 1993)

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TR. :	RECOMMENDED :
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