

# **CONCLUSION AND RECOMMENDATION**

Master Plan Study on the Power Sector for Major Towns  
in the United Republic of Tanzania

## **CONCLUSION AND RECOMMENDATION**

### **1. Background, Subjects and Scope of Study and Target Cities**

#### **1.1 Background**

In recent years, with the improvement of the economic and social situations, the demand for electric power has been increasing rapidly, calling for development of new sources of electricity. Under this condition, the Tanzanian government is constructing the Lower Kihansi Hydropower Station, part of which was put into operation in June 2000. In addition, the government has plans to construct a gas turbine power station and a diesel power station in the suburbs of Dar es Salaam. There is also a plan to construct a pipeline for transporting natural gas from the Songo Songo Gas Field to supply those thermal power stations with fuel in the future.

In addition to developing new sources of electricity, improving reliability of electric power supply and promoting efficient use of electric power are included in the national energy policy. The government is discussing various measures to make the necessary improvements.

In the major cities that are centers of industry and commerce, ensuring the stable supply of electric power and improving the reliability of power supply are especially important since they contribute not only to the improvement of the country's climate for investors at home and abroad and the activation of the national and regional economies but also to the improvement of the living environment of the nation.

However, despite the fact that power plants and transmission lines of the national grid system have been continually expanded, the development and expansion of power distribution facilities is left far behind due partly to the shortage of budget that is ascribable to the economic slump in the early 1980s. Therefore, there is no alternative but to continue using obsolescent distribution facilities which have poor supply capacity. Besides, the distribution networks in urban areas have deteriorated markedly because they have been kept in overload operation for many years. In particular, the electrical facilities that were installed right after the independence have become superannuated, causing the incidences of voltage drop, power loss, and unscheduled power stoppage to increase at various parts of the country. This is no small impediment to stable supply and efficient use of electric power.

## CONCLUSION AND RECOMMENDATION

Japan has helped Tanzania carry out a number of big projects, including the expansion of the power distribution networks in Dar es Salaam City and Kilimanjaro Province. The Japanese cooperation was much appreciated by the Tanzanian government. In particular, the Power Supply Expansion Project that was carried out in Dar es Salaam won high praises as it restored the power distribution system that had apparently been on the verge of disintegration. Under those conditions, the Tanzanian government has requested asked the Japanese government to conduct the present study.

Table 1 Previous Projects carried out under the coordination of Japanese Government

No.	Period	Name of Projects	Remark
1	1983-1984	Kilimanjaro Region Transmission and Distribution Network Project (OECF Loan)	
2	1986	The Project for the Reinforcement of Electric Power Distribution Network in Dar es Salaam (Grant Aid)	Supply of Equipment and Materials
3	1987	The Project for the Reinforcement of Electric Power Distribution Network in Dar es Salaam (Grant Aid)	Phase 1, Phase 2
4	1991	The Project for the Reinforcement of Electric Power Distribution Network in Dar es Salaam (Grant Aid)	Phase 3
5	1996-1997	Kilimanjaro Electrification Project(Grant Aid)	
6	1997-1998	Dar es Salaam Power Supply Expansion Project (Grant Aid)	Japanese Portion Phase 1 Expansion of Ilala S/S, Construction of Kariakoo S/S Mbagala S/S 132kV Ubungo-IlalaT/L
7	1998-1999	Dar es Salaam Power Supply Expansion Project (Grant Aid)	Japanese Portion Phase 2 Construction of 132kV Ubungo-FZ III T/L, Expansion of F.Z.III S/S

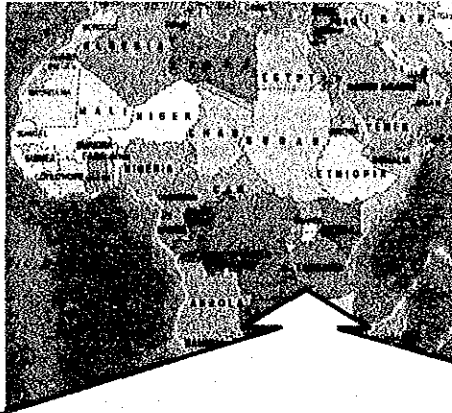
### 1.2 Subjects and Scope of Study

The purpose of the present study, carried out in the three cities of Dar es Salaam, Arusha, and Moshi, is to:

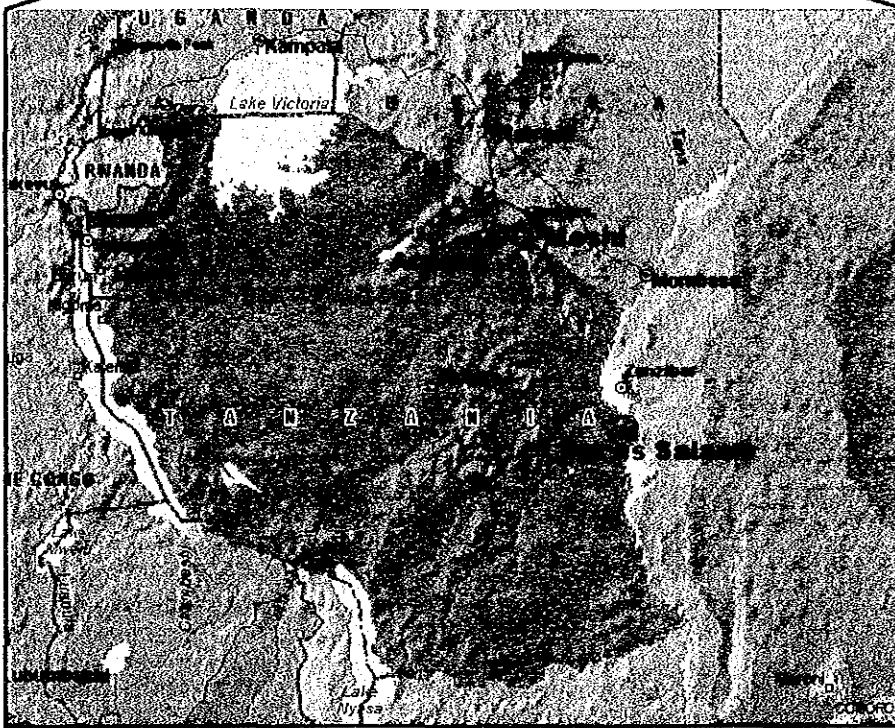
- investigate the present conditions of the power distribution networks and the future plans for development, problems, etc. of the existing networks,
- formulate a five-year master plan and a 10-year master plan to ensure stable supply and efficient use of electric power from a medium- to long-range viewpoint,
- carry out a feasibility study for priority items of the five-year master plan, and
- prepare a plan to reinforce the equipment maintenance capability of TANESCO and provide TANESCO with guidance in equipment maintenance.

According to the purpose of study, the Study Team conducted the 3 kinds of investigations listed below.

- (1) Distribution System Master Plan Study in 3 Cities
- (2) Feasibility Study on Expansion and Rehabilitation Plan in 3 Cities
- (3) DAMP Improvement Plan Study



Target Cities  
(Dar es Salaam, Arusha, Moshi)



## 2. Conclusion

### 2.1 Distribution System Master Plan Study

Master plans for distribution lines in the Dar es Salaam region and the Arusha and Kilimanjaro regions, respectively, were prepared from a demand forecast based on the study results. They are shown in Tables 4 and 5. The estimated costs of carrying out all the projects included in the master plans are as shown in Tables 2 and 3. (The cost of Mbezi S/S rehabilitation carried out by TANESCO, construction of Tandika S/S and Magomeni S/S supported by KfW, rehabilitation of Ubungu S/S financed by Sida, construction of Monduli S/S financed by AfDB are included in the Project Cost)

Table 2 Project Cost of Dar es Salaam Region Unit 1000US\$

Summary	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	
<b>Grand Total (w/o O &amp; M)</b>											
Foreign Currency	3373	7990	50355	45697	12895	8941	1531	3409	3591	137781	
Local Currency	289	811	6550	7273	1398	739	178	242	472	17952	O & M after 2011
<b>O &amp; M</b>											
Foreign Currency	0	20	56	340	565	626	659	667	677	3609	699
Local Currency	27	88	227	503	632	740	753	796	808	4572	808
<b>Grand Total (w/ O &amp; M)</b>											
Foreign Currency	3373	8010	50411	46038	13460	9567	2189	4076	4268	141390	
Local Currency	316	899	6777	7776	2030	1479	931	1038	1279	22524	

Total Cost 164 mil. US\$

Table 3 Project Cost of Arusha, Kilimanjaro Region Unit 1000US\$

Summary	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	
<b>Grand Total (w/o O &amp; M)</b>											
Foreign Currency	1714	8172	28439	14766	16291	2994	3196	1110	0	76683	
Local Currency	129	306	3719	3160	3675	216	256	35	0	11495	O & M after 2011
<b>O &amp; M</b>											
Foreign Currency	0	9	21	196	233	355	364	375	377	1929	377
Local Currency	12	165	200	286	304	372	410	433	434	2616	434
<b>Grand Total (w/ O &amp; M)</b>											
Foreign Currency	1714	8181	28460	14962	16524	3349	3560	1485	377	78611	
Local Currency	141	470	3919	3446	3980	588	666	469	434	14111	

Total Cost 93 mil. US\$

Table4 Distribution System Master Plan in Dar es Salaam

Year	Name of S/S	Specification	Type	Remark	Name of Transmission Line	Specification	Type	Remark	
2002	Bahari Beach S/S	33kV 15MVAx1	New	Commissioned by KfW by SIDA by KfW by TANESCO	Tegeta-Bahari Beach	33kV 100mm <sup>2</sup> 2cdt 13km	New	Commissioned	
	Kurasini S/S	Switchgear	Replace		Ilala-Kurasini	33kV 150mm <sup>2</sup> 2cct 7.1km	Reconductor	On Going KfW	
	Ubungo S/S	33kV 15MVAx1	Expansion		Magomeni-Magomeni Tap	33kV 100mm <sup>2</sup> 1cdt 1km	New	On Going	
	Magomeni S/S	33kV 15MVAx1	New						
	Mbezi S/S	33kV 15MVAx1	R/E						
2003	Sokoine S/S	33kV 15MVAx1	Expansion		City Center-Sokoine	33kV 100mm <sup>2</sup> 1cdt 3km	Reinforce		
	FZ III S/S	33kV 15MVAx1	Expansion		Chang'ombe-Kurasini	33kV 240mm <sup>2</sup> 1cdt 5km	Reinforce		
2004	Bagamoyo S/S	33kV 5MVAx1	New	1x15-->1x30 by KfW Tandika Line	Tegeta-Bagamoyo	33kV 100mm <sup>2</sup> 2cdt 45km	New	On Going 2cct	
	City Center S/S	33kV 30MVAx1	R/E						
	Mikocheni S/S	33kV 15MVAx1	Expansion						
	Tandika S/S	33kV 15MVAx1	New			FZ I-Tandika	33kV 150mm <sup>2</sup> 2cdt 4.2km		New
	FZ III S/S	33kV Leadout	Expansion						
	FZ I S/S	Panel, others	Replace						
2004	City Center S/S	33kV Leadout	Expansion	Sokoine Line	Tandale-Magomeni	33kV 150mm <sup>2</sup> 1cdt 3km	New		
	Tandale S/S	33kV 15MVAx1	Expansion		Ubungo-New Oysterbay	132kV 240mm <sup>2</sup> 1cdt 8.5km	New		
	New Oysterbay S/S	132kV 45MVAx2	New						
	Ubungo S/S	33kV 15MVAx2	Expansion		NOB Line				
	Oysterbay S/S	132kV Leadout	R/E		2x5-->1x15	New Oysterbay-Oysterbay	33kV 240mm <sup>2</sup> 2cdt 1.6km		New
Msasani S/S	33kV 15MVAx1	Expansion		New Oysterbay-Msasani	33kV 150mm <sup>2</sup> 2cdt 5km	New	1cct		
2005	Mbagala S/S	33kV 15MVAx1	Expansion	TOL Line University Line Yombo Line Kurasini Line	Muhimbili Tap-Muhimbili	33kV 100mm <sup>2</sup> 1cdt 0.5km	New	1cct	
	Muhimbili S/S	33kV 15MVAx1	New		Ilala-TOL	33kV 100mm <sup>2</sup> 2cdt 5km	New		
	TOL S/S	33kV 15MVAx1	New						
	Ilala S/S	33kV Leadout	Expansion		Ubungo-University	33kV 100mm <sup>2</sup> 1cdt 3km	New		
	University S/S	33kV 15MVAx1	New		FZ III-Yombo	132kV 240mm <sup>2</sup> 1cdt 12km	New		
	Ubungo S/S	33kV Leadout	Expansion						
	Yombo S/S	132kV 45MVAx1	New						
	FZ III S/S	33kV 15MVAx1	New						
	FZ III S/S	132kV Leadout	Expansion						
	Kitunda S/S	33kV 15MVAx1	New			Yombo-Mbagala	132kV 240mm <sup>2</sup> 1cdt 10km		New
Mbagala S/S	132kV 45MVAx1	Expansion		Yombo-Kitunda	33kV 100mm <sup>2</sup> 1cdt 3.9km	New			
Kurasini S/S	132kV 45MVAx2	Expansion		Kurasini-Mbagala	132kV 240mm <sup>2</sup> 1cdt 16km	New			
Ilala S/S	132kV Leadout	Expansion		Ilala-Kurasini	132kV 240mm <sup>2</sup> 1cdt 10km	New			

Year	Name of S/S	Specification	Type	Remark	Name of Transmission Line	Specification	Type	Remark
2005	Kurasini S/S Kigamboni Sw/S Tabata Sw/S Mburahati S/S Ubungo S/S Kurasini S/S	33kV 15MVAx1 33kV 33kV 33kV 15MVAx1 33kV Leadout 33kV 15MVAx1	Expansion Rehabilitation New New Expansion Replace	Ilala Line	Ubungo-Ilala	33kV 150mm <sup>2</sup> 2cct 7.5km	Rehabilitation	1cct
2006	Kinondoni S/S  Kawe S/S Mbezi S/S City Center S/S Ilala S/S	33kV 15MVAx1  33kV 15MVAx1 33kV Leadout 33kV 30MVAx1 132kV 45MVAx1 33kV 15MVAx1	New  New Expansion R/E Expansion Expansion	Kawe Line 1x15-->1x30	Kinondoni Tap-Kinondoni Oysterbay-Ilala Mbezi-Kawe  Ubungo-Ilala Ilala-City Center #2	33kV 100mm <sup>2</sup> 1cct 1.0km 33kV 240mm <sup>2</sup> 2cct 6.3km 33kV 100mm <sup>2</sup> 1cct 4.5km  132kV 240mm <sup>2</sup> 1cct 7.5km 33kV 100mm <sup>2</sup> 1cct 2.8km	New Reinforce New  Reinforce Reconductor	Upgrade
2007	Bahari Beach S/S Tegeta S/S Kigogo S/S Mbezi S/S Tegeta S/S	33kV 15MVAx1 33kV Leadout 33kV 15MVAx1 33kV 15MVAx1 33kV Leadout	Expansion Expansion New Expansion Expansion	Bahari Beach Line  Mbezi Line	Kigogo-Kigogo Tap Tegeta-Mbezi	33kV 100mm <sup>2</sup> 1cct 1km 33kV 100mm <sup>2</sup> 1cct 8.4km	New Reinforce	
2008	Chang'ombe S/S	33kV 15MVAx1	Expansion					
2009	Msasani S/S	33kV 15MVAx1	Expansion					
2010	Kariakoo S/S Ilala S/S Ilala S/S	33kV 15MVAx1 33kV Leadout 33kV 15MVAx1	Expansion Expansion Expansion	Kariakoo Line	Ilala-Kariakoo	33kV 100mm <sup>2</sup> 1cct 1.3km	Reinforce	

# CONCLUSION AND RECOMMENDATION

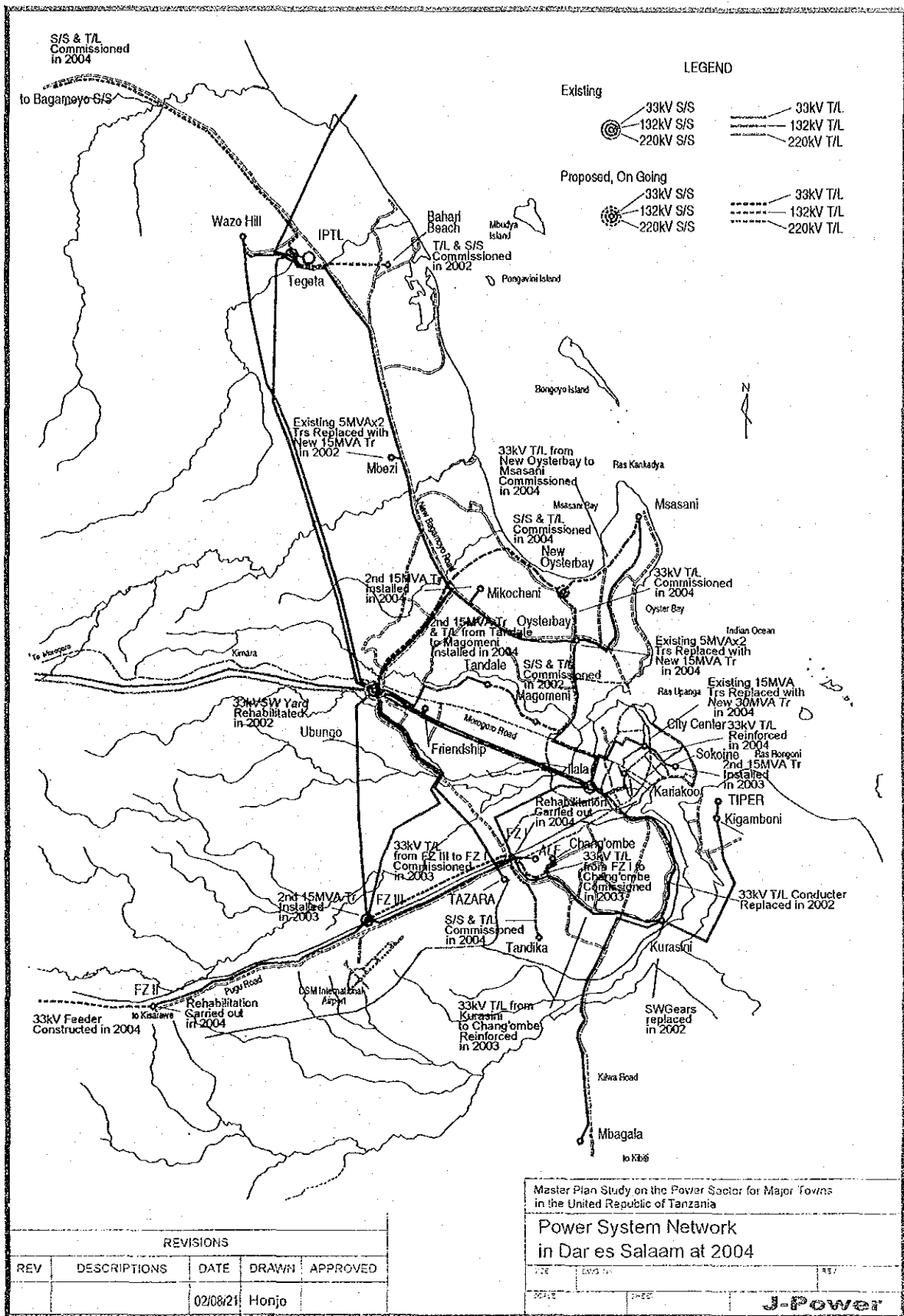


Fig. 1 Expansion Plan in Dar es Salaam from 2002 to 2004



CONCLUSION AND RECOMMENDATION

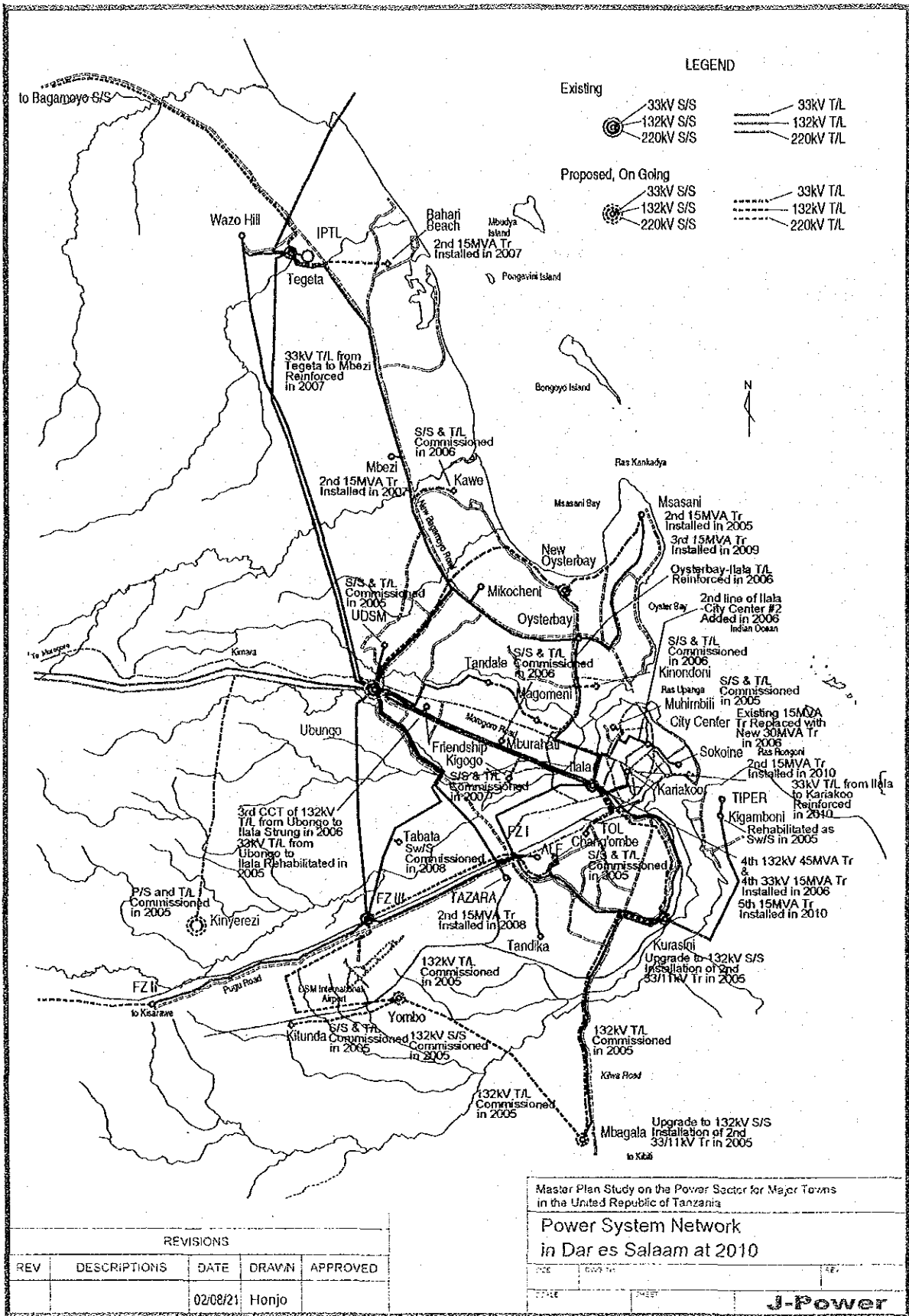


Fig. 2 Expansion Plan in Dar es Salaam from 2005 to 2010

Table5 Distribution System Master Plan in Arusha and Kilimanjaro

Year	Name of S/S	Specification	Type	Remark	Name of Transmission Line	Specification	Type	Remark
2002	Njiro S/S Monduli S/S YMCA S/S	Switchgear 33kV 2.5MVAx1 33kV 10MVAx1	Replace New New	On going On going On going	Njiro-Monduli	33kV 100mm <sup>2</sup> 38.6km	New	On Going 1cct
2003								
2004	Njiro S/S Phase1 Mt. Meru S/S Unga LTD S/S Kiyungi S/S Boma Mbuzi S/S Trade School S/S Marangu Sw/S	132kV 45MVAx1 33kV 10MVAx3 33kV 10MVAx3 Switchgear etc 132/33kV 45MVAx1 Switchgear etc 33kV 10MVAx1 33kV 10MVAx1 33kV 33kV	Expansion Expansion R/E Replace Expansion Replace Expansion R/E New	2x5-->3x10	Njiro-Mt.Meru Njiro-Unga LTD Kiyungi-Boma Mbuzi Kiyungi-Trade School Kiyungi-Marangu	33kV 100mm <sup>2</sup> 7.3km 33kV 100mm <sup>2</sup> 5.8km 33kV 100mm <sup>2</sup> 7km 33kV 100mm <sup>2</sup> 10km 33kV 100mm <sup>2</sup> 69km	Reinforce Reinforce Reinforce Reinforce New	1cct-->2cct 1cct-->2cct 1cct-->2cct 1cct-->2cct 1cct
2004	Kijex S/S Phase2 Machame S/S Same S/S NYM P/S	33kV 10MVAx1 33kV 5MVAx1 Switchgear etc CB,LS	R/E R/E Replace Reinforce	1x5-->1x10 1x2.5-->1x5				
2005	Njiro B S/S Sakina S/S KCMC S/S Trade School S/S Boma Ngombe S/S	33kV 10MVAx1 33kV 10MVAx1 33kV 10MVAx1 33kV Leadout 33kV 5MVAx1	New New New Expansion New	KCMC Line	Njiro-Njiro B Njiro-Sakina Mt.Meru-Sakina Njiro-Kiyungi Trade School-KCMC	33kV 100mm <sup>2</sup> 3km 33kV 100mm <sup>2</sup> 13.2km 33kV 100mm <sup>2</sup> 8.1km 132kV 240mm <sup>2</sup> 70km 33kV 100mm <sup>2</sup> 3.7km	New New New Reinforce New	1cct 1cct 1cct 1cct-->2cct 1/2
2006	Usa River Sw/S Njiro S/S Kiyungi S/S	33kV 220kV 60MVAx1 132kV 45MVAx1 132kV Leadout	New Expansion Expansion Expansion	Njiro Line	Njiro-Usa River Tengeru-Usa River Njiro-Kiyungi	33kV 100mm <sup>2</sup> 21.3km 33kV 100mm <sup>2</sup> 12.5km 132kV 240mm <sup>2</sup> 70km	New New Reinforce	1cct 1cct 1cct-->2cct 2/2
2007	Gomber S/S KCMC S/S	33kV 5MVAx1 33kV Leadout	New Expansion	Gomber Line	KCMC-Gomber	33kV 100mm <sup>2</sup> 4.9km	New	1cct
2008	Them S/S	33kV 10MVAx1	Expansion					
2009	Lawate S/S	33kV 5MVAx1	R/E	1x2.5-->1x5				
2010								

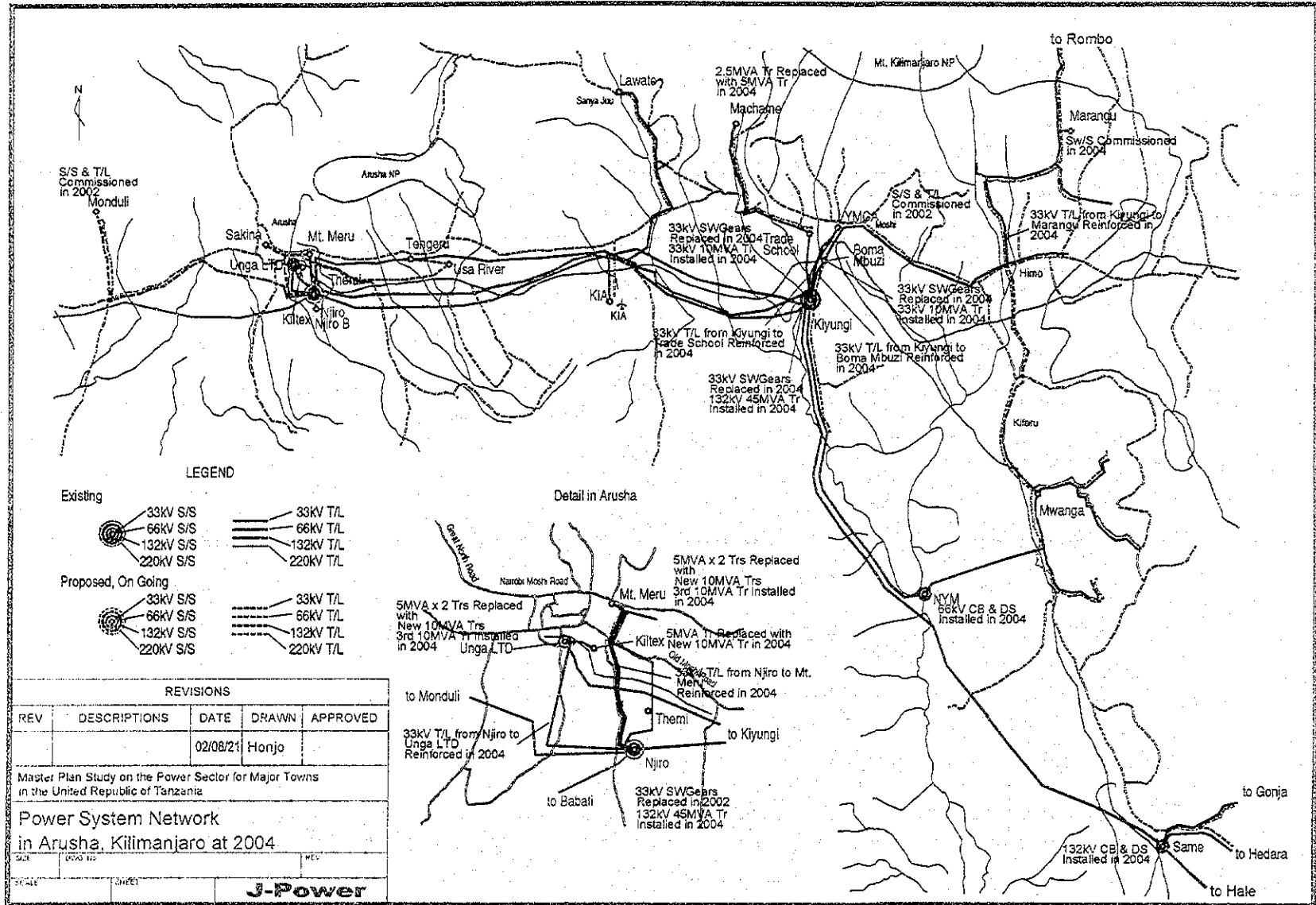


Fig. 3 Expansion Plan in Arusha and Kilimanjaro from 2002 to 2004

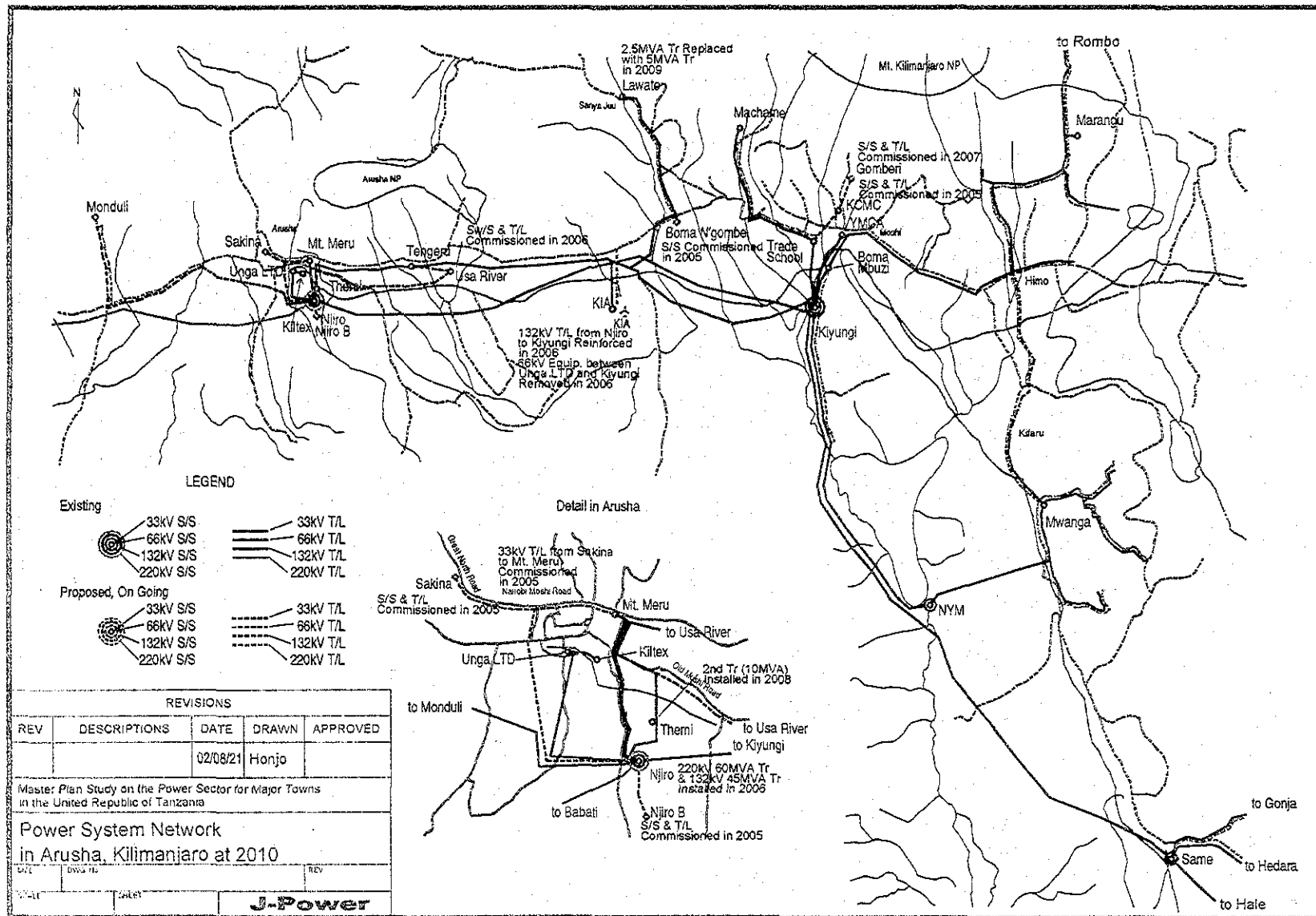


Fig. 4 Expansion Plan in Arusha and Kilimanjaro from 2005 to 2010

## 2.2 Feasibility Study

### (1) Scope of Feasibility Study and Results of Cost Estimation

Each of the projects included in the 2002-2004 master plans was subjected to basic design and cost estimation. The contents of those projects are described in Tables 4 and 5 and Figures 1 and 3, and the results of cost estimation are shown in Tables 2 and 3 (2002 ~ 2004).

### (2) Effects of Projects

It is expected that the projects mentioned above will bring about the following effects.

#### (a) Reduction/Elimination of Overload and Exhausted Substations

Dar es Salaam 11→2 (City Center S/S, Kurasini S/S)  
Arusha, Kilimanjaro 8→0

#### (b) Loss Reduction

Dar es Salaam 3,767kW  
Arusha 1,124kW  
Moshi 2,910kW

#### (c) Reduction of Outage

A total of 326 MWh in the three cities under consideration

#### (d) Reduction of Voltage Drop

Dar es Salaam Max.32.2%→8.8%  
Arusha Max. 23.6%→8.6%  
Moshi 28.9%→8.8%

#### (e) Results of Economic and Financial Analyses

EIRR

Dar es Salaam 14.24% Arusha, Kilimanjaro 5.74%

FIRROI

Dar es Salaam 9.0% Arusha, Kilimanjaro 2.3%

FIRROE

Dar es Salaam 45.2% Arusha, Kilimanjaro No Return

#### (f) Project Funds

At the end of 2001, TANESCO set about improving the efficiency of its management with the aid of a management consulting firm of South Africa. According to a recent report, TANESCO is implementing specific measures to increase revenue. However, in view of the fact that the company's policy of raising the power rates is not going smoothly and that it has to pay large amounts of electricity bills to IPP that started commercial operation in the Dar es Salaam region in 2001, it seems extremely difficult for TANESCO to procure the project funds, especially in the near future. In Tanzania's electric power sector, several foreign organizations, such as KfW, NORAD, and SIDA, have been active in providing financial backing. TANESCO, to which Japan has so far extended generous cooperation, wishes to obtain continuing cooperation of

the Japanese government. In the case of transmission/distribution projects, they can be executed independently of one another. For example, after the "Master Plan Study and Pre-Feasibility Study on Dar es Salaam Power Supply System Expansion" JICA made in 1992-1994, the projects stated in the master plan were successfully carried out separately by individual donors. It is, therefore, considered desirable that each of the present projects should be executed jointly by TANESCO and each individual donor.

### 2.3 Model Case Study of Maintenance Center

The Study Team made a model case study for a review and local deployment of the Dar es Salaam Distribution Network Maintenance Project (DAMP). The study results are summarized in Fig. 5.

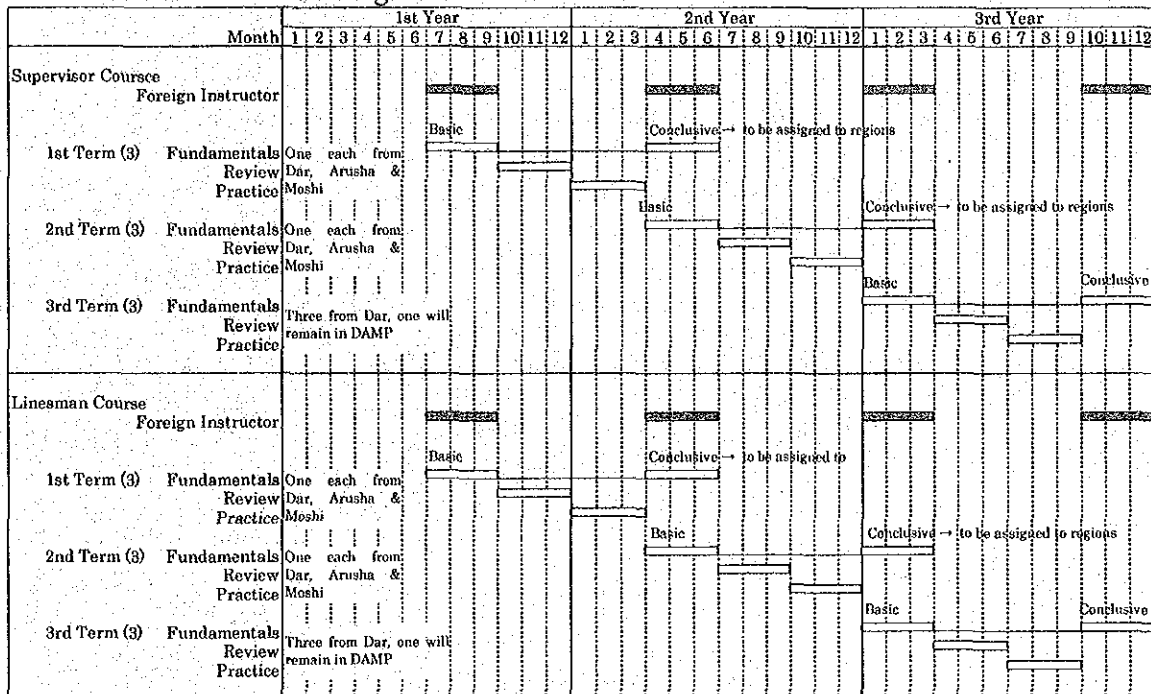


Fig. 5 Proposed Training Schedule

Table 6 Cost of DAMP Improvement and Expansion to Arusha and Kilimanjaro Unit

		1st	2nd	3rd	Total
DAMP	FC	772			772
	LC	100			100
Arusha	FC		318		318
	LC		100		100
Moshi	FC		318		318
	LC		100		100
Training	FC	40	40	40	120
Total	FC	812	676	40	1528
	LC	100	200		300

Total Cost 1.8 mil. US\$

### 3. Contents of Study

The matters that the Study Team discussed before drawing conclusions from the present study are summarized below.

#### 3.1 Study of Future Plans

The Study Team reviewed the existing plans for transmission lines, substations, and distribution lines in Dar es Salaam, Arusha, and Moshi. As a future plan for those facilities, there is a long-range master plan (up until 2025) which TANESCO formulated with the cooperation of Acres International of Canada. Power supply projects have been carried on in line with this master plan, although the time of project execution is reviewed from time to time.

Concerning a future plan for a distribution network, Dar es Salaam has a long-range master plan (1993-2007) which is based on the "Master Plan Study and Pre-Feasibility Study on Dar es Salaam Power Supply System Expansion" JICA made in 1992-1994. Basically, TANESCO and donors have been developing the distribution network according to this master plan. However, the master plan needs to be reviewed now that nearly 10 years have passed since it was formulated.

In Arusha, there are no long-range master plans like the one in Dar es Salaam. So far, TANESCO has been meeting the ever-increasing energy demand in Arusha by constructing new substations (Mt. Meru S/S, etc.) as required. However, even the Mt. Meru S/S that was constructed 10 years ago is already overloaded. Thus, it has become necessary for the company to formulate a long-range plan for its distribution network in Arusha and expand the facilities according to the plan.

Moshi does not have any master plan for its distribution network either. As in Arusha, TANESCO copes with the continual increase in energy demand in Moshi by constructing new facilities as required.

Needless to say, TANESCO's distribution system is the interface between its electric power system and the user. In order for the company to secure sufficient revenue and stand on its own feet, it is indispensable to develop and expand its distribution network deliberately on the basis of an accurate demand forecast. The Study Team forecast the electricity demand in Tanzania macroscopically and microscopically, and proposed an equipment expansion plan on the basis of the forecast demand. By applying the techniques to forecast demand described in this report and revising results of demand forecast on the basis of actual demand, each individual regional office of TANESCO should be able to formulate a workable equipment expansion plan.

#### 3.2 Present Conditions and Problems

Amid the chronic shortage of maintenance materials, manpower, and techniques, the field engineers and technicians strive to keep the transmission lines, substations, and distribution lines in good condition. As described below, there is a possibility that they could significantly improve the reliability of equipment even by slightly changing the present methods of inspection and maintenance.

During the present study, the problem of frequent occurrence of troubles due to obsolescent facilities and overload operation was found. The Study Team has discussed the obsolescent facilities and overload operation and reflected them in its master plans. Therefore, in the discussions that follow, focus is placed on the operation and

maintenance of the facilities.

#### **(a) Transmission Lines**

The present study revealed that TANESCO did not have accurate drawings or ledgers which record the positions and types (suspension/tension) of transmission line supports, the tower heights and spans, etc. From the standpoint of ensuring a prompt response to emergencies, implementing regular rounds of inspection, and procuring and storing spare parts in a planned way, the company should prepare accurate maps and ledgers for the individual transmission lines as early as possible.

During the field investigation, the Study Team confirmed that many troubles had occurred with transmission lines due to fallen wooden poles or trees interfering with the line. By making regular rounds of field inspection and taking suitable measures, it is possible to reduce those troubles and the resulting service interruption.

#### **(b) Substations**

Concerning the substations in Tanzania, there are two major tasks to tackle in the future. One is maintaining the functions of the substations, that is, establishing an effective system of inspection and maintenance. The other is establishing a basic configuration of distribution substations (33 kV/11 kV) to allow for flexible operation of the substations. In Tanzania, as in many other developing countries, it is generally considered that inspecting a substation is nothing but repairing it. Patrol inspection and periodical inspection by way of preventive maintenance are seldom done. The main reason for this is that the facilities can hardly be stopped for inspection due to lack of equipment redundancy and that funds and manpower required for preventive maintenance are unavailable. In the present report, the Study Team proposed methods of patrol inspection of the substations and periodical inspection of the substation devices.

In addition, the Study Team proposed that TANESCO should install a total of three transformers in each substation on a step-by-step basis in order to reduce the unfavorable effects of inspection and trouble with a device on other devices and users. By implementing the proposed measures, the company should be able to reduce service interruption and troubles with substation equipment.

#### **(c) Distribution Lines**

Reducing the loss of energy in the distribution lines is an important issue that can never be neglected from the standpoint of utilizing valuable electric energy effectively, obtaining a lot of economic effect, and operating the distribution lines efficiently. The Study Team proposed a number of things which TANESCO should strive to achieve in order to reduce the loss of energy in its distribution facilities (replacing the existing cables with thicker ones, adopting an energy-efficient transformer, improving the power factor, leveling the load, etc.).

Revenue from the sale of electricity is the most important factor in sound management of TANESCO. In order for the company to collect electricity bills steadily, it is indispensable that the supply meters installed to the distribution facilities should be used properly. In the present report, the Study Team refers to the inspection of meters and the rationalization of contracts.



### 3.3 Optimization of Master Plans

The Study Team reviewed the master plans to optimize them as described below. In preparing master plans, the Study Team investigated the local environmental administration and legislation, decided environmental assessment items referring to the environmental assessment procedure established in Tanzania, and summed up environmental matters to be attended to in the major projects. Rehabilitation of transmission lines/substations has less impact on the environment than construction of power stations. By taking suitable environmental measures, it will be possible to carry out all the rehabilitation projects smoothly.

#### (1) Demand Forecast

On the basis of TANESCO's forecast for electricity demand and record of loads at each of its substations, the Study Team made a demand forecast macroscopically and microscopically and confirmed that the macroscopic forecast and microscopic forecast agreed very well.

#### (2) Formulating Basic Expansion Plan

On the basis of the microscopic demand forecast for each of the substations, the Study Team prepared a substation expansion plan which requires any substation to be expanded at the time when the load exceeds its installed capacity. Then, the Study Team prepared a transmission line/distribution line expansion plan (Case-A) appropriate to the substation expansion plan and presented it to TANESCO.

#### (3) Formulating Plan which Allows for Overload Operation and Load Shedding to Reduce Initial Investment

On the basis of Case-A, the Study Team prepared an equipment expansion plan (Case-B) which allows for overload operation of equipment and load shedding to reduce the initial project cost. In this plan, as the maximum load at certain substations exceeds the installed capacity, it is necessary to implement load shedding or overload operation during the peak hours.

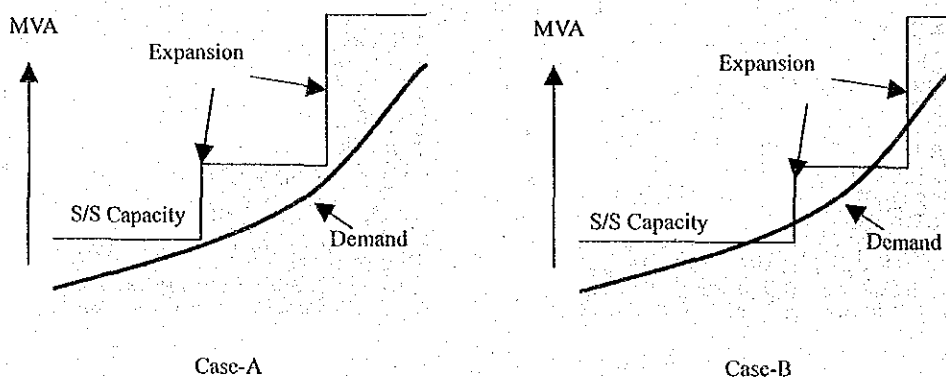


Fig. 6 Expansion Method

#### (4) Comparison of Economic Characteristics

The Study Team compared Case-A and Case-B in terms of economy. As a result, it was confirmed that Case-B would give a higher economic internal rate of return (EIRR) even when the decrease in revenue due to load shedding was taken into account. The estimated EIRRs are as follows:

- Dar es Salaam region (Case-A): 14.73%
- Dar es Salaam region (Case-B): 15.92%
- Arusha/Kilimanjaro regions (Case-A): 7.19%
- Arusha/Kilimanjaro regions (Case-B): 7.72%

#### (5) Revising Master Plan

Reflecting TANESCO's opinions as to the times to start the individual projects, etc., the Study Team formulated a final master plan (10-year plan) based on Case-B.

#### (6) Setting Short-Term Master Plan

In formulating the above master plan, top priority was given to replacing the obsolescent facilities and reducing the overload operation of equipment. As a result, the master plan has become such that many of the equipment rehabilitation and expansion projects concentrate in the first few years, whereas the pace of equipment expansion to meet the increase in demand slows down in the subsequent years. Therefore, with the consent of TANESCO, the Study Team set a short-term equipment expansion plan for the years up to 2004. In terms of the project cost, 43% of the projects planned in the Dar es Salaam region and 46% of the projects planned in the Arusha/Kilimanjaro regions are to be carried out during the period of the short-term equipment expansion plan.

#### (7) Estimating Project Costs

The Study Team estimated the cost of the present master plan by the same method as used for cost estimation in the detail design of the Dar es Salaam Power Supply System Expansion Plan that is one of the transmission line/substation projects carried out in Tanzania in the past (see Table 1) and that is similar in voltage and equipment scale to the present plan.

### 3.4 Model Case Study of Maintenance Center

#### (1) Background

Since the early 1990s, with the increase in electricity demand in Dar es Salaam, the power supply system that is not very reliable has been regarded as an impediment to the promotion of social and economic activities. Under this condition, TANESCO, with the aim of improving its power distribution system, launched on the Dar es Salaam Power Distribution and Maintenance Project (DAMP) with its own funds and technology. In the early stages of the project, the company had difficulty in securing effective maintenance techniques and materials required for the management of DAMP. Eventually, the Ministry of Energy and Mining asked the Japanese government for technical cooperation necessary for execution of the DAMP project. In response to the request, the Japanese government carried out a mini-project to back up DAMP. In the mini-project, which was carried out in three years from January 1996 to January 1999, the Japanese government supplied TANESCO with tools and materials necessary for training maintenance personnel for DAMP and provided the company's technical staff with technical guidance in Japan and Tanzania. During the project period, an expert of JICA resided in Tanzania to help with the project management as advisor and coordinator.

Since the technical cooperation of JICA ended, the DAMP project has been managed by the Kinondoni North Regional Office of TANESCO. The company intends to deploy the efficient functions of DAMP throughout the country in the future. (At present, they are confined within Dar es Salaam.) Actually, however, the functions of

## CONCLUSION AND RECOMMENDATION

---

DAMP have deteriorated markedly since the end of JICA's technical cooperation. This is due largely to the personnel reduction that followed the drastic management rationalization and to the fact that DAMP has been so busy with emergency works (e.g., construction of new distribution lines and repair of failed distribution lines) that it has not had much time to perform the function of training technical personnel.

### (2) Improvement measures

The Study Team proposed that DAMP should stop executing construction and repair works and specialize in the training of technical personnel—the purpose of establishment of DAMP, and that the organization of DAMP that is now under the control of the Kinondoni North Regional Office should be put under the direct control of the distribution department of the Head Office. Concerning materials required to restore the original function of DAMP, the Study Team decided them in consultation with TANESCO and estimated the cost involved.

In order to recover TANESCO's maintenance ability to at least the January 1999 level when the technical cooperation of JICA ended, it is to be desired that at least one person who has received the DAMP trainer training course should be assigned to each office and have him train the personnel there. In the regions that are covered by the present plan, a minimum of four such leaders are required in Dar es Salaam and a minimum of two in Arusha and Moshi, respectively. Taking this into consideration, the Study Team prepared a maintenance center training program.

### (3) Extension of DAMP Function to Arusha and Moshi

In the first two years, persons of trainer class shall be fostered at the offices in Arusha and Moshi, and in the third year they shall be posted in local areas to train maintenance personnel.

# **CHAPTER 1**

## **INTRODUCTION**

# CHAPTER 1 INTRODUCTION

## 1.1 Background to the Master Plan Study

Since its independence in 1961, the United Republic of Tanzania had been pressing ahead with its own socialist economic policy based on agriculture. In the early 1980s, however, due at least in part to the global oil crises, battles with Uganda, and droughts, Tanzania fell into extreme economic difficulties and came to receive financial aids from various countries.

In order to tide over the difficulties, Tanzania adopted an economic restructuring policy and launched an economic development plan under the guidance of the World Bank and the IMF. In recent years, the country is at last finding a way out toward economic stability.

With a population of about 33 million (in 2000) and per-capita GDP of \$261 (in 2000), Tanzania is still positioned as one of the least less-developed countries (LLDCs).

In recent years, with the improvement of the economic and social situations, the demand for electric power has been increasing rapidly, calling for development of new sources of electricity. Under this condition, the Tanzanian government is constructing the Kihansi Hydropower Station, part of which was put into operation in June 2000. In addition, the government has plans to construct a gas turbine power station and a diesel power station in the suburbs of Dar es Salaam. There is also a plan to construct a pipeline for transporting natural gas from the Songo Songo Gas Field to supply those thermal power stations with fuel in the future.

In addition to developing new sources of electricity, improving reliability of electric power supply and promoting efficient use of electric power are included in the national energy policy. The government is discussing various measures to make the necessary improvements.

In the major cities that are centers of industry and commerce, ensuring the stable supply of electric power and improving the reliability of power supply are especially important since they contribute not only to the improvement of the country's climate for investors at home and abroad and the activation of the national and regional economies but also to the improvement of the living environment of the nation.

However, despite the fact that power plants and transmission lines of the national grid system have been continually expanded, the development and expansion of power distribution facilities is left far behind due partly to the shortage of budget that is ascribable to the economic slump in the early 1980s. Therefore, there is no alternative but to continue using obsolescent distribution facilities which have poor supply capacity. Besides, the distribution networks in urban areas have deteriorated markedly because they have been kept in overload operation for many years. In particular, the electrical facilities that were installed right after the independence have become superannuated, causing the incidences of voltage drop, power loss, and unscheduled power stoppage to increase at various parts of the country. This is no small impediment to stable supply and efficient use of electric power.

Japan has helped Tanzania carry out a number of big projects, including the expansion of the power distribution networks in Dar es Salaam City and Kilimanjaro Province. The Japanese cooperation was much appreciated by the Tanzanian government. In particular, the Power Supply Expansion Project that was carried out in Dar es Salaam won high praises as it restored the power distribution system that had apparently been on the verge of disintegration. Under those conditions, the Tanzanian government has requested the Japanese government to conduct the present study.

## 1.2 Purpose, Subject, and Scope of the Study

### 1.2.1 Purpose of the Study

The purpose of the present study, carried out in the three cities of Dar es Salaam, Arusha, and Moshi, is to:

- investigate the present conditions of the power distribution networks and the future plans for development, problems, etc. of the existing networks,
- formulate a five-year master plan and a 10-year master plan to ensure stable supply and efficient use of electric power from a medium- to long-range viewpoint,
- carry out a feasibility study for priority items of the five-year master plan, and
- prepare a plan to reinforce the equipment maintenance capability of TANESCO and provide TANESCO with guidance in equipment maintenance.

The present study is also intended to transfer to the Tanzanian counterpart engineers as much relevant technology as possible.

### 1.2.2 Surveyed Area

The areas covered by the present study are the three cities of Dar es Salaam, Arusha, and Moshi. The electrical facilities investigated are mainly the transmission, substation, and distribution systems of not more than 132 kV.

### 1.2.3 Scope of the Study

The present study is carried out according to the S/W that was signed on October 17, 2000. The scope of the study is shown below.

The Tanzanian government now has plans to reform the railway, communication, and electric power sectors. Therefore, the Team studied the current status, progress, etc. of those plans as well.

#### (1) Master plan study

- (a) Grasping the present conditions of the 11 kV, 33 kV, 66 kV, and 132 kV transmission, substation, and distribution facilities in the above areas and preparing drafts of rehabilitation and expansion plans
- (b) Formulating a power supply plan for each of the above areas (includes review of existing data)
- (c) Grasping the present practice of training of personnel for power transmission and distribution and formulating a plan to promote technology transfer to local areas
- (d) Studying environmental considerations in executing rehabilitation plans
- (e) Conceptual design of planned facilities
- (f) Financial and economic analysis

- (2) Feasibility study
  - (a) Basic design and cost estimation for planned facilities
  - (b) Financial and economic analysis
  - (c) Environmental impact assessment
  - (d) Formulation of execution plan (includes construction plan, financial plan, etc.)
- (3) Study of maintenance center model
  - (a) Grasping the present status of the Dar es Salaam Power Distribution and Maintenance Project (DAMP) that TANESCO is executing with the technical cooperation of Japan, and formulating an improvement plan
  - (b) Preparing a draft of maintenance plan, including technology transfer to and functional enhancement of local maintenance centers, etc., to improve the efficiency of equipment maintenance in local areas.

### 1.3 Outline of Final Report

- (1) Master Plan Study
  - On 1st, 2nd, 3rd on-site survey, the Team investigated existing facilities and proposed sites in each region (Kinondoni North, Ilala, Kinondoni South, Temeke in Dar es Salaam and Arusha and Kilimanjaro) with TANESCO's engineers and surveyors. Through the detailed on-site survey, the Team collected considerable information regarding current condition of power equipment within covered area to achieve the appropriate rehabilitation plan and optimal expansion plan. With the obtained information, the Team formulated rehabilitation plan for heavily deteriorated facilities such as transformers built in 1960's. (See Chap. 5)
  - The Team interviewed with the person of planning department in TANESCO and learned the operated method of electric power demand forecast in Tanzania. The Team also obtained the latest reference index needed for demand prediction and made a forecast of power demand in designated area. The load forecast the Team carried out was based on macroscopic and microscopic method and it was confirmed that both calculations derived similar results. (See Chap. 4)
  - The power system expansion plan was made regarding 3 cities on the basis of power demand forecast. The validity of expansion plan was proved by power flow calculation from 2001 to 2010. (See Chap. 6)
  - In parallel with the master plan study mentioned above, the Team investigated current structural reforming plan in public sector (railroad, telecommunication, power sector and so on) in Tanzania and its progress status. Because of difficulties and problems to be solved for structural reforming, as of September 2001, only the communication sector has been partly privatized. Reforming of other highly public sectors were not going ahead. Before the privatization of TANESCO, the problems such as unsound financial performance, great amount of heavily deteriorated equipment, the shortage of maintenance staff, the securement of publicity and so on shall be solved. (See Chap. 3)
  - The Team made contract with Tanzanian consultant and surveyed financial background of TANESCO. The report from the local consultant shows the TANESCO's structural problems such as the millions of uncollected bills and debt, unstable generation cost because TANESCO relies upon hydro power stations much

more than thermal power stations which are affected by yearly precipitation, although TANESCO is pushing ahead with a large-scale rationalization to achieve privatization. (See Chap. 11)

- Based on the expansion plan formulated in master plan study, the Team took the required reliability in Tanzania and the interface with existing facilities into account and set out the basic design for transmission, substation, distribution equipment installed in designated area. The Team also estimated approximate cost of proposed rehabilitation and expansion plan on the basis of similar project carried out in the past in Tanzania. (See Chap. 7)
- On the basis of an equipment expansion plan which makes unnecessary the load shedding and overload operation of equipment throughout the year (Case-A), we prepared alternative equipment expansion plan which permits a measure of load shedding or overload operation and which puts off the construction of new equipment one to three years to squeeze the initial investment cost (Case-B). Then, we carried out an economic analysis of the two plans. As a result, it was confirmed that Case-B which postpones the entire expansion work for some time would offer a higher economic internal rate of return (EIRR) even when the estimated decrease in revenue due to load shedding was taken into account. The estimated EIRR was about 15% for Dar es Salaam and around 7% for the Arusha and Kilimanjaro area where the density of customers is much lower than in Dar es Salaam (see Chap. 12).

## (2) Feasibility Study

- Of the projects included in the 2002-2010 Master Plan (Case-B), we designated those which were to be carried out during 2002-2003 as priority projects and deferred starting each of the projects until the time when it would be really possible. Then, we prepared an expansion plan for feasibility study (Case-B') taking TANESCO's preference into consideration. Therefore, it is Case-B' that is the conclusive (long-term) master plan in the Study. The 2002-2004 portion of this master plan was labeled the short-term master plan and subjected to a feasibility study (see Chap. 14).
- For the priority projects, the Transmission, Substation, and Distribution Planners of Study Team prepared detailed designs (see Chap. 14).
- The local condition of administration and law regarding environment assessment was surveyed and actual environment assessment method applicable on rehabilitation and expansion project was established. The Team carried out the environment assessment to the typical project in each area by the formulated method. The result shows there is the possibility the problems of the noise and/or landscape may occur on the transmission line construction in urban area, however, these problems would be solved with appropriate route planning, discussion with communities, suitable compensation. On the other hand, no such considerable problems may occur from substation constructions because the scale of constructions are comparatively limited. (See Chap. 9)

## (3) Case Studies of a Model Maintenance Management Center

- On 1st, 2nd, 3rd on-site survey, the Team investigated DAMP and confirmed the current condition of maintenance staff training of TANESCO and the problems TANESCO is facing at.
- The Team interviewed with the engineers in each regional office and was informed



of critical condition of the distribution network management on the front line, their requests for DAMP, the possibility of DAMP function diversion.

- On the basis of survey result, the Team proposed practical way to reinforce maintenance function and agreed with TANESCO regarding revision of DAMP which included separation of construction working department. (See Chap. 8)
- Based on conceptual DAMP improvement plan agreed with TANESCO, the Team designs the Model Maintenance Management Center and training schedule.

**CHAPTER 2**

**GENERAL CONDITION**

**IN**

**TANZANIA**

## CHAPTER 2 GENERAL CONDITION IN TANZANIA

### 2.1 Overview of Tanzania and Its Economy

#### 2.1.1 Nature and Social Situation

##### (1) Land

Tanzania is the largest country in East Africa, with a total land area of 945,037 km<sup>2</sup> consists of mainland and islands include Mafia, Pemba and Zanzibar. It shares borders with Brundi, Kenya, Malawi, Mozambique, Rwanda, Uganda and Zambia, and length of borderlines amount to 3,400 km. The geography of this country can be divided into plains along coast, central plateau and highlands in north and south. The climate varies from tropical along coast to temperate in highlands.

##### (2) Politics

Tanzania is the united nation formed by the union of Tanganyika and Zanzibar in 1964, right after its independence. The sovereignty of Zanzibar is delegated to the federal government in terms of matters concerning the constitution, federal government, diplomacy, national defense, police, citizenship, taxation, aviation, telecommunication, postal services, etc. Other matters in Zanzibar are administrated by the Government of Zanzibar.

The President is the head of Government, and is elected by popular vote for five-year term. Cabinet ministers, including the Prime Minister, are appointed by the president from among the members of the National Assembly. The unicameral National Assembly has 374 seats (232: elected by popular vote, 37: allocated to women nominated by president, 5: members of Zanzibar House Representative). Zanzibar has its own House of Representative and its president who is responsible for matters internal to Zanzibar. The Chama Cha Mapinduzi (CCM) lead by Mr. Benjamin William MPAKA (the current president) has 244 and 34 seats in National Assembly and Zanzibar House of Representative, respectively. Tanzania has been stable politically, and has moved from socialist and centrally planned economy to much more private sector led economy.

##### (3) Population and labor force

The population of Tanzania in 2000 is estimated at 33 million, and 49% of that are males and 51% are females. About 47% of the total population comprise of children less than 15 years. The above estimate is made based on population growth rate of 2.8% p.a. in accordance with the 1988 Population Census. The forth-coming Population Census will be made in 2002. In mainland Tanzania, 99% of the population is native Africans (of which 95% are Bantus consisting of more than 130 tribes) and others are 1% (Asians, Europeans, and Arabians). In Zanzibar, major populations are Arabians, native Africans and mixed Arabian and native African. By religion, in mainland, 45% are Christians, 35% are Muslims and indigenous beliefs are 20%. In Zanzibar, more than 99% are Muslims.

It is estimated that labor force of Tanzania 11.4 million is growing at an annual rate of 2.4% of which 52% are women. Over half of labor force is in the age group of 15 to 29 years. It is estimated that only 8.5% of the labor force has secondary school and above

educational level. The preliminary results of the Labor Force Survey conducted on April, May and June of 2000 shows that unemployment rate was 16%. The problem is more serious in urban areas (32%) as compared to rural areas (9%). More than 80% of people are engaged in agriculture and the largest source of employment is public sector. Since 1994, the Government has continued efforts to create employment opportunities in the private or non-government sectors, as well as to retrench public employees. The number of public servants declined to 259,846 at the end of 1999. Following table shows the number of retrenched public servants.

Table 2.1 Number of public servants cut

Year	Sex	Number	Percent	Total
1993-1996	Female	3,189	28.2	11,310
	Male	8,121	71.8	
1997	Female	3,685	38.15	9,958
	Male	5,973	61.85	
1998	Female	150	26.98	556
	Male	406	73.02	
1999	Female	1,942	43.85	4,429
	Male	2,487	56.15	
Total	Female	8,966	34.55	25,953
	Male	16,987	65.45	

Source: The Economic Survey 1999 (The Planning Commission)

#### (4) Education

The public education system of Tanzania is a so-called 7-4-2-3 system consists of 7 years of primary school, 4 years of secondary school, 2 years of high school and 3 years of college education. The percentage of enrolment in primary school (standard I) in 1999 was 77.8%, and the gender balance for pupil is equal. Teacher/pupil ratio reached 1:40 and varied widely from region to region. In rural areas, due to shortage of teachers, the national standard ratio of 1:45 is not satisfied. Literacy rate (population ages 15 and over can read and write Swahili, English, or Arabic) is estimated at 68% of total population.

#### (5) Infrastructure

##### (a) Railways

The railway system of Tanzania is composed of Tanzania Railway (TR) operated by the Tanzania Railways Corporation (TRC) and a route operated by the Tanzania Zambia Railway Authority (TAZARA; known as Tan-Zam Railway). Railways system links 14 out of 20 regions in Tanzania Mainland, and neighboring countries of Zambia, Democratic Republic of Congo, Burundi, Rwanda, Uganda, and Kenya.

Total length TR is 2,605 km, and TR carried 630 thousands passengers and 1.17 million tons of freight in 2000. TAZARA has a total length of 1,800 km, of which 960 km lies in Tanzania. The total freight carried by TAZARA in 2000 was 638 thousand tons. Total passengers carried in 2000 were 1.6 million. Both TR and TAZARA are facing problem of shortage of locomotives and wagons.

##### (b) Roads

Road transport comprises 70% of the country's surface land transport. Total road length of the country is about 85,000 km. The length of the trunk road is 10,230 km, of which 3,921 km are paved. The transport service of the country is largely provided by

private sector. All Regional Transport Companies (RETCOs) are undergoing the process of privatization to become more viable and profitable. Urban passenger transport services are also dominated by private companies. It is only in Dar es Salaam City where the public Transport Company (UDA) continues passenger transport services along side private companies.

**(c) Harbors**

The Tanzania Harbor Authority (THA) are operating three major ports of Dar es Salaam, Tanga and Mtwara. All inland ports are under the management of Marine Service Company that was established in August 1999. The port of Dar es Salaam is the largest port in Tanzania, and has responsibility for the freight to and from neighboring countries such as Zambia, Burundi, Rwanda and Uganda. The Dar es Salaam Port has an annual capacity of 3.1 million tons normal cargo, 6.0 million tons of fuel cargo and 1.0 million tons of container.

**(d) Airways**

Air transportation, especially for the movement of passengers, is important for the Tanzania because population is scattered over the vast area of the country. International airports are located in Dar es Salaam and Kilimanjaro. Beside these, Tanzania has 11 airports with paved runways. The number of landing of aircraft in 2000 was 51,960 (increased by 27% from previous year).

In Tanzania, air transport sector is also liberalized, and the monopoly of ATC is no longer there. Currently, there are more than 20 private air transportation companies including Eagle Air, Precision Air, Regional Air Service Ltd. and Coastal Travel Ltd. In 2000, a number of domestic.

**(e) Telecommunications**

In 2000, the telephone exchange capacity of Tanzania increased by 11.6% in comparison with previous year and to 233,843 lines. Although telephones including mobile phones are penetrated rapidly, number of telephone lines per 100 people is less than 0.5. Internet is also becoming popular in recent years. It is reported that the numbers of Internet Service Providers (ISPs) and Internet users in year of 2000 are 6 and 25,000, respectively.

**(f) Health and sanitation**

Contagious diseases, malnutrition, and ailments related to childbirth are the largest health problems in Tanzania like other African countries. The average life expectancy at birth is about 52 years (51 years for male and 53 years for female), and infant mortality rate is 79.4 death per 1,000 live births. Although the most widespread and serious disease is malaria, HIV/AIDS is becoming serious problems in recent years. The number of carrier of HIV/AIDS virus is 1.3 million or 8% of adult (1999 estimate).

**(g) Water supply and sewerage**

Although the Government is making efforts to expand water supply system, in rural areas, the population receiving water supply is less than 50% due to the lack of budget. Even in urban area, delivery of clean and safety water is only to the 68% of the population. It is estimated that only 7% of the urban houses are connected with piped sewerage system. Many of houses in urban area are using pit latrines or toilets connected to septic tanks. On the other hands, sewerage system were constructed a

long time ago, and leaked sewage from the system causes environmental problems including pollution of groundwater.

## 2.1.2 Economic Situation

### (1) Overview of Tanzania's economy

Tanzania is ranked in LLDC countries. A GDP per capita in 2000 is about 261 dollars, and majorities of Tanzanians live below the poverty line as defined by the UN of \$1.00 per day. The economy of the country depends heavily on agriculture, and the share of agriculture in GDP, export and labor force are 50%, 85% and 80%, respectively.

Under the guidance and assistance of the World Bank and IMF, the rehabilitation of the economy is proceeding. In recent years, the economy of the country is becoming better gradually. For example, economic growth higher than an increase in population has been achieved in recent years. The actual GDP growth rate was 4.9%, a rate higher than 4.7% of the previous year. The sectors contributed to the growth were agriculture. Tables 2.2 and 2.3 show changes in GDP and contribution of sectors to overall GDP, respectively. As shown in Fig. 2.1, under the control of money supply and expenditure restraining policies, the rate of inflation is declining.

### (2) National Finance

In July 1998, the sales tax was replaced by the value-added tax (VAT). An introduction of VAT is contributing to improve tax collection performance, and tax revenue is increasing. However, government expenditure is increasing at higher rates than revenue, and deficits are increasing. The deficits are covered by foreign assistance and borrowing in the country. Tables 2.4 and 2.5 show trends of national finance and breakdown of government expenditure, respectively.

## CHAPTER 2 GENERAL CONDITION IN TANZANIA

Economic Activity	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Agriculture	604.9	612.4	631.4	644.7	682.2	708.7	726.1	739.9	770.5	796.8
Mining and Quarrying	12.5	13.5	14.6	16.8	18.8	20.5	24.	30.0	33.5	38.1
Manufacturing	109.0	104.6	105.2	105.0	106.8	111.9	117.5	126.9	131.5	137.8
Electricity and Water	20.0	19.8	19.9	20.3	21.6	24.0	24.5	25.9	268.7	28.2
Construction	65.0	68.9	59.0	59.8	51.0	54.9	59.3	65.2	70.9	76.8
Trade, Hotel and Restaurant	203.6	202.2	201.4	203.7	210.8	218.1	229.1	239.8	254.1	270.6
Transport and Communication	58.0	66.2	66.3	66.9	70.8	71.6	75.1	79.8	84.4	89.5
Financial and Business Services	123.3	128.0	134.1	137.7	138.5	139.1	149.8	158.1	164.6	172.3
Public Services	111.2	117.4	112.9	112.8	109.8	111.5	115.0	118.1	122.2	126.6
Less Financial Services indirectly measured	▲54.4	▲57.0	▲63.8	▲68.8	▲65.1	▲58.6	▲72.3	▲78.5	▲81.2	▲82.4
Total	1,253.1	1,275.9	1,281.0	1,298.9	1,345.2	1,401.7	1,448.2	1,506.8	1,577.3	1,654.4
Growth Rate	2.8%	1.8%	0.4%	1.4%	3.6%	4.2%	3.3%	4.0%	4.7%	4.9%

Source: The Economic Survey 1999 (The Planning Commission)  
The Economic Survey 2000 (The Planning Commission)

Economic Activity	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Agriculture	48.3	48.0	49.3	49.6	50.7	50.6	50.1	49.1	48.9	48.2
Crops	35.7	35.3	36.3	36.5	37.7	37.6	37.3	36.5	36.4	35.7
Livestock	6.7	6.7	6.9	6.9	6.8	6.7	6.7	6.6	6.5	6.4
Forestry and Hunting	3.2	3.2	3.3	3.3	3.3	3.3	3.2	3.1	3.1	3.1
Fishing	2.7	2.8	2.9	2.9	2.9	2.9	3.0	2.9	2.9	3.0
Mining and Quarrying	1.0	1.1	1.1	1.3	1.4	1.5	1.7	2.0	2.1	2.3
Manufacturing	8.7	8.2	8.2	8.1	7.9	8.0	8.1	8.4	8.3	8.3
Electricity and Water	1.6	1.5	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7
Construction	5.2	5.4	4.6	4.6	3.8	3.9	4.1	4.3	4.5	4.8
Trade, Hotel and Restaurant	16.2	15.8	15.7	15.7	15.7	15.6	15.8	15.9	16.1	16.4
Transport and Communication	4.6	5.2	5.2	5.1	5.3	5.1	5.2	5.3	5.4	5.4
Financial and Business Services	9.8	10.0	10.5	10.6	10.3	9.9	10.3	10.5	10.4	10.4
Public Services	8.9	9.2	8.8	8.7	8.2	8.0	7.9	7.8	7.7	7.7
Less Financial Services indirectly measured	▲4.3	▲5.5	▲5.0	▲5.3	▲4.8	▲4.2	▲5.0	▲5.2	▲5.1	▲5.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: The Economic Survey 1999 (The Planning Commission)  
The Economic Survey 2000 (The Planning Commission)

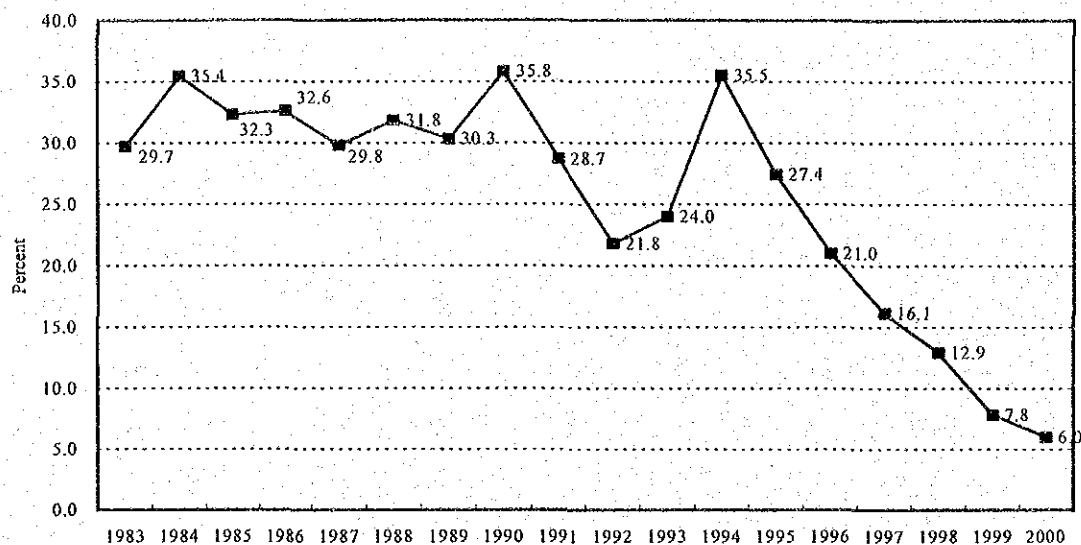


Fig. 2.1 Change in inflation rate

Source: The Economic Survey 2000 (The Planning Commission)

Table 2.4 Trends of National Finance

(Unit: Billion TSch)

Year	1996/97	1997/98	1998/99	1999/00	2000/01
	Actual	Actual	Actual	Actual	Budget
<b>A. Domestic Revenue</b>	<b>572.0</b>	<b>627.5</b>	<b>689.3</b>	<b>777.6</b>	<b>861.4</b>
1. Tax Revenue	505.4	586.2	616.3	685.1	772.6
Import and Excise Duty	176.8	187.4	172.0	178.0	255.8
Sales Tax	115.3	145.4	0.0	0.0	0.0
Value Added Tax	0.0	0.0	208.6	222.3	263.9
Income Tax	125.7	157.0	162.4	209.7	167.9
Other Taxes	87.6	96.5	73.4	75.1	85.0
2. Non-Tax Revenue	66.7	41.3	73.0	92.5	88.8
<b>B. Total Expenditure</b>	<b>730.9</b>	<b>856.2</b>	<b>927.7</b>	<b>1168.8</b>	<b>1,394.6</b>
<b>C. Surplus/Deficit (A - B)</b>	<b>▲158.8</b>	<b>▲228.7</b>	<b>▲238.4</b>	<b>▲391.1</b>	<b>▲533.2</b>
<b>D. Financing</b>	<b>158.8</b>	<b>237.1</b>	<b>201.5</b>	<b>476.0</b>	<b>533.2</b>
1. External Sources	177.5	256.2	223.8	468.1	518.2
Grants	115.4	119.4	169.9	280.3	366.3
Import Support/OGL Loan	47.1	80.1	36.6	54.8	72.3
Project Loans	15.0	56.8	17.2	133.0	79.6
Amortization	0.0	0.0	0.0	▲82.4	0.0
2. Internal Sources	▲18.7	▲19.2	▲22.3	7.9	15.0
Non-Bank Borrowings	4.3	27.3	7.7	7.7	0.0
Bank Borrowings	▲47.7	▲23.6	8.0	0.2	▲0.0
Proceed from Privatization	24.7	0.0	7.0	0.0	15.0
Adjustment to Cash	0.0	▲22.8	▲45.0	0.0	0.0

Source: The Economic Survey 2000 (The Planning Commission)

Table 2.5 Government Expenditure by Purpose

(Unit: Billion TSch)



## CHAPTER 2 GENERAL CONDITION IN TANZANIA

Year	1996/97 Actual	1997/98 Adjusted	1998/99 Adjusted	1999/00 Adjusted	2000/01 Estimate
1. General Public Service	151.0	255.3	269.8	280.1	304.4
2. Defense Affairs and Service	52.8	77.2	82.6	88.7	106.7
3. Public Order and Safety	46.9	27.7	34.7	46.1	74.6
4. Education Affairs and Service	72.1	47.2	54.1	160.2	277.91
5. Health Affairs and Service	26.5	36.7	45.5	63.6	76.4
6. Social Security and Welfare Affaires and Safety	1.3	16.7	14.2	21.0	26.7
7. Housing and Community Amenity Affairs and Service	17.7	12.5	39.2	36.7	46.0
8. Recreational, Cultural & Religious Affairs & Service	7.7	1.0	1.4	1.5	1.2
9. Fuel and Energy Affairs and Service	0.5	10.9	15.6	22.2	2.4
10. Agriculture, Forestry, Fishing & Hunting Affairs & Service	13.5	24.3	42.5	46.1	37.9
11. Mining, Mineral, Manufacturing & Construction Affairs & Service	30.2	1.5	9.5	7.4	7.6
12. Transportation & Communication Affairs and Service	33.8	35.8	78.8	90.1	80.7
13. Other Economic Affairs & Service	11.7	22.3	37.0	50.6	23.0
14. Other	N.A.	246.5	208.5	265.7	323.4
Total	730.9	815.8	933.3	1,180.0	1,465.5

Source: The Economic Survey 1999 (The Planning Commission)  
The Economic Survey 2000 (The Planning Commission)

### (3) Industrial trends

#### (a) Agriculture

In 2000, agricultural sector contributing about 50% to the GDP grew by 3.4% in real term, a rate lower than 4.1% of previous year. This was attributed to a decreased production of food crops under a short rainfall in some regions including Kilimanjaro, Arusha and Singida. The national goal of self-sufficiency in food was not attained because mainly of decline production of maize. A production of coffee; one of the most important export commodities; decreased by 0.4% from 48,000 tons in 1999 to 47,800 in 2000. It is estimated that about 400,000 farmers are directly involved in coffee production, while another 1.78 million peoples are employed in activities related with coffee industry. Productions of cash crops other than coffee in 2000 were same level or decreased some extent comparing with previous year. Tables 2.6 and 2.7 show production of cash crops and food crops, respectively.

CHAPTER 2 GENERAL CONDITION IN TANZANIA

Table 2.6 Production of Cash Crops (Unit: Thousand Tons)

Crop	1994/95	1995/96	1996/97	1997/98	1998/99	2000*
Coffee	43,989	55,000	34,117	38,000	42,700	47,811
Cotton	126,094	251,171	253,300	208,200	105,400	188,643
Sisal	34,498	38,000	20,542	15,300	24,000	20,584
Tea	16,572	23,000	19,767	26,200	25,000	24,584
Cashew-nuts	60,000	81,729	65,100	99,000	110,000	188,643
Tobacco	22,110	28,370	35,400	52,000	37,800	26,488
Sugar	104,624	116,810	116,100	111,040	116,930	132,000

Source: The Economic Survey 1999 (The Planning Commission)

The Economic Survey 2000 (The Planning Commission)

Note: \* figure in calendar year 2000

Table 2.7 Production Food Crops (Unit: Thousand Tons)

Crop	1994/95	1995/96	1996/97	1997/98	1998/99	2000*
Maize	2,567	2,663	2,387	2,685	2,805	2,128
Paddy	262	339	235	788	865	576
Wheat	75	84	79	53	69	32
Millet/ Sorghum	665	629	655	702	743	771
Cassava	1,992	1,498	1,426	2,048	2,209	1,440
Beans	166	196	147	506	570	584

Source: The Economic Survey 1999 (The Planning Commission)

The Economic Survey 2000 (The Planning Commission)

Note: \* figure in calendar year 2000

**(b) Manufacturing**

Manufacturing sector grew by 4.8% in 2000, higher rate than 3.6% in 1999. This change was attributed to the completion of rehabilitation of privatized manufacturing industries. However, the production in some industries including basic metals, dry cell batteries, cigarettes, fish-ropes and sisal ropes are still lower than available capacity. The major industries of the country are light industries such as food, beverage, textiles and garment, and leather allied manufacturing. A contribution of these industries to value-added in manufacturing sector was about 53%. As for a type of products, consumer goods accounts 65% to total value-added, with intermediate goods adding 25%, whilst capital goods contributing 10%. In 2000, 191 projects were approved by the Tanzania Investment Center (TIC), and 65 projects were manufacturing industries. Out of the total manufacturing projects, 45 projects were located in Dar es Salaam. Table 2.8 shows production of major industrial products of the country.

Table 2.8 Production of Major Industrial Products

Item	Unit	1996	1997	1998	1999	2000
Cement	000 ton	726	621	778	883	833
Iron Sheet	Ton	7,733	12,498	9,522	9,482	11,182
Corrugated Iron	Ton	6,422	15,218	14,918	23,028	25,046
Petroleum Products	000 ton	336	313	312	287	177
Aluminum	Ton	360	117	180	187	133
Wood Products	000 ton	315	115	0	1,953	568
Cigarette	Million	3,733	4,710	3,933	3,371	3,745
Textiles	000 m <sup>2</sup>	33,178	41,706	45,546	49,757	73,566
Sisal Ropes	Ton	11,178	4,919	4,329	3,253	3,900
Beer	000 Ltr	125,074	148,340	170,700	167,478	183,003
Wheat Flour	Ton	33,998	77,598	87,669	144,693	162,634

Source: The Economic Survey 2000 (The Planning Commission)

### (c) Mining

Mining sector is developing rapidly, under the active investment of foreign companies. It is reported that 50 foreign companies have taken 500 prospecting licenses and have invested around 300 million dollars from 1995. Major targets are gold and base metals (nickel, Copper and Cobalt). Production and/or exploration of other minerals including diamond, gem stones, coal, soda ash and uranium are also conducted. In 1998/99, two gold mines; Golden Pride and Ashanti) came on stream. In April 2001, AngloGold South Africa acquired 50% interest in Ashanti Gold Geita Project. Anglo America is doing feasibility study of nickel/copper/cobalt project. Table 2.9 shows production of major mining products.

Table 2.9 Production of Major Mining Products

Item	Unit	1996	1997	1998	1999	2000
Diamond	Carat	126,670	123,090	97,830	235,000	354,388
Gold	kg	318	323	427	4,767	15,060
Gemstones	kg	142,160	509,489	48,518	95,200	150,000
Salt	ton	86,700	72,511	75,000	35,000	70,000
Phosphate	ton	717	2,120	1,431	7,250	5,100
Limestone	000 ton	1,200	1,282	1,181	1,241	1,500
Tin Ore	ton	n.a.	n.a.	n.a.	n.a.	n.a.
Gypsum	ton	55,430	46,320	59,066	40,000	60,000
Coal	ton	52,000	28,448	45,073	75,044	79,184
Pozolana	ton	n.a.	n.a.	n.a.	2,274	n.a.
Kaolin	ton	1,332	898	n.a.	n.a.	n.a.

Source: The Economic Survey 2000 (The Planning Commission)

Note: Carat = 0.205 grams

### (d) Energy

Tanzania has abundant identified energy sources including hydropower, natural gas, coal, solar energy and geothermal. However, a share of commercial energy such as petroleum products, electricity and coal are very low, and biomass based energy contributes more than 90% of total energy consumption. Charcoal is sold in urban areas and cutting trees for a production of coal causes a serious environmental degradation. In 2000, petroleum sector was liberalized, and 21 companies were licensed to sale petroleum products.

After an abolishment of subsidies, the price of petroleum products was set by taking into account the cost. The prices of petroleum products rose in 2000 as compared with 1999. This trend was caused mainly by the rise of crude oil price from about US\$ 12 per barrel in 1999 to US\$ 26.5 per barrel in 2000. A privatization of the oil refinery, which was closed by the Government, is investigated by PSRC. The government continued the efforts to enhance the exploration of oil to reduce dependence on imported oil.

#### (4) Balance of international payments

As shown in Table 2.10, Tanzania has recorded deficit in trade balance, service balance and total balance. The amount of export is still as low as one third of the amount of import, and large amount of deficit in trade is the structural problems of the Tanzanian economy. As shown in Table 2.11, major export commodities are cash crops (7 cash crops; coffee, cotton, sisal, tea, tobacco and cashew nuts), and contribution of them to total export is about 50%. As for non-agricultural commodities, exports of mining products are increasing, while exports of industrial products are decreasing. Major export partners are India (20%), UK (10%), Germany (8%), Japan (8%), and Holland (8%). As for import, major partners are South Africa (8%), Japan (8%), UK (8%), Kenya (7%) and India (6%).

Item	1995 Actual	1996 Actual	1997 Actual	1998 Actual	1999 Actual	2000 Estimate
Good Balance	▲657.6	▲448.8	▲395.4	▲777.5	▲824.9	▲672.8
Export (fob)	682.9	763.8	752.6	588.5	543.3	662.1
Import (cif)	1340.5	1,212.6	1,148.0	1,366.0	1,368.2	1,334.9
Service Balance	▲216.9	▲278.8	▲306.4	▲452.6	▲226.8	▲95.8
Receipts	582.9	537.1	493.8	537.0	648.8	663.7
Payments	799.8	815.9	800.2	989.6	873.2	759.5
Income	▲110.3	▲72.0	▲122.8	▲124.2	▲75.4	▲93.9
Receipts	31.8	41.5	44.9	48.3	56.1	63.0
Payments	142.1	113.5	167.7	172.5	131.5	156.9
Current Transfer	338.4	338.4	269.5	407.7	333.7	347.9
Inflows	370.7	370.7	337.2	448.1	457.0	424.7
Outflows	32.3	32.3	67.7	40.4	123.3	78.8
Current Account	▲646.4	▲461.2	▲555.1	▲946.6	▲793.4	▲514.8
Capital Transfer	191.0	191.0	166.8	276.0	322.5	330.4
Inflows	191.0	191.0	166.8	276.0	322.5	330.4
Outflows	0.0	0.0	0.0	0.0	0.0	0.0
Financial Account	139.5	0.3	▲136.4	97.0	177.2	22.2
Errors and Omissions	▲70.1	25.0	▲31.5	▲42.1	▲79.0	▲174.9
Overall Balance	▲386.0	▲245.0	▲556.1	▲615.7	▲372.7	▲336.9

Source: The Economic Survey 2000 (The Planning Commission)

Item	1995	1996	1997	1998	1999	2000
<b>Traditional Commodities</b>						
Coffee	142.6	136.1	119.3	108.7	76.6	83.7
Cotton	120.2	125.3	130.4	47.6	28.3	38.0
Sisal	6.3	5.3	9.1	6.8	7.3	5.6
Tea	23.4	22.5	31.8	30.4	24.4	32.7
Tobacco	27.1	49.2	53.6	55.4	43.4	38.4
Cashew Nuts	64.0	97.8	91.1	107.3	100.9	84.4
Croves	-	-	-	-	19.9	10.0
Sub-total	383.6	436.3	435.3	356.3	301.2	292.8
<b>Non-traditional Commodities</b>						
Petroleum Products	11.0	15.8	7.1	0.1	0.4	0.0
Minerals	44.9	55.9	51.1	26.4	73.3	177.4
Manufactured Goods	109.3	122.8	111.3	35.7	30.1	43.1
Others	134.3	133.0	147.7	170.1	138.4	143.8
Sub-total	299.4	327.5	317.2	232.2	242.2	369.3
<b>Grand Total</b>	<b>682.9</b>	<b>763.8</b>	<b>752.6</b>	<b>588.5</b>	<b>543.3</b>	<b>662.1</b>

Source: The Economic Survey 2000 (The Planning Commission)

Huge amount of external debt and debt reduction are one of the most important issues for the Government of Tanzania. In 1996/97, total external debt of the country amounted to US\$ 8 billion compared with US\$ 196 million in 1970. Under the Paris Club Agreement, from 1996 to 1997, Tanzanian Government benefited debt cancellation of US\$ 523.8 million and rescheduling of US\$ 3,537 million. However, total debt at December 2000 was US\$ 7.6 billion, and per capita external debt for a Tanzanian is about 260 dollars. This implies that per capita external debt is higher than per capita GDP (about US\$ 256). In June 1999, the Group of Seven rich countries (G-7) adopted a new initiative in debt relief for highly indebted developing countries, namely Enhanced Highly Indebted Poor Countries Initiative (HIPC). The World Bank and IMF endorsed the initiative in September 1999. Under the Enhanced HIPC, the Tanzanian Government has been executing structural reform programs including deregulation and privatization of public corporations.

#### (5) Structural reform

Under the guidance of the World Bank and IMF, the Government of Tanzania has been making effort for structural reform. In 1992, the new Public corporation Act was established to legalize private participation public ownership or to provide for the Government to divest the ownership of business enterprises. Under the above Act, Privatization Sector Reform Commission (PSRC) was established. As of September 2001, a total number of privatized public enterprises was 124. Many privatized firms are contributing the Government in the form of taxes, increased production of quality goods and services, creation of more employment opportunities, and introduction of advanced technology. As for the telecommunication sector (Tanzania Telecommunication Company Limited; TTCL), Detecom (Germany) and MSI (Netherlands) purchased 35% shares of TTCL. The petroleum sector was fully liberalized and subsidies were removed by October 2000. In banking sector, ABSA Banking Group of South Africa purchased 70% share of the National Bank of Commerce in 1997. Further, hotels including New Africa Hotel and Bahari Beach Hotel have been privatized. Privatization of utility and transportation sectors shown below is planned or underway.

- Dar es Salaam Water and Sewage Authority (DAWASA, considering 10 years lease)
- Tanzania Harbor Authority (THA; excluding Container Terminal which was already been leased)
- Remaining state-own shares of Tanzania Telecommunication Company Limited (TTCL)
- Tanzania Railway Corporation (TRC; reformed by long term lease)
- Air Tanzania Corporation (ATC; at bidding stage)
- Tanzania Electric Power Company (TANESCO)

Eight airline companies; Kenya Airways, South African Airways, Comair (South Africa), Nationwide (South Africa), Gulf Air Falcon (UAE), Aero Asia International (Pakistan), Air Consult International (Ireland) and Precision Air (Tanzania); have expressed interest, and will submit bids to own up to 75% stake of ATC.

The divestiture of the TRC is underway, and four companies; Great Lake Railways of South Africa, Genesee and Wyoming Inc. of USA, CANAC of Canada and SNFC of France; were short-listed to bid for the concession of TRC. However, it is reported that the bid will be delayed due to the railway accident on 24<sup>th</sup> June 2002.

## 2.2 Projects Related to National Development

### 2.2.1 Tanzania Development Vision 2025

In 1999, the Government adopted "Tanzania Development Vision 2025," which is the government's basic policy on development up to the year 2025. The ultimate goal of this basic policy is to graduate from the least developed country to a middle-income country by 2025. As measures to attain that goal, the government clearly states "change of low productive agricultural economy to semi-industrialized one" and "change of policy and economic system from the state control system in the past to that depending on the market and the private sector". The objectives of Vision 2025 are as follows.

#### (1) High quality livelihood

- Food self-sufficiency and food security.
- Universal primary education (eradication of illiteracy and the attainment of a level of tertiary education)
- Gender equality and the empowerment of women in all socio-economic and political relations and cultures.
- Access to quality primary health care for all.
- Access to quality reproductive health services for all individuals of appropriate ages.
- Reduction in infant and maternal mortality rates to 20 deaths per 1,000 births from the current 85 deaths.
- Universal access to safe water.
- Life expectancy comparable to the level attained by typical middle-income countries.
- Absence of abject poverty

#### (2) Good governance and rule of laws

- Desirable moral and cultural uprightness.
- Strong adherence to and respect for the rule of law
- Absence of corruption and other vices.

**(3) Strong and competitive economy**

- A diversified and semi-industrialized economy with a substantial industrial sector
- Macroeconomic stability manifested by a low inflation economy and basic macroeconomic balances.
- A growth rate 8% per annum or more.
- An adequate level of physical infrastructure required for economic development
- An active and competitive players in the regional and world markets, with the capacity to articulate and promote national interests and to adjust quickly to regional and global market shifts.

**2.2.2 Invitation of Private Enterprises**

In 1997, the government revised the National Investment Act and simplified the necessary formalities for investment with the aim of increasing direct investment by business enterprises at home and abroad. At the same time, the government equipped the Tanzania Investment Center (TIC) with 'one-stop center' function to speed up the formalities. As a result, the time required for an applicant to obtain a permit was curtailed from 100 days in 1997 to 14 days in 2000 on average. The direct investment in Tanzania is steadily increasing thanks mainly to the fact that Tanzania is politically stable as compared with its neighboring countries and that incentives includes reduction or exemption of taxes are provided to priority projects. In 2000, TIC approved 66 projects worth about 639 billion Tsh. Out of those projects, 41 were by foreign investors and 66 were joint ventures promoted by foreign and local investors. There are two fields of priority investment that are given the above incentives.

**- Lead sectors**

Mining, Infrastructure (e.g. Road Construction, Bridges, Railway, Airports, Generation of Electricity, Telecommunication, Water Services, Back up Services to Mining) and Export Processing Zones

**- Priority areas**

Agriculture including Livestock; Air aviation; Commercial buildings; Development and Microfinance banks; Export processing; Geographical special development areas; Human resources development; Manufacturing; Natural resources including fishing; Rehabilitation & expansion; Radio & Television Broadcasting; Tourism and Tour Operations

**2.3 Energy Supply and Demand**

Although Tanzania has abundant energy such as biomass, natural gas, hydropower, coal, geothermal power, solar energy, and wind power, many sources of energy are not yet developed. The primary energy supply in Tanzania is about 15 million tons oil equivalent (toe), and is dominated by renewable energy such as firewood and charcoal with account for 93.8%. Petroleum and hydropower account for 4.9% and 1.2%. The primary energy consumption per person is 0.45 toe, about 1/9 of that in Japan.

The consumption of petroleum, which is the second most important commercial energy next to electric power, is about 750,000 tons/year. The major consumer of petroleum is the transportation sector. In Tanzania, there is an oil refinery (capacity: 17,500 bbl/day) owned by The Tanzania Italian Petroleum Refining Co., Ltd. (TIPER) whose stock is equally shared by the Tanzanian government and AGIP of Italy. However, this refinery was closed in November 1999. Since then, Tanzania has been dependent entirely on imports for petroleum. Petroleum imports, and petroleum

prices, have been liberalized completely. As of the end of 2000, there were 21 companies distributing and selling petroleum. PSRC is considering the privatization of the above refinery.

Concerning coal, it is estimated that there are 1,200 million tons of coal reserves in the western and southwestern parts of the country. However, only a small amount of coal is produced and consumed in Tanzania. Coal production in 2000 was about 80,000 tons, 42,000 tons of which were used to generate electricity at Kiwara Coal Mine. The remainder was consumed mostly in cement plants, and coal was not used as a domestic fuel. The amount of electricity generated at Kiwara Coal Mine in 2000 was about 31 GWh. The mine consumed 8 GWh for own use and remaining amount (23 GWh) were sold to TANESCO.

## **2.4 Energy Resources and Development Projects**

The basic energy policy of the Tanzanian government is to develop domestic energy resources and reduce dependence on imported energy (petroleum and petroleum product, in particular) and thereby improve the balance of payments. Therefore, the Government has been continuing its efforts of enhancing exploration and development of oil and gas in cooperation with foreign companies.

### **2.4.1 Natural Gas**

The natural gas reserves in Tanzania are estimated to be 2 trillion cubic feet. At present, the Songo Songo Gas-to-Electricity Project, in which natural gas transported from Songo Songo Island (estimated reserves: 1 trillion cubic feet) in the southern part of Tanzania to Dar es Salaam by a pipeline is use for power generation and as a raw material for industrial products is under way. This project consists of developments of two onshore gas fields and three offshore gas fields, and constructions of two gas processing plants, a 14-inch pipeline (25 km from Songo Songo to Somanga Funga), a 12-inch pipeline (207 km from Somanga Funga to Dar es Salaam) and a 115 MW thermal power plant. In 2000, IFC (an organization under the World Bank which had been cooperating in the project), TCPL Tanzania Limited (a wholly-owned subsidiary of Transcanada Pipeline Ltd. which had been the main sponsor from the very beginning), and DEG (an investment company of Germany) withdrew from the project. However, the project has been propelled by AES Sirocco of the U.S., Pan African Energy of Mauritius, CDC of the U.K., European Investment Bank (EIB), TANESCO, and Tanzania Petroleum Development Corporation (TPDC). Although the future schedule depends on when the necessary loan is granted, they plan to start construction of the pipelines in 2002 and transport natural gas to Dar es Salaam by the end of 2003.

Although natural gas fields have also been discovered in Mnazi Bay, there is no specific development plan of this gas field.

### **2.4.2 Petroleum**

The history of exploration and development of petroleum and natural gas resources in Tanzania dates back to 1952, when BP and Shell obtained the concession of development. At present, several foreign companies, including Dublin International Petroleum Limited (Canada), CANOP (Canada), and Ndovu Resources (Australia) are continuing research and exploration under a production sharing agreement with TPDC. However, they have not yet discovered any promising fields.



### 2.4.3 Other Energy Resources

Concerning renewable energies such as solar, wind power and geothermal, they are still in the stage of research and development under the financial assistance of African Development Bank (AfDB), and none of them have been put into practical use.