

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

DAR ES SALAAM CITY COMMISSION
THE UNITED REPUBLIC OF TANZANIA

**THE STUDY
ON
THE SOLID WASTE MANAGEMENT
FOR
DAR ES SALAAM CITY**

**FINAL REPORT
VOLUME III**

MAIN REPORT FOR THE FEASIBILITY STUDY

SEPTEMBER 1997

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PREFACE

In response to the request from the Government of the United Republic of Tanzania, the Government of Japan decided to conduct the Study on the Solid Waste Management for Dar es Salaam City in the United Republic of Tanzania and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Tanzania a study team headed by Mr. Susumu Shimura, KOKUSAI KOGYO CO., LTD., three times between February 1996 to August 1997.

The team held discussions with the officials concerned of the Government of Tanzania, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the United Republic of Tanzania for their close cooperation extended to the team.

September, 1997



Kimio Fujita
President

Japan International Cooperation Agency

September 1997

Mr. Kimio Fujita
President
Japan International Cooperation Agency

Dear Mr. Fujita

Letter of Transmittal

We are pleased to submit to you the report on the study of Solid Waste Management for Dar es Salaam City in the United Republic of Tanzania.

This report contains the urban environment sanitation study, the solid waste management master plan until the year 2005 and the feasibility study on the first priority projects which cover 39 wards in Dar es Salaam.

The urban environment sanitation study identified the importance of solid waste management in various public services after assessing the present sanitary condition of Dar es Salaam.

The master plan comprises the forecast of future waste generation, planning framework with phased goals / targets / strategies, technical system and institutional system. Since the improvement of the institutional system is required to materialize the master plan and to establish a sustainable solid waste management system, eight items proposed on improvement of the institutional system, including establishing the independent solid waste management authority, were recommended.

The feasibility study was conducted on the first priority project consisting of improvement of refuse collection and transportation system, construction of the new Kunduchi disposal site, improvement of the maintenance workshop, etc. The project was evaluated from financial, economical, technical, social and environmental views. It found it would be feasible in all aspects.

Four pilot projects were conducted during the study. One of them, the enhancement of public awareness which was so called "Beautify Your City" campaign provoked response from many citizens.

We wish to take this opportunity to express our sincere gratitude to your Agency, the Ministry of Foreign Affairs, the Ministry of Health and Welfare and the Environmental Agency. And in the United Republic of Tanzania, we also wish to express our deep gratitude to the Prime Minister's Office, Dar es Salaam City Commission, the Embassy of Japan and the JICA office in the United Republic of Tanzania.

Finally, we hope that this report will help to enhance the solid waste management and the urban environment sanitation in Dar es Salaam

Respectfully,



Susumu Shimura
Team Leader
The Study of the Solid Waste Management
for Dar es Salaam City in the United
Republic of Tanzania

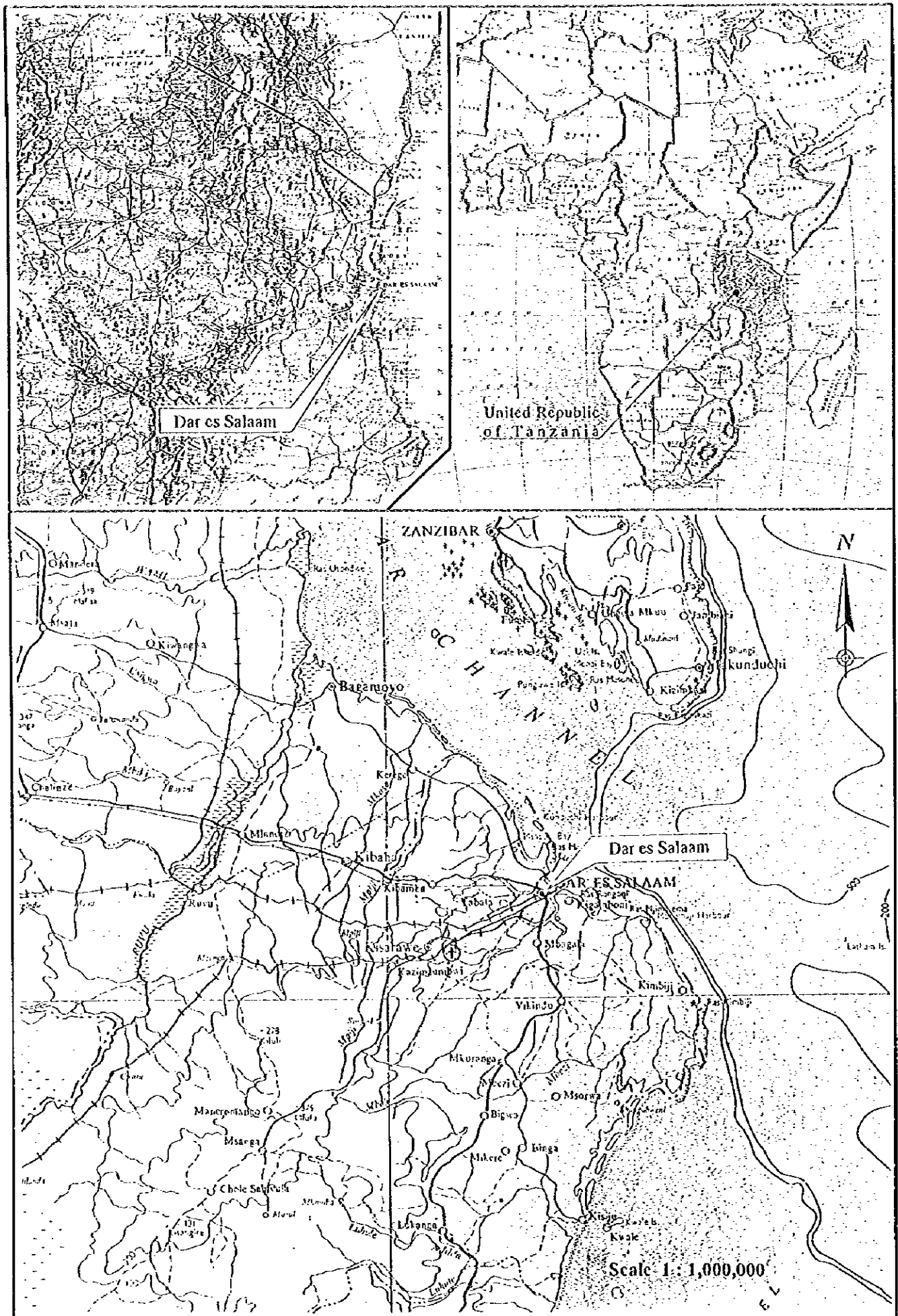
**The Study on
The Solid Waste Management for
Dar es Salaam City**

List of Volumes

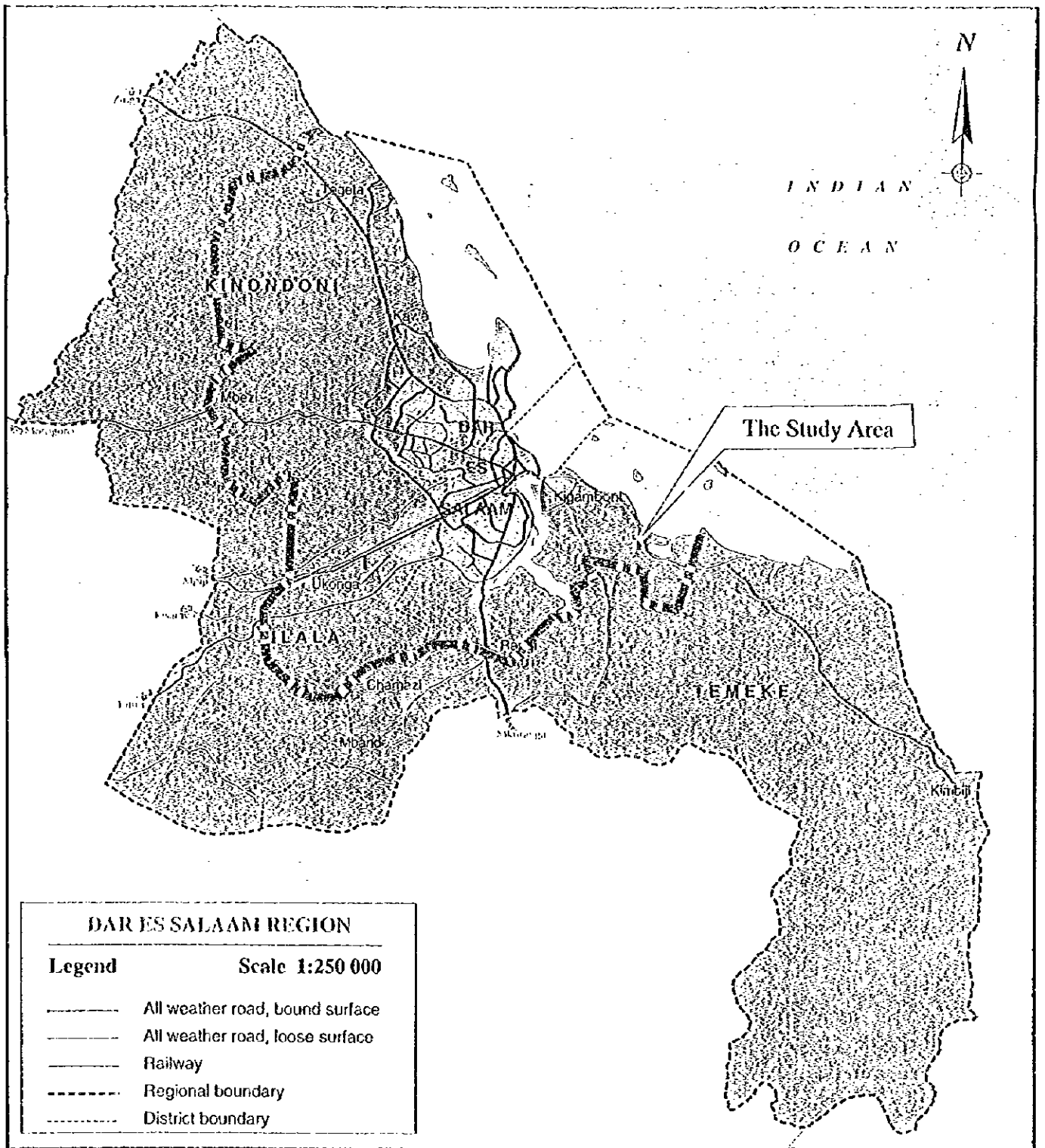
- Volume I Executive Summary
- Volume II Main Report for the Master Plan
- Volume III Main Report for the Feasibility Study
- Volume IV Annex
- Volume V Data Book

This is the Main Report for the Feasibility Study.

In this report, the project cost is estimated using the February 1997 price and at an exchange rate of 1US\$ = 120.85 Japanese Yen = 597.8 Tanzanian Shilling



Map 1 : The Location Map of the Study Area



Map 2 : The Location Map of the Study Area

Plate 1 : Pilot Project The "Beautify Your City" Campaign (1)



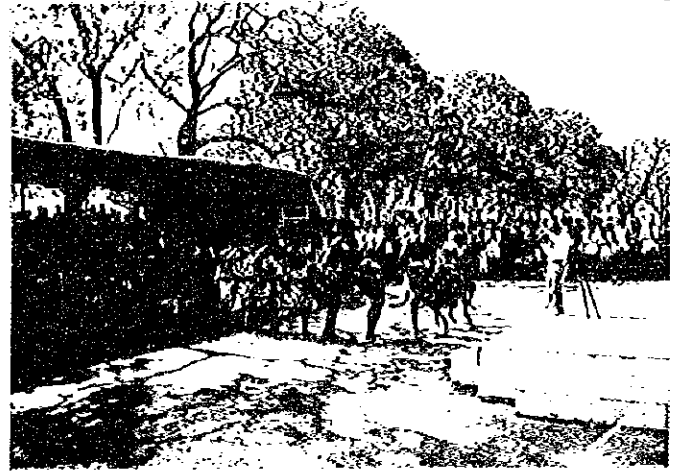
Banner showing "Beautify your city", the catchphrase for the campaign.

The "Beautify Your City" campaign, aiming at public education and awareness, was held during February, with most of the pilot project being conducted within this month. This was advertised in the mass media (television, newspapers) including some newspaper articles and using 16,000 stickers, 300 T-shirts, 20 street banners and a competition for the 100 best posters.

Program	Events
Public Awareness	Beautify DSM month 10 km Race
Adult Education	Educational Cultural Show on SWM by the Tanzanian Culture Group Cinema Show on SWM
Primary School Education	Production of books for primary School Students about SWM Trial Lessons on SWM to Primary School students Seminar for Primary School Teachers Poster Competition



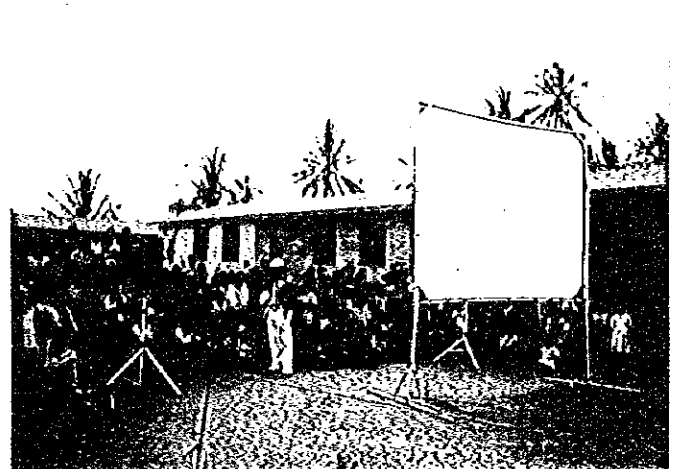
A drama containing many strong messages concerning SWM.



4 Cultural shows featuring songs, drama and dancing about SWM at various venues in DSM.

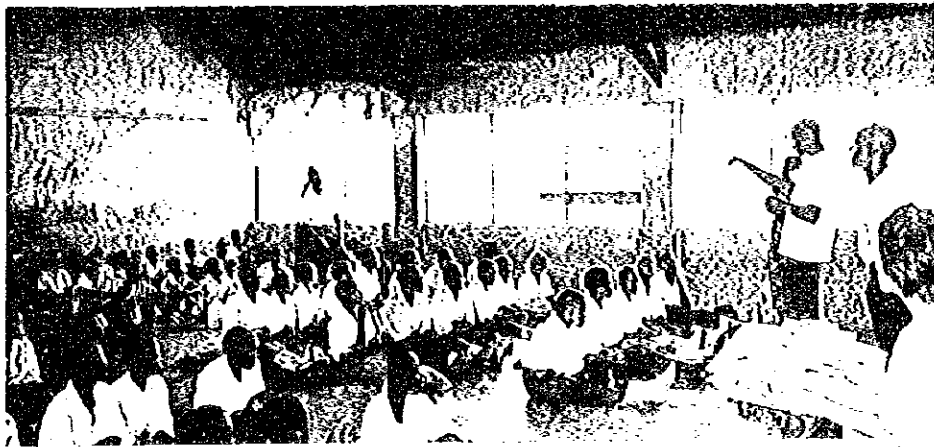


The culture show was prepared and performed by the Tanzanian Peoples' Defense Force Culture Group and featured dancing, singing and dramas.

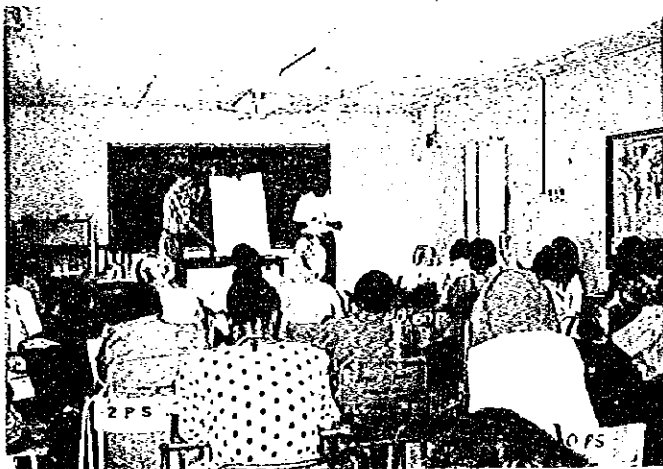


10 shows, each featuring 2-3 videos on SWM and environmental issues held at various venues in DSM in the evening.

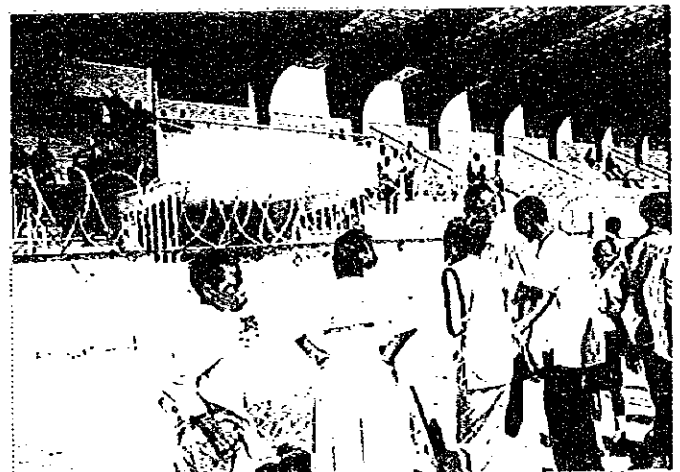
Plate 2 : Pilot Project The "Beautify Your City" Campaign (2)



20,000 copies of a 28 pages book on SWM has been produced for Standard 4-7 primary school students in Swahili. Trial Lessons on SWM were conducted with Standard 2 and Standard 5 classes at 6 primary schools in DSM.



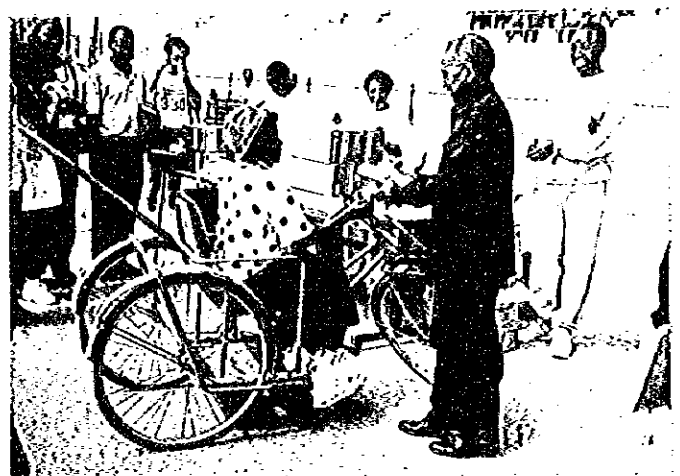
A seminar for 29 primary school teachers, District School Inspectors and District Academic Officers on SWM was held.



A poster competition was held on February 20 for all primary school students on the theme : "Beautify Your City".



An open 10 km race was held on March 2 for men, women and disabled people using tricycles. This was the closing event for the Beautify DSM month.



The winner of 10 km tricycle race is being awarded a prize by the Minister.

Plate 3 : Pilot Project, Improvement of Refuse Collection System in Kariakoo



100 liter bins were installed along the Msimbazi Road for string litter. However, most of them became the collection points for municipal wastes. One of the 3 skips placed in Kariakoo. Most of them were always filled with refuse even though they are replaced every day.



Plate 4 : Pilot Project, Improvement of the Vingunguti Disposal Site (I)



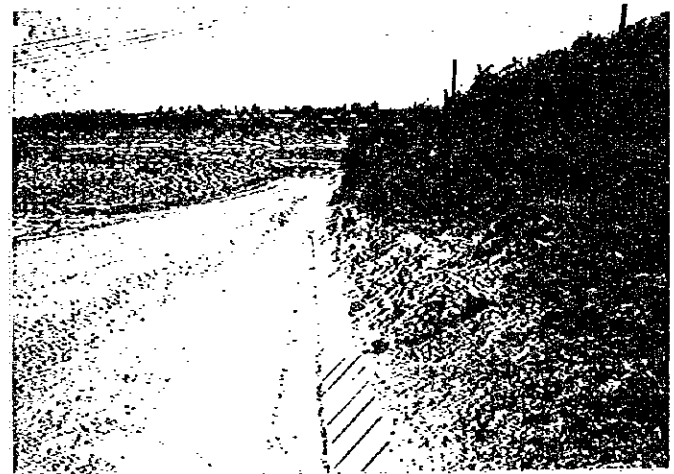
The condition of Vingunguti Disposal site before the improvement work.



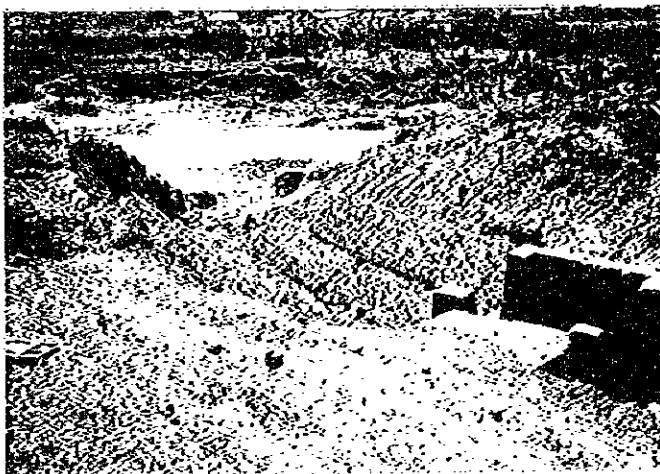
The condition of Vingunguti Disposal Site after the improvement work.



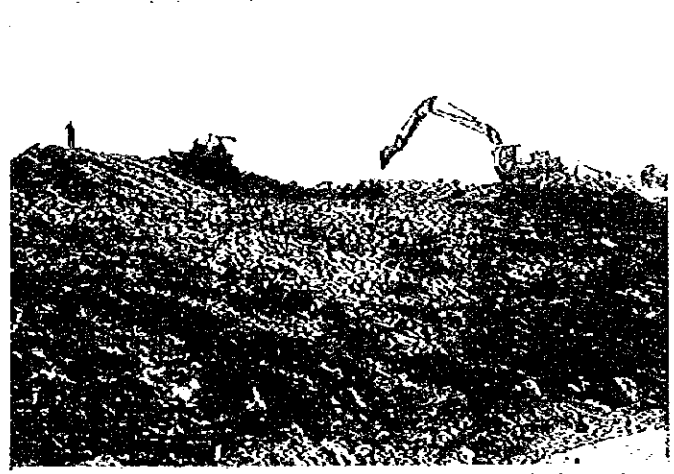
5 gas removable pipes were installed in the site.



Concrete surfaced side drain was constructed along the slope entrance to the disposal site.

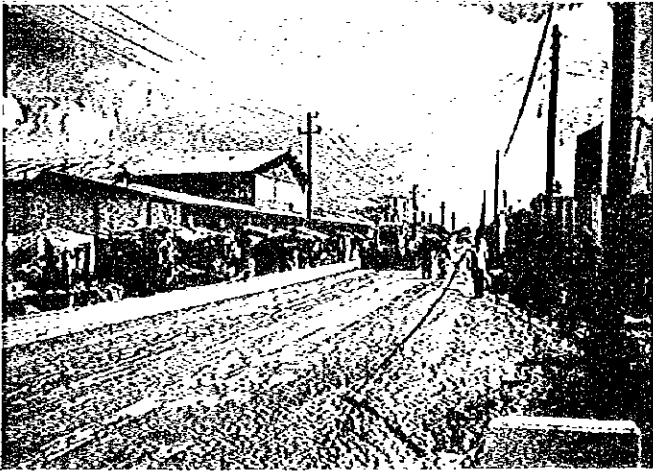


The outlet of side drain was protected by a stone gabion.



The landfill site was cleared and graded with a bulldozer and backhoe.

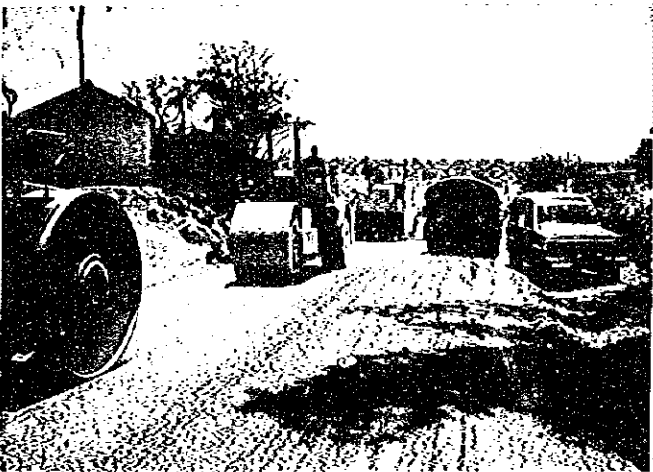
Plate 5 : Pilot Project, Improvement of the Vingunguti Disposal Site (2)



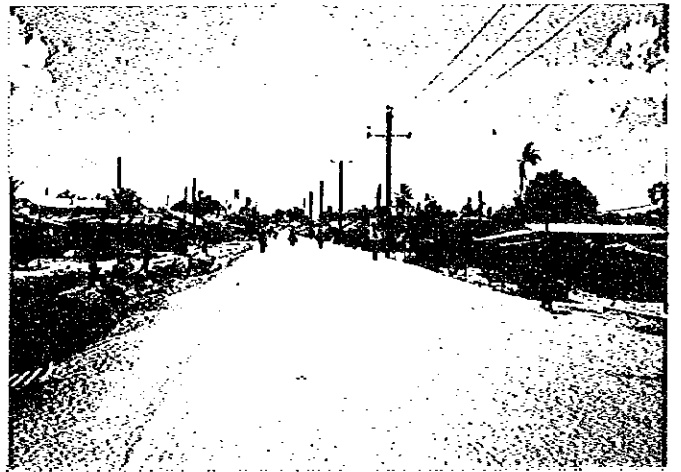
The access road from Nyerere Road to the landfill was paved.



The condition of Vingunguti Road near Nyerere Road.



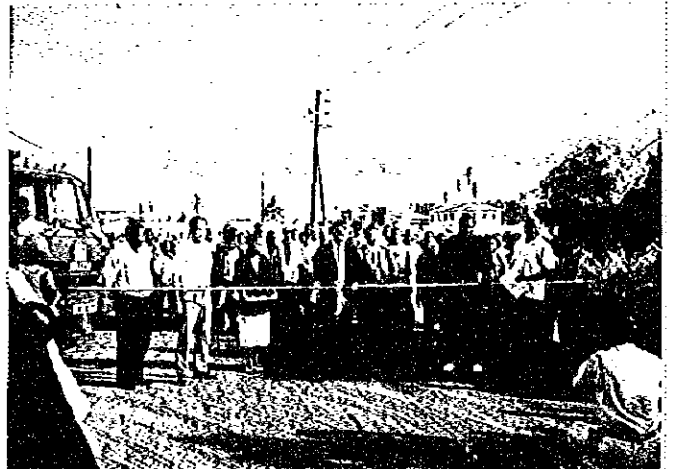
The access road near the disposal site being paved.



The condition of Vingunguti Road, in the middle section .



The road was paved on one lane.



The opening ceremony of the Vingunguti Road took place on 21 March 97.

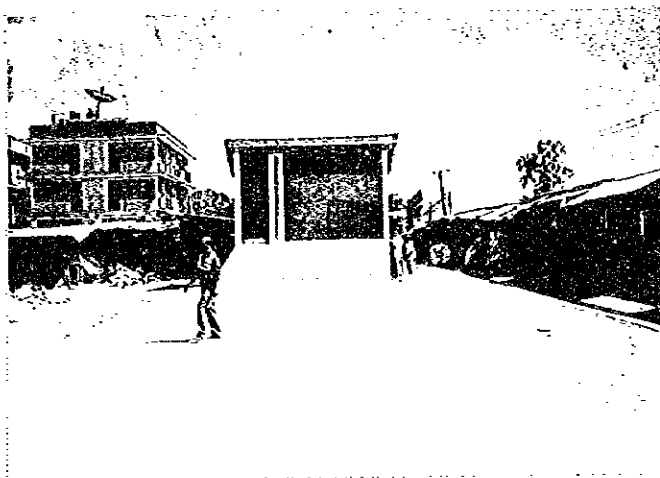
Plate 6 : Pilot Project, Improvement of Refuse Collection system in Buguruni



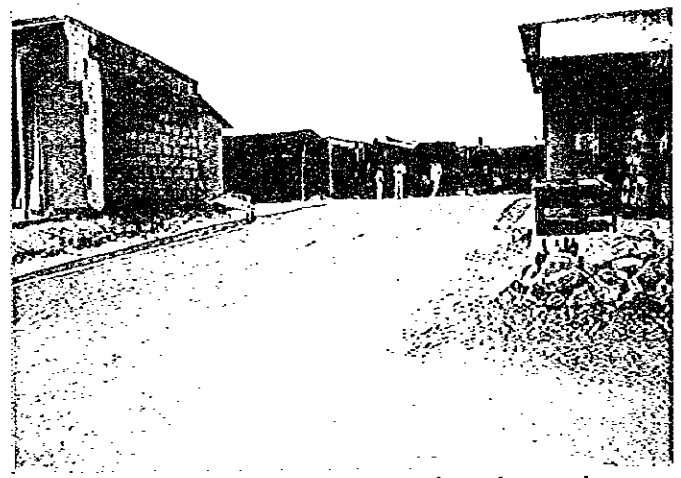
The centre square of the Buguruni Market was filled with plenty of refuse.



Leachate was stagnant and methane gas was emitted.



The centre square completely transformed after all the wastes and leachate were removed.



The access road from Uhuru Road to the market was constructed after two shops, blocking access, were demolished.



The road surrounding the market improved.



The road surrounding the market improved.

**The Study on the Solid Waste Management
for
Dar es Salaam City**

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List of Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
a.m.s.l.	Above Mean Sea Level
ANGOZA	Association of Non-Governmental Organisations in Zanzibar
BET	Board of External Trade
CBO	Community Based Organisation
CCF	Consumption Conversion Factor
CCM	Chama Cha Mapinduzi (The Revolution Party)
CRE	Central Register of Establishment
DANIDA	Danish International Development Assistance
DCC	Dar es Salaam City Council or Dar es Salaam City Commission
DF/R	Draft Final Report
DIS	Disposal Interview Survey
DLW	Domestic Liquid Waste
DSM	Dar es Salaam
DSSD	Dar es Salaam Sewerage and Sanitation Department of the City Council
EIRR	Economic Internal Rate of Return
ESAF	Enhancement Structural Adjustment
FIRR	Financial Internal Rate of Return
F/S	Feasibility Study
F/R	Final Report
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
HISW	Hazardous Industrial Solid Waste
HIV	Human Immune-deficiency Virus
IC/R	Inception Report
ILO	International Labour Organisation
ILW	Industrial Liquid Waste
ISW	Industrial Solid Waste
ISWM	Industrial Solid Waste Management
IUCN	International Union for Conservation of Nature and Natural Resources
IW	Industrial Waste
JICA	Japan International Cooperation Agency
IDS	Illegal Dumping Survey
IT/R	Interim Report
M.A.	Medical Assistant
M/M	Minute of Meeting
MSW	Medical Solid Waste
MSWM	Medical Solid Waste Management
MI&T	Ministry of Industry and Trade
MLD	Megalitres per day
MWEM	Ministry of Water, Energy and Minerals
NCSSD	National Conservation Strategy for Sustainable Development
NEAP	National Environment Action Plan
NEMC	National Environment Management Council
NEAP	National Environment Action Plan
NEP	National Environment Plan
NGO	Non-Governmental Organisation
NHC	National Housing Corporation
NORAD	Norwegian Development Agency

NUWA	National Urban Water Authority
O & M	Operation and Maintenance
PMO	Prime Minister's Office
POS	Public Opinion Survey
P/R	Progress Report
RA	Rural Area
RCC	Refuse Collection Charge
RMA	Rural Medical Aid
RPFB	Rolling Plan and Forward Budget
RS	Recycling Survey
RTD	Radio Tanzania Dar es Salaam
RTO	Regional Trade Office
SAF	Structural Adjustment Facility
SCF	Standard Conversion Factor
SCP	Sustainable Cities Programme
SDP	Sustainable Dar es Salaam Project
SKAT	Swiss Centre for Development Co-operation in Technology and Management
SIDA	Swedish International Development Authority
STD	Sexually Transmitted Disease
SUPA	Semi-urban Planned Developed Area
SUUA	Semi-urban Unplanned Developed Area
S/W	Scope of Works
SWM	Solid Waste Management
TACOSODE	Tanzanian Council of Social Development Inc.
TANGO	Tanzanian Association of Non-Governmental Organisations
TANESCO	Tanzanian Electricity Supply Company
TAZARA	Tanzania Zambia Railway Authority
TCCIA	Tanzanian Chamber of Commerce, Industry and Agriculture
TRC	Tanzania Railways Corporation
Tsh	Tanzanian Shilling
TTCL	Tanzanian Telephone Company Ltd.
UA	Urban Area
UCLAS	University College of Land and Architectural Studies
UDSM	University of Dar es Salaam
UES	Urban Environment Sanitation
UN	United Nations
UNCHS	United Nations Centre for Human Settlements (Habitat)
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UPE	Universal Primary Education Contribution
URTI	Upper Respiratory Tract Infections
USAID	United States Agency for International Development
USD	United States Dollar
WACS	Waste Amount and Composition Survey
WCP	Waste Collection Point
WAGR	Waste Generation Rate
WHO	World Health Organisation
WMA	Waste Management Authority
WOSS	Waste from Other Sources Survey

Glossary

Concession contract	A contract system in which the contractor which is entrusted refuse collection and transportation work in a certain area are granted the right to collect RCC from its beneficiaries.
Contracting out	A contract system in which the client make payment to the contractor in return for performing refuse collection and transportation work.
Concessionaire	The contractor that works in the concession contract.
Special RCC	A refuse collection charge which is applied to all wastes other than household and informal wastes and also applied to bulky waste collection, door to door collection, garden waste collection and any other refuse where collection costs are generally more expensive than for household waste. DCC collects Special RCC in this report.
Informal waste	Waste generated through the activities which do not reflect the statistic data.

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Chapter 1

Introduction



1 Introduction

1.1 Targets of the First Priority Projects

The SWM master plan proposed in Volume 2 covers all proposed projects to be conducted from 2000 until 2005. The first priority projects in the master plan aim to improve the solid waste collection, transportation and disposal systems and the night soil collection and transport systems in order to attain the targets between 2000 and 2002 as shown in Table 1-1.

Table 1-1: Targets of the First Priority Projects

Item	1996	2000	2001	2002
Improvement of Waste Collection, Transport and Disposal System				
Population in Dar es Salaam (persons)	2,261,000	3,114,050	3,404,211	3,736,041
Population within the Study area (persons)	2,030,000	2,633,000	2,835,000	3,066,000
Waste generation amount (ton/day)	1,772	2,300	2,476	2,678
Waste collection amount (ton/day)	143	545	757	1,001
Waste collection rate (%)	8.1	23.7	30.6	37.4
Population receiving waste collection services (persons)	101,500	624,021	867,510	1,011,780
Road length swept (km)	32.8	67	83	100
Final disposal				
Disposal amount (m ³ /year)	57,183	221,028	307,006	405,939
Name of the disposal site	-	Kunduchi New Disposal Site		
Level of disposal method	Level 1	Level 2		
Improvement of Night Soil Collection and Transport System				
Total night soil collection amount (m ³ /day)	277	1,422	1,531	1,655
Night soil amount to be collected by DCC (m ³ /day)	155	392	423	457

1.2 Outline of the First Priority Projects

The priority projects proposed for materialising the targets shown in Table 1-1 are as follows.

1. Improvement of Waste Collection, Transport and Disposal System
 - 1.1 Improvement of Waste Collection and Transport
 - 1.2 Development of the New Kunduchi Disposal Site
 - 1.3 Improvement of Street Sweeping
 - 1.4 Improvement of the Nyerere Workshop
 - 1.5 Administrative Improvement
2. Improvement of Night Soil Collection and Transport System

The purpose of this report is to study their financial, technical, social and environmental feasibility. The alternative systems are discussed for selecting the most appropriate ones; and the preliminary design will be conducted for each system to enable a reliable cost estimation. Based on the preliminary design, the environmental impacts will be examined and the financial feasibility will be examined based on the result of cost estimation.

Although the investment to the first priority projects will be made from 2000 until 2002, the financial performance of projects are examined from 2000 until 2005. The solid waste management system which will be established by 2003 was assumed to continue after 2003 until 2005.

As a final conclusion of this report, the recommendation on solid waste management in DSM is designed to be more appropriate.