

**THE PROJECT  
FOR  
COMPREHENSIVE PLANNING AND SUPPORT  
FOR  
URGENT DEVELOPMENT ON SOCIAL ECONOMIC  
INFRASTRUCTURE  
IN MALAKAL TOWN  
IN THE REPUBLIC OF SOUTH SUDAN**

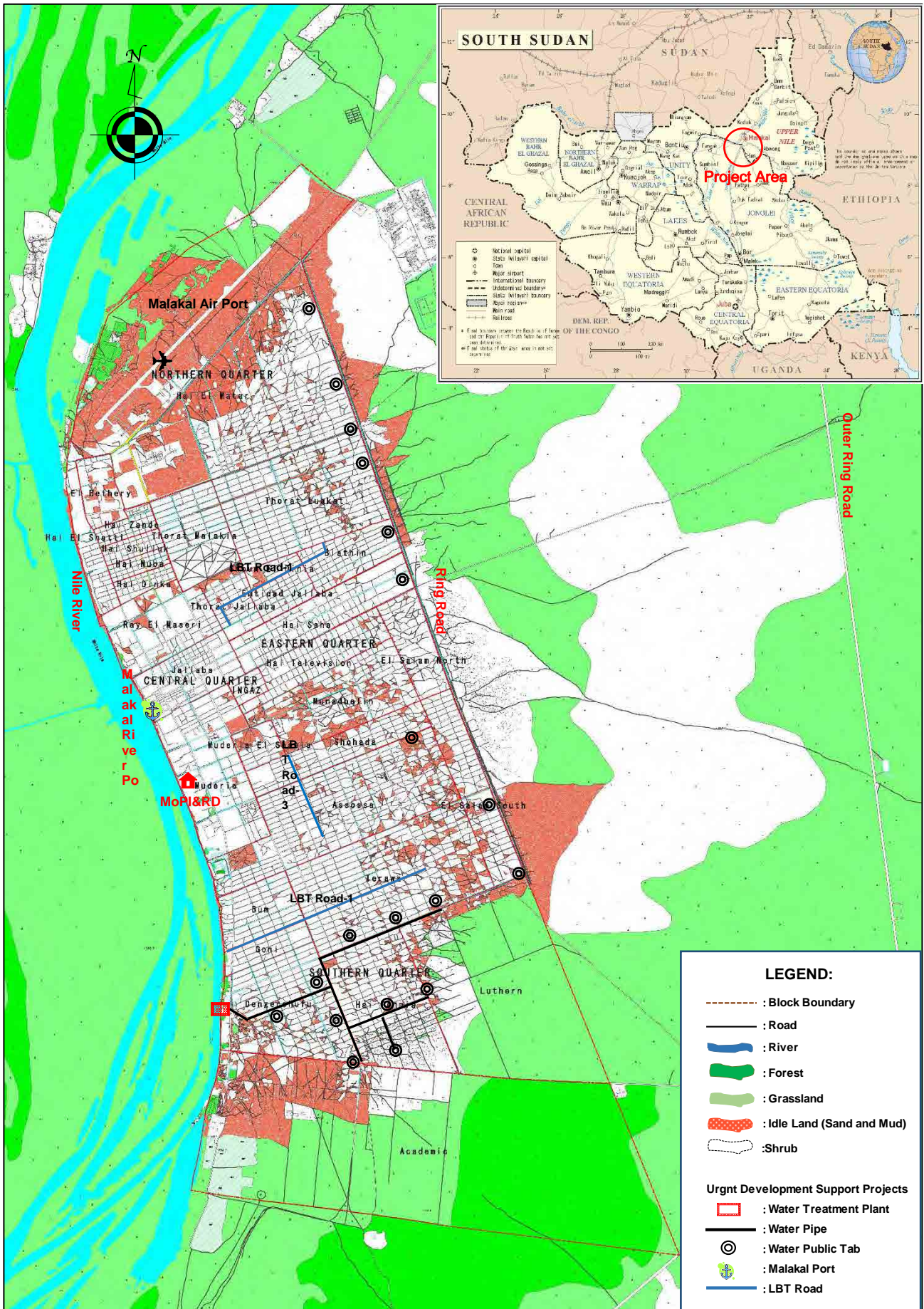
**FINAL REPORT**

**MAIN TEXT**

**JULY 2014**

**JAPAN INTERNATIONAL COOPERATION AGENCY  
KATAHIRA & ENGINEERS INTERNATIONAL  
YACHIYO ENGINEERING CO., LTD.  
RECS INTERNATIONAL INC.  
KOKUSAI KOGYO CO., LTD.**

<b>EI</b>
<b>JR</b>
<b>14-122</b>



PROJECT LOCATION MAP



## Photographs

### Present Situation of Socio-Economic Infrastructure in Malakal Town 1



Water Treatment Plant of SSUWC  
(Filter Tank)



Water pipes are deteriorated and damaged,  
resulting in high ratio of non-revenue water



Malakal Port (Cargo Jetty)



Malakal Port (Passenger Jetty)



Community Road (Black and Clayey Soil  
called Black Cotton Soil)



Community roads easily get muddy in rainy  
season. LBT Construction Site (Upper Part)



Public Toilets at Malakal Market



Storm Water Drainage (Main Drain)

### Present Situation of Socio-Economic Infrastructure in Malakal Town 2



Collection Point of Solid Waste  
(Terawa Area)



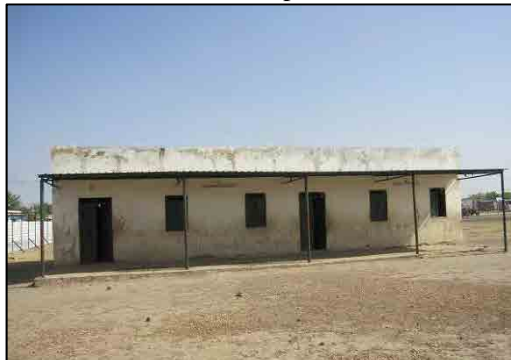
Collection Vehicle



Diesel Generator Engine of Malakal Power Station in Operation



11kV Distribution Line



Primary School (Ordinary Type)



Junior High School (Inside)



Malakal Teaching Hospital (Inside)



Health Centre (Bum Area)



## Meetings and Workshops



1<sup>st</sup> JCC Meeting in Malakal  
(2012-03-13)



Malakal Workshop on Pragmatic Project  
Affairs in Malakal (2012-07-23)



Seminar on Master Plan of Malakal Town  
(in Juba 2013-08-26)



Seminar on Master Plan of Malakal Town  
(Juba 2013-08-26) The Minister of MOLH&PP



Auto CAD Training (at MoPI&RD)



Arc GIS Training (Certificate Awarding  
Ceremony at MoPI&RD)



IT Training (at MVTC)



Certificate Awarding Ceremony of IT and  
English Document Trainings at MVTC

### Urgent Development Project (Port)



Present Situation of Cargo Jetty Before Construction



Present Situation of Passenger Jetty Before Construction



Survey Work



Installation of Project Signboard



Loading Construction Materials at Juba River Port



Same as the Left



Ground Breaking Ceremony (2013-11-28)  
CPs, VIP Guests and JICA Representatives were present.



Piling for Reinforcement of Existing Jetty



### Urgent Development Project (Water Supply)



Construction Site of Water Treatment Plant Before Construction



Survey Work



Relocation of the Existing Facilities



Installation of Project Signboard



River Transportation of Construction Materials from Juba to Malakal



After Leveling of the Ground, Removal of the Facilities and Storage of the Equipemnt and Construction Materials

### Urgent Development Support Project (Road)



Condition of Existing Community Roads in Malakal Town



Decreased Traffic Performance due to Mud



Construction Work by Labour Based Technology (LBT)



Laying Sandbags



Training for Roads Improvement Skills (Inspection)



Training for Roads Improvement Skills (Inspection)



Training for Roads Improvement Skills (Survey)



Lecture on Roads Improvement Skills (Survey, Inspections, etc) at JICA Malakal Compound



**The Project for Comprehensive Planning and Support for Urgent Development on Social Economic Infrastructure in Malakal Town in Republic of South Sudan**

**TABLE OF CONTENTS**

Project Location Map

Photographs

Table of Contents

List of Tables, Figures and Photographs

List of Abbreviations

Glossary of Terms

**INTRODUCTION.....1**

**CHAPTER 1 OUTLINE OF THE PROJECT ..... 1-1**

1.1 BACKGROUND OF THE PROJECT ..... 1-1

1.2 OUTLINE OF THE PROJECT ..... 1-2

1.2.1 Project Purpose..... 1-2

1.2.2 Outputs of the Project..... 1-2

1.2.3 Project Area ..... 1-2

1.2.4 Project Period ..... 1-2

1.3 ORGANIZATIONAL STRUCTURE OF THE PROJECT ..... 1-3

1.4 METHODOLOGY ..... 1-6

1.4.1 Methodology of the Project..... 1-6

1.4.2 Meetings, Seminars and Workshops..... 1-7

**<PART I> COLLECTION AND ANALYSIS OF DATA AND INFORMATION**

**CHAPTER 2 PRESENT SITUATION OF THE PROJECT AREA ..... 2-1**

2.1 NATURAL CONDITIONS ..... 2-1

2.1.1 Terrain ..... 2-1

2.1.2 Climate ..... 2-2

2.2 SOCIO-ECONOMIC SITUATION..... 2-4

2.2.1 Population..... 2-4

2.2.2 Livelihoods - Findings from the Household Survey ..... 2-10

2.2.3 Economic Situation and Findings from the Malakal Market Survey ..... 2-14

2.3 ADMINISTRATIVE FRAMEWORK ..... 2-19

2.3.1 Layers of the Government and the Local Government ..... 2-19

2.3.2 Financial Resources of Local Governments and Administration ..... 2-23

2.3.3 Existing Policies and Strategy Related to Local Administration..... 2-24

2.3.4 Existing Projects in the Local Administration..... 2-25

2.3.5	Issues Related to Local Administration and Government .....	2-26
2.4	LAND USE .....	2-28
2.4.1	Administrative and Regulatory Framework of Land Use .....	2-28
2.4.2	Present Land Use.....	2-33
2.4.3	Existing Land Use and Planning Issues.....	2-40
<b>CHAPTER 3 PEACEBUILDING NEEDS AND IMPACT ASSESSMENT(PNA).....</b>		<b>3-1</b>
3.1	INTRODUCTION OF JICA PEACE BUILDING NEEDS AND IMPACT ASSESSMENT.....	3-1
3.2	PEOPLE AND ETHNICITY.....	3-1
3.2.1	Ethnic Distribution of UNS .....	3-1
3.2.2	Ethnic Distribution of Malakal Town.....	3-2
3.2.3	Returnees in Upper Nile State .....	3-2
3.2.4	Repatriation and Resettlement in Malakal .....	3-3
3.2.5	Land Ownership .....	3-5
3.2.6	Land Mines.....	3-6
3.3	CONFLICT PREVENTION MEASURES - UTILISATION OF THE PEACEBUILDING NEEDS AND IMPACT ASSESSMENT .....	3-7
3.3.1	Resettlement and Infrastructure Improvements.....	3-7
3.3.2	Ownership and Utilisation of Land .....	3-10
3.3.3	Livelihood and Employment .....	3-12
 <b>&lt;PART II&gt; DEFINING CONCEPTS FOR THE COMPREHENSIVE PLAN</b>		
<b>CHAPTER 4 CONCEPTUAL FRAMEWORKS FOR FORMULATION OF THE COMPREHENSIVE PLAN.....</b>		<b>4-1</b>
4.1	PLANNING APPROACH FOR THE COMPREHENSIVE PLAN .....	4-1
4.2	REVIEW OF EXISTING DEVELOPMENT PLANS .....	4-4
4.2.1	The Millennium Development Goals .....	4-4
4.2.2	National Level Development Plan– <i>South Sudan Development Plan 2011-13</i> .....	4-5
4.2.3	State Level– <i>Upper Nile State Strategic Plan 2012/13-2014/15</i> .....	4-8
4.2.4	County Level– <i>Makal County Strategic Plan: 2012-2014</i> .....	4-9
4.3	VISION FOR THE DEVELOPMENT OF MALAKAL.....	4-11
4.3.1	Conceptual Hierarchy of the Comprehensive Plan.....	4-11
4.3.2	SWOT Analysis for Malakal .....	4-11
4.3.3	Problem Structure Analysis .....	4-12
4.3.4	Results from the Workshops.....	4-13
4.3.5	Development Vision for Malakal “Vision Malakal for 2022” .....	4-16
4.4	DEVELOPMENT STRATEGIES .....	4-16
4.4.1	Outline of the Development Strategies.....	4-16
4.4.2	Background of Designing the Development Strategies and Programmes.....	4-17
4.4.3	Malakal Infrastructure Development Strategy .....	4-19



4.4.4	Region-wide Economic Development Strategy .....	4-20
4.4.5	Social Development Strategy .....	4-21
4.4.6	Peacebuilding and Governance Strengthening Strategy.....	4-22
4.5	SOCIO-ECONOMIC FRAMEWORK .....	4-22
4.5.1	Population Framework for the Year 2022.....	4-22
4.5.2	Economic Development Framework.....	4-27
4.6	SPATIAL DEVELOPMENT FRAMEWORK .....	4-35
4.6.1	Future Urban Structure and Allocation of Functions.....	4-35
4.6.2	Future Land Use Plan .....	4-38
4.7	CONFLICT PREVENTION MEASURES .....	4-46
4.7.1	Conflict Prevention Measure for Malakal Infrastructure Development .....	4-46
4.7.2	Conflict Prevention Measures for Region-wide Economic Development .....	4-46
4.7.3	Conflict Prevention Measure for Social Development.....	4-46
4.7.4	Conflict Prevention Measures for Governance .....	4-46
4.8	SEARNS—a Long-sighted Perspective for Urban Development Planning.....	4-47
4.9	CONCLUSION .....	4-49

### **< PART III > SECTOR ANALYSIS**

<b>CHAPTER 5</b>	<b>WATER SUPPLY .....</b>	<b>5-1</b>
5.1	INSTITUTIONAL FRAMEWORK.....	5-1
5.1.1	Ministry of Water Resources and Irrigation (MOWRI), Republic of South Sudan ROSS.....	5-1
5.1.2	The South Sudan Urban Water Corporation (SSUWC) .....	5-1
5.2	POLICIES AND STRATEGIES .....	5-1
5.3	FINANCIAL RESOURCES.....	5-3
5.4	OPERATION AND MAINTENANCE SYSTEM .....	5-3
5.4.1	Water Use .....	5-3
5.4.2	Water Supply Service in Malakal Town .....	5-4
5.4.3	Current Situation for Operation and Maintenance by SSUWC-Malakal .....	5-6
5.5	FACILITIES AND STAFFING.....	5-7
5.5.1	Water Supply Facility of SSUWC-Malakal.....	5-7
5.5.2	Water Supply Facility of NGO (Solidarities International: SI) .....	5-9
5.5.3	Water Quality Laboratory of SSUWC-Malakal .....	5-10
5.5.4	Ex-Water Supply Facility of Rural Water Department of MoPI&RD.....	5-13
5.6	FINDINGS FROM RELEVANT SURVEY(S).....	5-13
5.6.1	Possibility of Groundwater Development .....	5-13
5.6.2	Result of Water Quality Analysis .....	5-13
5.7	PROGRAMMES AND PROJECTS .....	5-15
5.7.1	Rehabilitation of Water Supply Facilities.....	5-15

5.7.2	Capacity Building for SSUWC .....	5-15
5.8	NEEDS AND ISSUES .....	5-15
5.8.1	General Issue .....	5-15
5.8.2	Urgent Issue.....	5-16
5.8.3	Consideration for the Comprehensive Plan .....	5-16
5.9	WATER SUPPLY SECTOR DEVELOPMENT PLAN .....	5-17
5.9.1	Objectives of Water Supply Sector.....	5-17
5.9.2	Sector Strategy .....	5-18
5.9.3	Water Demand Projection.....	5-18
5.9.4	Proposed Water Supply Plan .....	5-20
5.10	WATER SUPPLY SECTOR PROJECT .....	5-22
5.11	OPERATION AND MAINTENANCE PLAN.....	5-27
5.11.1	Responsibility for Operation and Maintenance.....	5-27
5.11.2	Independence of SSUWC-Malakal .....	5-28
5.11.3	Organization of SSUWC-Malakal.....	5-28
5.11.4	Organization of Water Committee.....	5-30
5.11.5	O&M Cost Estimates.....	5-30
5.11.6	Water Tariff to be Proposed.....	5-31
5.12	IDENTIFIED CD NEEDS FOR WATER SUPPLY SECTOR.....	5-31
<b>CHAPTER 6</b>	<b>WATER TRANSPORTATION.....</b>	<b>6-1</b>
6.1	INSTITUTIONAL FRAMEWORK.....	6-1
6.1.1	Joint Operation by ROSS, UNS and the Military.....	6-1
6.2	POLICIES AND STRATEGIES .....	6-2
6.3	FINANCIAL RESOURCES.....	6-2
6.4	OPERATION AND MAINTENANCE SYSTEM .....	6-3
6.4.1	Categories of Ships Used in Malakal Port.....	6-3
6.4.2	Freight Management and Trading .....	6-3
6.4.3	Water Traffic Management for Passenger Boat.....	6-5
6.4.4	Existing Port Operation and Maintenance System.....	6-11
6.5	FACILITIES AND STAFFING.....	6-12
6.5.1	Port Facilities.....	6-12
6.6	FINDINGS FROM RELEVANT SURVEY(S) .....	6-16
6.7	PROGRAMMES AND PROJECTS .....	6-16
6.8	NEEDS AND ISSUES .....	6-17
6.8.1	Port Improvement for Cargo Transport .....	6-17
6.8.2	Port Improvement for Passenger Transport.....	6-19
6.8.3	Consideration for the Comprehensive Plan .....	6-20
6.9	WATER TRANSPORT SECTOR DEVELOPMENT PLAN.....	6-22
6.9.1	Objectives of River Transport Sector .....	6-22

6.9.2	Forecast of River Transport Demand .....	6-23
6.9.3	Port Sector Plan .....	6-24
6.10	WATER TRANSPORT SECTOR PROJECT .....	6-28
6.11	OPERATION AND MAINTENANCE PLAN.....	6-38
6.11.1	Operation Section.....	6-38
6.11.2	Maintenance Section .....	6-38
6.12	IDENTIFIED CD NEEDS FOR WATER TRANSPORT SECTOR .....	6-42
<b>CHAPTER 7</b>	<b>ROAD TRANSPORTATION .....</b>	<b>7-1</b>
7.1	INSTITUTIONAL FRAMEWORK.....	7-1
7.1.1	Directorate of Roads and Transport, MoPI&RD .....	7-1
7.1.2	Traffic Police .....	7-2
7.1.3	Public Land and Air Transport Trade Union Cooperation (PLATUC).....	7-3
7.2	POLICIES AND STRATEGIES .....	7-3
7.2.1	Policies and Strategies for Roads and Transport Issued by the MoPI&RD, UNS .....	7-3
7.2.2	Target and Goal of the Policies and Strategies for Roads and Transport Sector of the MoPI&RD .....	7-3
7.3	FINANCE RESOURCES.....	7-4
7.4	OPERATION AND MAINTENANCE SYSTEM .....	7-4
7.4.1	Existing Road Network System.....	7-4
7.4.2	Present Condition of Public Transport .....	7-6
7.4.3	Present Condition of Traffic Control .....	7-7
7.4.4	Existing Road Maintenance System.....	7-9
7.5	FACILITIES AND STAFFING.....	7-9
7.6	FINDINGS FROM RELEVANT SURVEY(S).....	7-10
7.6.1	Result of Road Inventory Survey .....	7-10
7.6.2	Traffic Volume Survey .....	7-12
7.7	PROGRAMMES AND PROJECTS .....	7-15
7.8	NEEDS AND ISSUES .....	7-16
7.8.1	Identified Issues.....	7-17
7.8.2	Consideration for the Comprehensive Plan.....	7-18
7.9	ROAD TRANSPORT SECTOR DEVELOPMENT PLAN.....	7-19
7.9.1	Objectives of Road Transport Sector.....	7-19
7.9.2	Strategy for Road Transport Sector .....	7-21
7.9.3	Road Plan .....	7-22
7.10	PUBLIC TRANSPORT PLAN .....	7-27
7.10.1	Targets for Public Transport .....	7-27
7.10.2	Public Transport Plan .....	7-27
7.11	TRAFFIC MANAGEMENT PLAN .....	7-29
7.11.1	Traffic Facility .....	7-29



7.11.2	Traffic Safety Education.....	7-30
7.11.3	Traffic Enforcement Equipment.....	7-30
7.12	ROAD TRANSPORT SECTOR PROJECTS .....	7-31
7.12.1	Detailed Description of the Projects.....	7-31
7.13	OPERATION AND MANAGEMENT PLAN .....	7-33
7.13.1	Issues for Operation and Management .....	7-33
7.13.2	Organization .....	7-33
7.13.3	Operation and Maintenance Cost Estimates.....	7-35
7.14	IDENTIFIED CD NEEDS FOR ROAD TRANSPORT SECTOR .....	7-37
<b>CHAPTER 8</b>	<b>ENERGY .....</b>	<b>8-1</b>
8.1	INSTITUTIONAL FRAMEWORK.....	8-1
8.2	POLICIES AND STRATEGY.....	8-1
8.3	FINANCIAL RESOURCES.....	8-1
8.4	OPERATION AND MAINTENANCE SYSTEM .....	8-2
8.4.1	Power Generation of SSNEC .....	8-2
8.4.2	Distribution Network of SSEC.....	8-4
8.5	FACILITIES AND STAFFING.....	8-7
8.6	FINDINGS FROM RELEVANT SURVEY(S).....	8-7
8.6.1	Household Survey Results.....	8-7
8.7	PROGRAMMES AND PROJECTS .....	8-9
8.8	NEEDS AND ISSUES OF THE SECTOR .....	8-9
8.8.1	General Issues.....	8-9
8.8.2	Urgent Issues .....	8-10
8.8.3	Consideration for the Comprehensive Plan.....	8-11
8.9	ENERGY SECTOR DEVELOPMENT PLAN.....	8-11
8.9.1	Objectives of Energy Sector.....	8-11
8.9.2	Power Demand Forecast.....	8-12
8.9.3	Energy Sector Plan .....	8-13
8.10	ENERGY SECTOR PROJECT.....	8-15
8.11	IDENTIFIED CD NEEDS FOR ENERGY SECTOR .....	8-16
<b>CHAPTER 9</b>	<b>SEWAGE AND SANITATION.....</b>	<b>9-1</b>
9.1	INSTITUTIONAL FRAMEWORK.....	9-1
9.2	POLICIES AND STRATEGIES .....	9-3
9.3	FINANCIAL RESOURCES.....	9-3
9.4	OPERATION AND MAINTENANCE SYSTEM .....	9-4
9.4.1	Outline of Sanitation Facilities.....	9-4
9.4.2	Sanitation Facilities of Household.....	9-5
9.4.3	Sanitation Facilities in School.....	9-6
9.4.4	Public Toilets .....	9-7

9.4.5	Sanitation Facilities in Main Institutions.....	9-8
9.4.6	Condition of Vacuum Truck .....	9-9
9.5	FACILITIES AND STAFFING.....	9-9
9.6	FINDINGS FROM RELEVANT SURVEY(S).....	9-9
9.6.1	Household Survey Results.....	9-9
9.7	PROGRAMMES AND PROJECTS .....	9-11
9.8	NEEDS AND ISSUES .....	9-12
9.8.1	General Issues.....	9-12
9.8.2	Considerations for the Comprehensive Plan .....	9-13
9.9	SEWAGE AND SANITATION SECTOR DEVELOPMENT PLAN .....	9-13
9.9.1	Objectives of the Sewage and Sanitation Sector .....	9-13
9.9.2	Strategy for Sewage and Sanitation Sector .....	9-14
9.9.3	Sewer Development Plan .....	9-15
9.10	SEWAGE AND SANITATION SECTOR PROJECT .....	9-20
9.10.1	Proposed Projects .....	9-20
9.10.2	Details of the Projects.....	9-20
9.11	IDENTIFIED CD NEEDS FOR SEWAGE AND SANITATION SECTOR .....	9-25
<b>CHAPTER 10</b>	<b>STORM WATER DRAINAGE .....</b>	<b>10-1</b>
10.1	INSTITUTIONAL FRAMEWORK.....	10-1
10.2	POLICIES AND STRATEGIES .....	10-1
10.3	FINANCIAL RESOURCES.....	10-2
10.4	OPERATION AND MAINTENANCE SYSTEM .....	10-2
10.5	FACILITIES AND STAFFING.....	10-2
10.5.1	Present Condition of Storm Water Drainage Facilities.....	10-2
10.6	FINDINGS FROM RELEVANT SURVEY(S).....	10-7
10.6.1	Rainfall .....	10-7
10.6.2	Water Level of the Nile River.....	10-7
10.6.3	Flood Situation .....	10-8
10.7	PROGRAMMES AND PROJECTS .....	10-9
10.8	NEEDS AND ISSUES .....	10-9
10.8.1	General Issues.....	10-9
10.8.2	Urgent Issues .....	10-10
10.8.3	Consideration for the Comprehensive Plan.....	10-10
10.9	STORM WATER DRAINAGE SECTOR DEVELOPMENT PLAN .....	10-11
10.9.1	Objectives of the Storm Water Drainage Sector.....	10-11
10.9.2	Storm Water Drainage Sector Plan.....	10-12
10.10	STORM WATER DRAINAGE SECTOR PROJECT .....	10-15
10.11	IDENTIFIED CD NEEDS FOR ENERGY SECTOR .....	10-21
<b>CHAPTER 11</b>	<b>SOLID WASTE MANAGEMENT.....</b>	<b>11-1</b>

11.1	INSTITUTIONAL FRAMEWORK.....	11-1
11.2	POLICIES AND STRATEGIES .....	11-3
11.3	FINANCIAL RESOURCES.....	11-3
11.4	OPERATION AND MAINTENANCE SYSTEM .....	11-3
11.4.1	Solid Waste Flow .....	11-3
11.4.2	Domestic Solid Waste.....	11-5
11.4.3	Industrial Solid Waste.....	11-8
11.4.4	Medical Solid Waste.....	11-8
11.5	FACILITIES AND STAFFING.....	11-9
11.6	FINDINGS FROM RELEVANT SURVEY(S).....	11-9
11.6.1	Household Survey Results.....	11-9
11.7	PROGRAMMES AND PROJECTS .....	11-12
11.8	NEEDS AND ISSUES .....	11-12
11.8.1	General Issues.....	11-12
11.8.2	Urgent Needs.....	11-13
11.8.3	Consideration for the Comprehensive Plan.....	11-13
11.9	SOLID WASTE MANAGEMENT SECTOR DEVELOPMENT PLAN .....	11-14
11.9.1	Objectives of Solid Waste Management Sector.....	11-14
11.9.2	Strategy for Solid Waste Management .....	11-15
11.9.3	Solid Waste Management Plan.....	11-15
11.10	SOLID WASTE MANAGEMENT SECTOR PROJECT .....	11-20
11.11	IDENTIFIED CD NEEDS FOR SOLID WASTE MANAGEMENT SECTOR.....	11-22
<b>CHAPTER 12</b>	<b>EDUCATION.....</b>	<b>12-1</b>
12.1	INSTITUTIONAL FRAMEWORK.....	12-1
12.2	POLICIES AND STRATEGIES .....	12-2
12.3	FINANCIAL RESOURCES.....	12-3
12.3.1	Budget Expenditure Item for MoE in UNS .....	12-3
12.3.2	Budget Flow from MOF to MoE.....	12-3
12.3.3	Financial Structure in MoE .....	12-3
12.4	OPERATION AND MAINTENANCE SYSTEM .....	12-4
12.4.1	Primary School.....	12-4
12.4.2	Secondary Education.....	12-7
12.4.3	Alternative Education Systems (AES) .....	12-9
12.4.4	Higher Education.....	12-9
12.4.5	Vocational Training Centre.....	12-10
12.5	FACILITIES AND STAFFING.....	12-10
12.6	FINDINGS FROM RELEVANT SURVEY(S).....	12-10
12.6.1	Household Survey Results.....	12-10
12.7	PROGRAMMES AND PROJECTS .....	12-13



12.7.1 Existing Projects in 2012.....	12-13
12.7.2 Partner Organizations and Their Projects with MoE in Malakal Town.....	12-13
12.8 NEEDS AND ISSUES .....	12-13
12.8.1 Different Aspects of Concerns.....	12-13
12.8.2 General Issues.....	12-15
12.8.3 Consideration for the Comprehensive Plan .....	12-16
12.9 EDUCATION SECTOR DEVELOPMENT PLAN .....	12-16
12.9.1 Objectives of Education Sector .....	12-16
12.9.2 Education Service Strategy.....	12-17
12.9.3 Education Sector Plan .....	12-18
12.10 EDUCATION SECTOR PROJECT .....	12-19
<b>CHAPTER 13 HEALTH .....</b>	<b>13-1</b>
13.1 INSTITUTIONAL FRAMEWORK.....	13-1
13.2 POLICIES AND STRATEGIES .....	13-3
13.2.1 Policy Statement on Reducing Inequalities in Access to Health Care.....	13-3
13.2.2 Policy Statement on Community Participation .....	13-3
13.3 FINANCIAL RESOURCES.....	13-3
13.3.1 Funding of Policy Implementation.....	13-3
13.3.2 Annual Plans and Guidelines .....	13-3
13.4 OPERATION AND MAINTENANCE SYSTEM .....	13-5
13.4.1 Overview of Health Condition .....	13-5
13.4.2 Health Service Provision .....	13-6
13.5 FACILITIES AND STAFFING.....	13-8
13.5.1 Health Facilities.....	13-8
13.5.2 Human Resources.....	13-10
13.6 FINDINGS FROM RELEVANT SURVEY(S).....	13-12
13.6.1 Results of Household Survey .....	13-12
13.7 PROGRAMMES AND PROJECTS .....	13-12
13.8 NEEDS AND ISSUES .....	13-13
13.8.1 Issues Found in Malakal.....	13-13
13.8.2 Issues Commonly Seen in Malakal and UNS as a Whole.....	13-13
13.8.3 Considerations for the Comprehensive Plan .....	13-14
13.9 HEALTH SECTOR DEVELOPMENT PLAN .....	13-15
13.9.1 Objectives of Health Sector.....	13-15
13.9.2 Health Sector Improvement Plan.....	13-16
13.10 HEALTH SECTOR PROJECT .....	13-21
<b>CHAPTER 14 CAPACITY DEVELOPMENT .....</b>	<b>14-1</b>
14.1 EXISTING HUMAN RESOURCES IN THE GOVERNMENT OF UNS.....	14-1
14.2 DONORS' CAPACITY DEVELOPMENT ACTIVITIES	

FOR PUBLIC OFFICIALS IN UNS.....	14-4
14.2.1 United Nations (UN) Agencies.....	14-4
14.2.2 Capacity Building Trust Fund (CBTF).....	14-6
14.2.3 The Inter-Governmental Authority on Development (IGAD) Regional Initiative .....	14-6
14.2.4 JICA .....	14-8
14.3 CD NEEDS IN IMPLEMENTING THE PROJECTS	
FOR THE COMPREHENSIVE PLAN.....	14-9
14.3.1 Individual Capacity Development Needs .....	14-9
14.3.2 Organizational Capacity Development Needs.....	14-11
14.3.3 Institutional Capacity Development Needs .....	14-12
14.4 CAPACITY DEVELOPMENT PROJECT .....	14-13
<b>CHAPTER 15 ECONOMIC DEVELOPMENT .....</b>	<b>15-1</b>
15.1 ECONOMIC DEVELOPMENT BY STAGE .....	15-1
15.2 ESTABLISHMENT OF AN EAST-WEST TRANSPORTATION CORRIDOR .....	15-4
15.3 IMPROVEMENT OF BUSINESS ENVIRONMENT.....	15-6
15.4 STRENGTHENING OF RESEARCH, DEVELOPMENT	
AND EXTENSION SERVICES .....	15-8
15.5 HUMAN RESOURCES DEVELOPMENT .....	15-8
15.6 ECONOMIC DEVELOPMENT SECTOR PROJECTS .....	15-9
<b>CHAPTER 16 SOCIAL WELFARE .....</b>	<b>16-1</b>
16.1 SOCIAL WELFARE .....	16-1
16.2 SOCIAL DEVELOPMENT SECTOR PROJECTS .....	16-1
<b>&lt;PART IV&gt; FORMULATION OF THE COMPREHENSIVE PLAN</b>	
<b>CHAPTER 17 ECONOMIC AND FINANCIAL ANALYSIS.....</b>	<b>17-1</b>
17.1 GENERAL .....	17-1
17.2 ASSUMPTIVE VARIABLES AND PARAMETERS ADOPTED	
FOR FINANCIAL AND ECONOMIC ANALYSES .....	17-1
17.3 RESULTS OF PRELIMINARY ANALYSIS .....	17-4
17.4 RESULTS OF THE FINANCIAL AND ECONOMIC ANALYSIS BY SECTOR.....	17-5
17.4.1 Water Supply .....	17-6
17.4.2 Water Transport .....	17-8
17.4.3 Road Transport .....	17-9
17.4.4 Energy .....	17-10
17.4.5 Storm Water Drainage .....	17-11
17.5 RESULT OF SENSITIVITY ANALYSIS.....	17-12
17.6 CONCLUSION .....	17-14
<b>CHAPTER 18 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENTS.....</b>	<b>18-1</b>

18.1 SOUTH SUDAN EIA SYSTEM.....	18-1
18.1.1 The Ministry of Environment (MOE), Republic of South Sudan ROSS .....	18-1
18.1.2 Environmental Protection Bill, 2010.....	18-2
18.1.3 EIA Procedure .....	18-3
18.2 PREDICTED MAJOR ENVIRONMENTAL AND SOCIAL IMPACTS BY SECTOR ....	18-4
18.2.1 Profile of Short and Medium Term Projects.....	18-4
18.2.2 Rating of Predicted Impacts .....	18-12
18.2.3 Outline of Predicted Impacts.....	18-16
18.2.4 Analysis of Alternatives .....	18-19
18.2.5 Proposed Mitigation Measures and Monitoring for Key Impacts .....	18-19
18.3 CONCLUSION .....	18-21
<b>CHAPTER 19 THE COMPREHENSIVE PLAN.....</b>	<b>19-1</b>
19.1 DEFINITION OF THE COMPREHENSIVE PLAN.....	19-1
19.2 APPROACH TO FORMULATING THE IMPLEMENTATION PLAN.....	19-1
19.2.1 Principles for the Formulation of the Project Implementation Plan.....	19-1
19.3 PROGRAMMES .....	19-4
19.3.1 Programmes under Malakal Infrastructure Development Strategy .....	19-4
19.3.2 Programmes under the Region-wide Economic Development Strategy .....	19-7
19.3.3 Programmes under the Social Development Strategy .....	19-8
19.3.4 Programmes under the Peacebuilding and Governance Strengthening.....	19-10
19.4 PROJECT PROGRAMMING EVALUATION.....	19-10
19.5 PROJECT IMPLEMENTATION PLAN.....	19-16
19.5.1 Projects Programming .....	19-16
19.6 INVESTMENT SCHEDULE.....	19-19
19.7 PROFILE OF SHORT- AND MEDIUM-TERM PROJECTS .....	19-33
19.7.1 Malakal Infrastructure Development Programme .....	19-33
19.7.2 Region-wide Economic Development Programme .....	19-61
19.7.3 Social Development Programme.....	19-73
19.7.4 Peacebuilding/Governance Strengthening Programme .....	19-90
19.8 SELECTION OF URGENT DEVELOPMENT PROJECTS.....	19-93
19.9 CONCLUSION .....	19-95

## **<PART V> URGENT DEVELOPMENT PROJECTS**

<b>CHAPTER 20 URGENT DEVELOPMENT PROJECT IN WATER SUPPLY SECTOR ....</b>	<b>20-1</b>
20.1 OUTLINE OF THE PROJECT .....	20-1
20.1.1 Identification of the Project.....	20-1
20.1.2 Design.....	20-8
20.2 RECOMMENDATION ON CONFLICT PREVENTION.....	20-9
20.3 CONSTRUCTION .....	20-11



20.4	OPERATION AND MANAGEMENT PLAN .....	20-12
20.4.1	Organization .....	20-12
20.4.2	Operation and Management Plan .....	20-13
20.4.3	Monthly O&M Cost .....	20-19
20.5	CONCLUSION .....	20-21
<b>CHAPTER 21 URGENT DEVELOPMENT PROJECT IN WATER TRANSPORT SECTOR.....</b>		<b>21-1</b>
21.1	OUTLINE OF THE PROJECT .....	21-1
21.1.1	Selection of the Structure .....	21-1
21.1.2	Design.....	21-3
21.1.3	Construction Plan .....	21-6
21.2	RECOMMENDATIONS FOR CONFLICT PREVENTION.....	21-7
21.3	CONSTRUCTION .....	21-7
21.3.1	Work Plan .....	21-7
21.3.2	Quality Control.....	21-8
21.4	CONCLUSION .....	21-9
<b>CHAPTER 22 URGENT DEVELOPMENT PROJECT IN ROAD TRANSPORT SECTOR.....</b>		<b>22-1</b>
22.1	OUTLINE OF THE PROJECT .....	22-1
22.1.1	Selection of the Project.....	22-1
22.1.2	Design.....	22-5
22.1.3	Evaluation of Construction Method .....	22-9
22.2	RECOMMENDATION ON CONFLICT PREVENTION.....	22-13
22.3	CONSTRUCTION .....	22-14
22.3.1	Work Plan & Progress .....	22-14
22.3.2	Quality Control.....	22-20
22.3.3	Equipment and Materials Procurement Plan .....	22-21
22.4	OPERATION AND MAINTENANCE PLAN.....	22-22
22.4.1	Organization .....	22-22
22.4.2	LBT Implementation Unit .....	22-24
22.4.3	Operation and Management Plan .....	22-27
22.4.4	O&M Cost .....	22-27
22.5	CONCLUSION .....	22-30
<b>&lt; PART VI &gt; RECOMMENDATIONS</b>		
<b>CHAPTER 23 RECOMMENDATIONS .....</b>		<b>23-1</b>
23.1	PLANNING SYSTEM.....	23-1
23.1.1	Formation of all Relevant Organizations/Agencies for the Comprehensive Plan .....	23-1
23.1.2	Authorization of the Comprehensive Plan and Incorporation	

into National/Regional Development Plan .....	23-2
23.1.3 Amendment of the Plan as Situation Changes .....	23-2
23.1.4 Promotion of Capacity Building.....	23-3
23.1.5 Timely Conduct of Feasibility Studies .....	23-4
23.2 IMPLEMENTATION .....	23-5
23.2.1 Securing/Raising of Funds .....	23-5
23.2.2 Adoption of Labour-based Construction for Job Creation .....	23-5
23.2.3 Promotion of Local Construction Industries .....	23-6
23.3 OPERATION AND MANAGEMENT.....	23-7
23.3.1 Execution of Adequate Maintenance.....	23-7
23.3.2 Discreet Encouragement of Private Sector Participation .....	23-8
23.4 CONCLUSION .....	23-8

## **APPENDICES**

### APPENDIX-I

Appendix A- 1: Malakal Town Profile Final Report

### APPENDIX-II

Appendix A- 2: Topographic Survey Report

Appendix A- 3: Traffic Survey Report

Appendix A- 4: Water Quality Survey

Appendix A- 5: Technical Note on Long-Run Marginal Cost (LRMC) Method for Economic Benefit

Appendix A- 6: Rescheduling of the Comprehensive Plan

Appendix A- 7: Training Report

Appendix A- 8: Drawings and Photos of Urgent Development Project (Water Supply Sector)

Appendix A- 9: Work Execution Plan and Drawings of Urgent Development Project (Water Transport Sector)

Appendix A-10: Report of Reconnaissance Interview Survey on Pilot Works by LBT (Road Transport Sector)

Appendix A-11: LBT Implementation Manual

Appendix A-12: Report on the Study for Establishing and Improving for the Management, Operation and Maintenance System of Water Supply in Malakal Town

Appendix A-13: Final Report for Implementation of Urgent Development Projects

## LIST OF TABLES

### Chapter-1

Table 1.3-1	Project Team Members .....	1-4
Table 1.3-2	Project Schedule .....	1-5
Table 1.4-1	Meetings, Seminars and Workshops.....	1-8

### Chapter-2

Table 2.2-1	Population of Malakal Town in 2008 .....	2-4
Table 2.2-2	Population and Number of Households of Makal County at Boma Level in 2008 .	2-5
Table 2.2-3	Inflow and Outflow of Returnees to UNS and Malakal Town .....	2-6
Table 2.2-4	Estimate of 2012 Malakal Population by Macroscopic Approach .....	2-8
Table 2.2-5	Population of Malakal Town by Boma Estimated in 2012.....	2-9
Table 2.2-6	Household Income and Equivalent Income/Person/Day .....	2-12
Table 2.2-7	Gross Domestic Product (GDP) and Gross National Income (GNI) of South Sudan in 2008, 2009 and 2010.....	2-15
Table 2.2-8	GNI per capita of East African Countries.....	2-16
Table 2.2-9	Type and Number of Businesses Interviewed in the Market Survey.....	2-17
Table 2.2-10	Business Trends Perceived by Business Operators .....	2-18
Table 2.3-1	Layers of Government and Administrative Units.....	2-19
Table 2.3-2	New Jurisdiction of Payam in Makal County and Malakal City .....	2-21
Table 2.4-1	Zoning System and Other Approaches for Realising Future Visions .....	2-28
Table 2.4-2	Components of Administrative Framework for Land Use Management.....	2-28
Table 2.4-3	Permissible Development.....	2-30
Table 2.4-4	Land Classes in Malakal Town.....	2-31
Table 2.4-5	Land Use Composition by Boma in 2012 .....	2-36

### Chapter-3

Table 3.2-1	Population of Makal County and Returnees.....	3-3
Table 3.2-2	Length of Stay of the Residents by Boma .....	3-4
Table 3.3-1	Biggest Development Needs in Boma.....	3-9
Table 3.3-2	Average Monthly Income by Boma.....	3-14
Table 3.3-3	Source of Income by Boma .....	3-16

### Chapter-4

Table 4.2-1	Outline of SSDP National Priorities .....	4-7
Table 4.2-2	SSDP Expenditure Allocations (in %).....	4-8
Table 4.2-3	Pillars and State Strategic Goals.....	4-9
Table 4.2-4	Overall County SWOT Analysis .....	4-10
Table 4.2-5	Payam under Malakal and Makal .....	4-11
Table 4.3-1	SWOT Analysis on Malakal .....	4-11



Table 4.4-1	Comparison of Alternative Restoration/Reconstruction Scenarios .....	4-19
Table 4.5-1	Projected Population of Malakal Town in 2022 .....	4-23
Table 4.5-2	Population Projection for Malakal Town for 2022: Low Growth Scenario (1/3).....	4-24
Table 4.5-3	Population Projection for Malakal Town for 2022: Medium Growth Scenario (2/3).....	4-25
Table 4.5-4	Population Projection for Malakal Town for 2022: High Growth Scenario (3/3) .....	4-26
Table 4.5-5	Labour Force Supply and Demand Balance in 2012 and 2022 (Estimation) .....	4-27
Table 4.5-6	Labour Force Demand and Supply Balance (High Growth Scenario) .....	4-28
Table 4.5-7	Labour Force Demand and Supply Balance (Medium Growth Scenario).....	4-29
Table 4.5-8	Labour Force Demand and Supply Balance (Low Growth Scenario).....	4-30
Table 4.5-9	Gross Regional Domestic Product of Malakal in 2012 and 2022 .....	4-31
Table 4.5-10	Value Added Generated in Malakal Town (High Growth Scenario) .....	4-32
Table 4.5-11	Value Added Generated in Malakal Town (Medium Growth Scenario).....	4-33
Table 4.5-12	Value Added Generated in Malakal Town (Low Growth Scenario).....	4-34
Table 4.6-1	Utilisation of Urban Development Potential .....	4-36
Table 4.6-2	Urban Structure Patterns.....	4-37
Table 4.6-3	Urbanized Area Required by 2022 .....	4-38
Table 4.6-4	Land Class in Malakal Town .....	4-38
Table 4.6-5	Population Density by Housing Type.....	4-38
Table 4.6-6	Standard Land Use Composition.....	4-39
Table 4.6-7	New Land Development In and Outside of Malakal Town .....	4-39
Table 4.6-8	Residential Area Required.....	4-41
Table 4.6-9	Business/Commercial Area (Required) .....	4-41
Table 4.6-10	Composition of Tertiary Sector Population .....	4-42
Table 4.6-11	Industrial Area Required.....	4-42
Table 4.6-12	Future Land Use Demand in 2022.....	4-43
Table 4.6-13	Land Use Conversion Pattern in the Urbanized Area (Land Use Conversion Pattern by Functional Solvency/Productivity).....	4-44
Table 4.6-14	Zoning in This Project .....	4-44
Table 4.9-1	Socio-Economic Framework of Medium Growth Scenario Targeted 2022 .....	4-51
Table 4.9-2	Urban Structure Patterns (Dispersed Pattern).....	4-51
Table 4.9-3	Recommendations on Conflict Prevention by Strategy of the Comprehensive Plan .....	4-52
 <b>Chapter-5</b>		
Table 5.2-1	Projects Carried Out between 2011 and 2013 .....	5-3
Table 5.4-1	Summary of Water Supply Service of SSUWC-Malakal, UNS .....	5-4
Table 5.4-2	Financial Status of SSUWC-Malakal (Unit-SSP) .....	5-6

Table 5.4-3	Water Quality Data of Treatment Plant .....	5-7
Table 5.5-1	Current Condition of Water Use .....	5-8
Table 5.5-2	Water Supply Facility of SSUWC-Malakal.....	5-8
Table 5.5-3	Outlines of Unit Type Treatment Plant.....	5-10
Table 5.9-1	Design Criteria of Future Plan.....	5-18
Table 5.9-2	Water Demand Projection.....	5-20
Table 5.10-1	Components of Development Project WS-2 .....	5-23
Table 5.10-2	Comparison of the Treatment Process for Restoration .....	5-24
Table 5.11-1	Role of SSUWC-Malakal and Water Committee on the O&M Work .....	5-29
Table 5.11-2	Recommended Staff Members for Urgent Development Support Project .....	5-30
Table 5.11-3	Annual O&M Cost .....	5-31
Table 5.12-1	Capacity Development Logframe (Water Supply Sector) .....	5-32

**Chapter-6**

Table 6.4-1	Commercial Operator Fleets.....	6-4
Table 6.4-2	Number of Fleet Calling at Malakal Port .....	6-5
Table 6.4-3	Contents of Goods .....	6-5
Table 6.4-4	Boat Classifications .....	6-5
Table 6.4-5	Result of Boat Count Survey (Monday) .....	6-6
Table 6.4-6	Result of Boat Count Survey (Tuesday) .....	6-6
Table 6.4-7	Sample Number of Boat OD Survey .....	6-7
Table 6.4-8	OD Trip Pattern (Monday) .....	6-8
Table 6.4-9	OD Trip Pattern (Tuesday) .....	6-8
Table 6.4-10	Number of Passengers .....	6-8
Table 6.4-11	Sample Number and Trip Purpose.....	6-8
Table 6.4-12	Passenger OD Trip Pattern (Monday) .....	6-9
Table 6.4-13	Passenger OD Trip Pattern (Tuesday) .....	6-9
Table 6.4-14	Vehicle Classifications.....	6-9
Table 6.4-15	Result of Vehicle Count Survey (Monday).....	6-10
Table 6.4-16	Result of Vehicle Count Survey (Tuesday) .....	6-10
Table 6.4-17	Vehicle Type and Number for OD Survey.....	6-11
Table 6.4-18	Trip Purpose .....	6-11
Table 6.4-19	Unloading Fees.....	6-12
Table 6.5-1	Information of Seven River Ports.....	6-13
Table 6.5-2	Outline of Malakal Port Facilities .....	6-15
Table 6.7-1	List of Japanese Assisted Projects for Transport Sector .....	6-16
Table 6.7-2	Contents for the Capacity Development Project for Inland Waterway.....	6-16
Table 6.8-1	Cargo Distribution Patterns in UNS .....	6-19
Table 6.9-1	Forecast of River Transport Demand .....	6-23
Table 6.9-2	Items to be Considered for Port Planning.....	6-24

Table 6.9-3	Social and Natural Condition Considerations .....	6-24
Table 6.9-4	Candidate Locations for New Port .....	6-26
Table 6.9-5	Direction of Role Allotment of Port .....	6-26
Table 6.10-1	Proposed Plan for the Port Project.....	6-29
Table 6.10-2	Project List of Port Sector (1/2).....	6-36
Table 6.10-3	Project List of Port Sector (2/2).....	6-37
Table 6.11-1	Roles of Personnel.....	6-40
Table 6.11-2	Operation Cost per Day .....	6-41
Table 6.11-3	Annual Operation Cost .....	6-41
Table 6.11-4	Annual Maintenance and Repair Cost.....	6-41
Table 6.11-5	Total Annual Cost .....	6-42
Table 6.12-1	Capacity Development Logframe (Water Transport Sector) .....	6-43

## **Chapter-7**

Table 7.1-1	Institutional Framework of Road and Transport Sector .....	7-1
Table 7.3-1	Budget Plans of the MoPI&RD in 2011 by Resources.....	7-4
Table 7.3-2	Budget Plans of the MoPI&RD in 2011 by Expenditures .....	7-4
Table 7.3-3	Capital Budget of the MoPI&RD in 2011 .....	7-4
Table 7.4-1	Vehicle Categories .....	7-7
Table 7.4-2	Number of Traffic Accidents in Malakal Town (March – May 2012).....	7-8
Table 7.6-1	Results of Road Inventory Survey of Community Roads .....	7-11
Table 7.6-2	Summary of Traffic Survey Points .....	7-12
Table 7.6-3	Result of Traffic Volume Count Survey-1 .....	7-14
Table 7.6-4	Average Vehicle Occupancy/ (Passengers per Vehicle).....	7-14
Table 7.6-5	Traffic Volume on Arterial Roads.....	7-15
Table 7.6-6	Number of Vehicles and Passengers in Bus Terminal-1 (Dolef Terminal) .....	7-15
Table 7.6-7	Number of Vehicles and Passengers in Bus Terminal-2 (Moulet Square Terminal) .....	7-15
Table 7.7-1	Projects of Road Sector .....	7-16
Table 7.8-1	Issues of Road and Transport Sectors in Malakal.....	7-17
Table 7.9-1	Highways and Roads (Original) .....	7-19
Table 7.9-2	A Proposed Standard of Highways and Roads (Integral) .....	7-20
Table 7.9-3	Proposed Design Standards by Road Class .....	7-20
Table 7.9-4	Definition of Road Classification for Malakal Town .....	7-20
Table 7.9-5	Framework of Roads and Transport Plan for Malakal Town.....	7-21
Table 7.9-6	Traffic Volume Estimate on the Trunk Road .....	7-22
Table 7.9-7	Summary of Road Network Plan.....	7-23
Table 7.10-1	Plan of Public Transport Terminal.....	7-28
Table 7.13-1	Roles of Personnel.....	7-34
Table 7.13-2	Operation Cost per Day .....	7-35

Table 7.13-3	Annual Operation Cost .....	7-35
Table 7.13-4	Annual Maintenance and Repair Cost .....	7-36
Table 7.13-5	Total Annual Cost .....	7-36
Table 7.14-1	Capacity Development Logframe (Road Transport Sector) .....	7-38

### **Chapter-8**

Table 8.4-1	Status of Present Generating Plants at Malakal Power Station .....	8-4
Table 8.4-2	List of Existing Distribution Transformer .....	8-5
Table 8.6-1	Provider of Electric Power Service .....	8-7
Table 8.6-2	Expenditure on Electricity .....	8-8
Table 8.6-3	Expenditure on Other Fuel .....	8-8
Table 8.6-4	Issues with Energy .....	8-8
Table 8.9-1	Estimated Power Demand under Existing Situation as of April, 2012.....	8-13
Table 8.9-2	Power Demand Forecast.....	8-13
Table 8.11-1	Capacity Development Logframe (Energy Sector) .....	8-17

### **Chapter-9**

Table 9.2-1	Coverage of Improved Sanitation Facility (Target Value).....	9-3
Table 9.3-1	Budget for Water and Sanitation in UNS (2011/12).....	9-3
Table 9.4-1	Financial Balance of Public Toilet (Per One Site and Per One Month) .....	9-8
Table 9.6-1	Use of Public Toilet .....	9-10
Table 9.6-2	Type of Toilet Used and Flush/Non-flush Type.....	9-10
Table 9.6-3	Treatment Method for On-site Toilet.....	9-10
Table 9.6-4	Frequency of Removing Sludge .....	9-10
Table 9.6-5	Expenditure on Sludge Removal .....	9-10
Table 9.6-6	Issues with Toilet.....	9-11
Table 9.7-1	Projects Regarding Urban and Rural Sanitation Conducted by Local Government with Support of the Central Government .....	9-12
Table 9.8-1	Issues on Sewage and Sanitation Sector.....	9-12
Table 9.9-1	Precondition.....	9-16
Table 9.9-2	Population by Type of Toilet .....	9-17
Table 9.9-3	Precondition for Calculating Required Number of Vacuum Trucks.....	9-17
Table 9.9-4	Outline of Sludge Treatment Facilities (Capacity 140m <sup>3</sup> /day).....	9-18
Table 9.10-1	Proposed Member of Public Toilet Committee .....	9-21
Table 9.10-2	Estimated Wage for Responsible Agency for Public Sanitation.....	9-21
Table 9.10-3	Estimated Running Cost for Sludge Management .....	9-21
Table 9.10-4	Estimated Running Cost for One Location of Public Toilet (VIP Latrine) .....	9-22
Table 9.10-5	Estimated Running Cost for One Location of Public Toilet (PT Latrine) .....	9-22
Table 9.10-6	Proposed Organization in Malakal Town .....	9-25
Table 9.10-7	Staffing Plan for Operation and Maintenance for Malakal Town.....	9-25



Table 9.11-1	Capacity Development Logframe (Sewage and Sanitation Sector) .....	9-26
--------------	--	------

**Chapter-10**

Table 10.2-1	Target of Road Improvement.....	10-1
Table 10.3-1	2011/2012 Budget Estimates .....	10-2
Table 10.5-1	Existing Culverts under Shilluk Avenue.....	10-3
Table 10.6-1	Water Level of the Nile River.....	10-8
Table 10.7-1	Ongoing Projects .....	10-9
Table 10.9-1	Maximum Daily Rainfall 2002 – 2011 .....	10-12
Table 10.9-2	Rainfall Intensity .....	10-12
Table 10.9-3	Main Drain (Open Trapezoidal Drain) for Present Malakal Town.....	10-13
Table 10.9-4	Main Drain (Pipe Culvert) for Present Malakal Town .....	10-13
Table 10.9-5	Main Drain (Open Trapezoidal Drain) for New Urban Area.....	10-15
Table 10.9-6	Main Drain (Pipe Culvert) for New Development Area.....	10-15
Table 10.11-1	Capacity Development Logframe (Storm Water Drainage Sector) .....	10-22

**Chapter-11**

Table 11.1-1	Organization Units under Directorate of Community and Public Health, MoH ...	11-2
Table 11.4-1	Activities of General Sanitation for Environmental Corporation Department.....	11-5
Table 11.6-1	Amount of Garbage Generation per Week (1/2).....	11-10
Table 11.6-2	Amount of Garbage Generation per Week (2/2).....	11-10
Table 11.6-3	Availability of Garbage Collection Service.....	11-10
Table 11.6-4	Use of Garbage Collection Service by Service Provider.....	11-11
Table 11.6-5	Frequency of Garbage Collection Service by Different Providers .....	11-11
Table 11.6-6	Recycle of Garbage for Compost .....	11-11
Table 11.6-7	Recycle of Garbage for Fuel.....	11-11
Table 11.6-8	Issues with Garbage Collection Situation.....	11-12
Table 11.9-1	Results of Calculation and Estimation of Solid Waste Collection (2012 – 2022)	11-16
Table 11.9-2	Proposed Waste Collection System in Malakal Town (2022) .....	11-17
Table 11.10-1	Outline of Solid Waste Collection Activities Improvement Project (Phase-1)....	11-21
Table 11.10-2	Outline of Solid Waste Collection Activities Improvement Project (Phase-2)....	11-21
Table 11.10-3	Outline Landfill Management Improvement Project.....	11-22
Table 11.10-4	Outline of Medical Waste Management Improvement Project .....	11-22
Table 11.11-1	Capacity Development Logframe (Solid Waste Management Sector) .....	11-23

**Chapter-12**

Table 12.1-1	Education Ladder in ROSS .....	12-1
Table 12.2-1	SSDP Education Sector Targets in ROSS.....	12-3
Table 12.3-1	2010 Budget by Item in MoE UNS .....	12-3
Table 12.4-1	Overview of Primary Education in Malakal Town, UNS and ROSS .....	12-4
Table 12.4-2	Partner Lists in Education Sector .....	12-5

Table 12.4-3	Primary Schools in Malakal Town, 2008 – 2010 .....	12-6
Table 12.4-4	Primary School Facilities in Malakal Town, UNS and ROSS in 2010.....	12-7
Table 12.4-5	Primary Schools Language of Instruction by Grade, 2010 (UNS).....	12-7
Table 12.4-6	Overview of Secondary Education in Malakal Town, UNS and ROSS .....	12-8
Table 12.4-7	Secondary School in Malakal Town, 2008 – 2010 .....	12-8
Table 12.4-8	Secondary School Facilities in Malakal Town, UNS and ROSS in 2010.....	12-8
Table 12.4-9	Overview of Faculties of UNU.....	12-9
Table 12.4-10	Overview of VTC .....	12-10
Table 12.6-1	Educational Level of Household Head.....	12-12
Table 12.6-2	Level of Writing and Reading a Simple English Sentence with Good Understanding.....	12-12
Table 12.6-3	Level of Satisfaction with Present Educational Services .....	12-12
Table 12.6-4	Issues with Educational Services.....	12-13
Table 12.9-1	Educational Target 2022 in UNS .....	12-17
Table 12.9-2	School Facility Target 2022 in Malakal Town.....	12-17

### **Chapter-13**

Table 13.1-1	Roles and Functions of all Directorates in the Central MOH.....	13-2
Table 13.3-1	State Ministry of Health 2011/12 Budget Estimates by Expenditure Item.....	13-5
Table 13.4-1	Regional Composition of Key Health Indicator .....	13-6
Table 13.4-2	Health Service Provision in UNS .....	13-6
Table 13.4-3	Health Outcomes in UNS .....	13-8
Table 13.5-1	Health Facilities Inventory of UNS.....	13-9
Table 13.5-2	Physical Structure of Health Facilities in UNS .....	13-10
Table 13.5-3	Distribution of Health Human Resources by Categories and by County in UNS	13-11
Table 13.5-4	Distribution of HR, by Categories and Counties in UNS.....	13-12
Table 13.6-1	Social Development Indicators.....	13-12
Table 13.7-1	Priority Diseases for Integrated Disease Surveillance & Response .....	13-13

### **Chapter-14**

Table 14.1-1	Key Capacity Features and Elements .....	14-1
Table 14.1-2	Manpower of Public Organizations in UNS.....	14-3
Table 14.2-1	UN Development Assistance Framework South Sudan (2012 – 2013).....	14-5
Table 14.2-2	CBTF-II (2010 – 2012) and the Extension Period (2012 – 2013) Work Plan .....	14-7
Table 14.2-3	Deployment of the CSSOs According to Sector and Location.....	14-8
Table 14.2-4	JICA's on-going Capacity Development Projects in South Sudan .....	14-9
Table 14.3-1	Results of the Training Needs Survey .....	14-10
Table 14.3-2	Directorates of MoPI&RD .....	14-11
Table 14.4-1	English Documentation Training.....	14-15
Table 14.4-2	IT Skills Training.....	14-16

Table 14.4-3	Project Management Training .....	14-16
Table 14.4-4	GIS Training .....	14-17
Table 14.4-5	Auto CAD Training .....	14-18
Table 14.4-6	Technical (Skills) Training .....	14-19
Table 14.4-7	Basic Accounting Skill Training.....	14-20

### **Chapter-15**

Table 15.3-1	Result of Business Survey in Juba.....	15-6
Table 15.3-2	Measures Proposed to Improve Business Environment in Juba.....	15-7
Table 15.4-1	Strategic Objective, Strategy, Activity and Output on Research and Development by Ministry of Animal Resources and Fisheries ROSS .....	15-8

### **Chapter-17**

Table 17.2-1	Assumptive Variables and Parameters.....	17-1
Table 17.3-1	Rating of Plausible Impacts (Financial and Economic Aspects) .....	17-4
Table 17.3-2	Rating of Plausible Impacts (Financial and Economic Aspects) .....	17-5
Table 17.3-3	Rating of Plausible Impacts (Financial and Economic Aspects) .....	17-5
Table 17.4-1	Results of FIRRs, EIRRs, and ENPVs .....	17-5
Table 17.4-2	Summary Cash Flow (FIRR) (WS-2).....	17-6
Table 17.4-3	Summary Cash Flow (EIRR) (WS-2).....	17-6
Table 17.4-4	Summary Cash Flow (FIRR) (WS-4).....	17-7
Table 17.4-5	Summary Cash Flow (EIRR) (WS-4).....	17-7
Table 17.4-6	Summary Cash Flow (FIRR) (Water Transport) .....	17-8
Table 17.4-7	Summary Cash Flow (EIRR) (Water Transport) .....	17-8
Table 17.4-8	Summary Cash Flow (FIRR) (Road Transport) .....	17-9
Table 17.4-9	Summary Cash Flow (EIRR) (Road Transport) .....	17-9
Table 17.4-10	Summary Cash Flow (FIRR) (Energy).....	17-10
Table 17.4-11	Summary Cash Flow (EIRR) (Energy) .....	17-10
Table 17.4-12	Summary Cash Flow (FIRR) (Storm Water Drainage) .....	17-11
Table 17.4-13	Summary Cash Flow (EIRR) (Storm Water Drainage) .....	17-11
Table 17.5-1	Summary of Sensitivity Analysis .....	17-12
Table 17.5-2	Results of Sensitivity Analysis (WS-2) .....	17-12
Table 17.5-3	Results of Sensitivity Analysis (WS-4) .....	17-12
Table 17.5-4	Results of Sensitivity Analysis (Water Transport).....	17-13
Table 17.5-5	Results of Sensitivity Analysis (Road Transport).....	17-13
Table 17.5-6	Results of Sensitivity Analysis (Energy).....	17-13
Table 17.5-7	Results of Sensitivity Analysis (Storm Water Drainage).....	17-14

### **Chapter-18**

Table 18.1-1	Contents of Environmental Protection Bill, 2010 .....	18-3
Table 18.2-1	Summary of Project Profile (Water Supply Sector) .....	18-5

Table 18.2-2	Summary of Project Profile (Water Transport Sector) .....	18-6
Table 18.2-3	Summary of Project Profile (Road Transport Sector) .....	18-7
Table 18.2-4	Summary of Project Profile (Energy Sector).....	18-8
Table 18.2-5	Summary of Project Profile (Sewage and Sanitation Sector).....	18-8
Table 18.2-6	Summary of Project Profile (Storm Water Drainage).....	18-9
Table 18.2-7	Summary of Project Profile (Solid Waste Management Sector) .....	18-9
Table 18.2-8	Summary of Project Profile (Education Sector) .....	18-10
Table 18.2-9	Summary of Project Profile (Health Sector).....	18-11
Table 18.2-10	Summary of Project Profile (Socio-Economic Sector).....	18-11
Table 18.2-11	The Rating of the Predicted Impact (Water Supply, Water Transport, Road Transport Sector).....	18-13
Table 18.2-12	The Rating of the Predicted Impact (Energy, Sewage and Sanitation, Storm Water Drainage, Solid Waste Management, Education, Health Sector) ...	18-14
Table 18.2-13	The Rating of the Predicted Impact (Socio-Economic Sector) .....	18-15
Table 18.2-14	Outline of Predicted Impact.....	18-16
Table 18.2-15	Proposed Mitigation Measure and Monitoring Item .....	18-19
Table 18.3-1	Outline of Predicted Impact.....	18-22

## **Chapter-19**

Table 19.3-1	Programmes under Malakal Infrastructure Development Strategy .....	19-6
Table 19.3-2	Programmes under Region-wide Economic Development Strategy .....	19-8
Table 19.3-3	Programmes under Social Development Strategy .....	19-9
Table 19.3-4	Programmes for Peacebuilding/Governance Strengthening Strategy.....	19-10
Table 19.4-1	Programing Evaluation Criteria of the Projects.....	19-11
Table 19.4-2	Programming Evaluation Results of Projects .....	19-12
Table 19.5-1	Implementation Schedule of the Comprehensive Plan.....	19-17
Table 19.6-1	Budget Requirement Summary .....	19-19
Table 19.6-2	Commitment and Expenditure by Donors .....	19-20
Table 19.6-3	Balance between Capital Cost and Locally Available Financial Resource .....	19-24
Table 19.6-4	Balance between Operation & Management Cost and Locally Available Financial Resource .....	19-28
Table 19.6-5	2011 Budget for UNS .....	19-32
Table 19.8-1	Difficulties and Highest Needs of Residents Living in Malakal .....	19-93
Table 19.8-2	Views on the Urgent Development Projects.....	19-94
Table 19.8-3	Proposed Urgent Support Projects.....	19-95
Table 19.9-1	List of the Projects of the Comprehensive Plan .....	19-96

## **Chapter-20**

Table 20.1-1	Examination of Alternatives for the Urgent Development Project in the Water Supply Sector .....	20-3
--------------	--	------



Table 20.1-2	Design Criteria of Scheme 1 & 2 in the Urgent Development Project.....	20-9
Table 20.1-3	Design Criteria of Scheme 3 in the Urgent Development Project.....	20-9
Table 20.3-1	Construction Plan .....	20-12
Table 20.4-1	Staff Member of SSUWC Malakal.....	20-12
Table 20.4-2	Composition of Water Truck Section .....	20-13
Table 20.4-3	Activities of O&M on Water Truck.....	20-15
Table 20.4-4	Time Schedule of the Preparation Work.....	20-16
Table 20.4-5	Experience to be Required and Measure of the Training .....	20-17
Table 20.4-6	Cost for Personnel to be Outsourced for Training Period .....	20-18
Table 10.4-7	Time Schedule of the Preparation Work.....	20-19
Table 20.4-8	Monthly O&M Cost on Water Trucks .....	20-20
Table 20.5-1	Contents of Urgent Development Project in Water Supply Sector.....	20-21

### **Chapter-21**

Table 21.1-1	Study on the Type of Reconstruction of Jetty.....	21-2
Table 21.1-2	Study on the Type of Jetty for Passengers.....	21-3
Table 21.1-3	Material Plan .....	21-6
Table 21.3-1	Implementation Schedule for Construction of Passenger Jetty .....	21-8
Table 21.3-2	Implementation Schedule of Reconstruction of Jetty.....	21-8
Table 21.4-1	Contents of Urgent Development Project in Port Sector.....	21-9

### **Chapter-22**

Table 22.1-1	Candidate List for Community Road Improvement Programme .....	22-4
Table 22.1-2a	CBR with Yellow Soil .....	22-6
Table 22.1-2b	Swell with Yellow Soil .....	22-6
Table 22.1-3a	CBR with Cement Treatment .....	22-7
Table 22.1-3b	Swell with Cement Treatment .....	22-7
Table 22.1-4a	CBR with Lime Treatment .....	22-7
Table 22.1-4b	Swell with Lime Treatment .....	22-7
Table 22.1-5	Construction Method Evaluation Matrix for Community Road Improvement Programme (1/3) .....	22-10
Table 22.1-6	Construction Method Evaluation Matrix for Community Road Improvement Programme (2/3) .....	22-11
Table 22.1-7	Construction Method Evaluation Matrix for Community Road Improvement Programme (3/3) .....	22-12
Table 22.3-1	General Implementation Plan for Community Road Improvement Programme .	22-15
Table 22.3-2	Daily Based Detailed Schedule for Pilot Works.....	22-18
Table 22.3-3	Equipment Procurement List.....	22-22
Table 22.4-1	Evaluation Matrix for LBT Implementation Unit .....	22-26
Table 22.4-2	Operation Cost per Day.....	22-27

Table 22.4-3	Annual Operation Cost.....	22-28
Table 22.4-4	Annual Maintenance and Repair Cost.....	22-28
Table 22.4-5	Total Annual Cost.....	22-29
Table 22.5-1	Contents of Urgent Development Project in Road Transport Sector.....	22-30

**Chapter-23**

Table 23.2-1	Comparison of Construction Methods.....	23-6
Table 23.2-2	Target Market Share in Construction Industry .....	23-7

## LIST OF FIGURES

### Chapter-1

Figure 1.3-1	Project Organization .....	1-3
--------------	----------------------------	-----

### Chapter-2

Figure 2.1-1	Location of Sudd and Malakal Town.....	2-2
Figure 2.1-2	Average Monthly Rainfall in Malakal (2000 to 2010) .....	2-3
Figure 2.1-3	Average Maximum and Minimum Temperature in Malakal (2000 to 2010).....	2-3
Figure 2.1-4	Monthly Frequency of Wind Direction (2000 to 2010).....	2-4
Figure 2.2-1	Duration of Time Living in Malak .....	2-11
Figure 2.2-2	Status of Residents .....	2-11
Figure 2.2-3	Ethnic Distribution .....	2-11
Figure 2.2-4	Means of Livelihood .....	2-12
Figure 2.2-5	Education Level of the Household Head.....	2-14
Figure 2.2-6	Number of Shops/Companies Established in Malakal Town .....	2-17
Figure 2.3-1	Organizational Structure of Makal County .....	2-20
Figure 2.3-2	Organisational Structure of the Malakal City Council .....	2-21
Figure 2.4-1	Procedure for Endorsement of Administrative Boundaries in Malakal.....	2-32
Figure 2.4-2	Target Area for Existing Land Use Survey.....	2-34
Figure 2.4-3	Population Density of 22 Boma .....	2-35
Figure 2.4-4	Existing Land Use Composition.....	2-37
Figure 2.4-5	Housing Patterns by Population Density .....	2-38
Figure 2.4-6	Housing Development Patterns to the East of the Ring Road .....	2-39

### Chapter-3

Figure 3.2-1	Number of Returnees to South Sudan .....	3-3
Figure 3.2-2	Number of Returnees by State (February 2007 – September 2013).....	3-3
Figure 3.3-1	Five Highest Development Needs .....	3-8
Figure 3.3-2	Main Source of Livelihood.....	3-15

### Chapter-4

Figure 4.1-1	Flow of Comprehensive Plan Formulation.....	4-3
Figure 4.2-1	Hierarchy of Plans .....	4-4
Figure 4.3-1	Problem Structure of Malakal Town.....	4-13
Figure 4.3-2	Vision of Malakal Town in 2022 .....	4-15
Figure 4.3-3	Desirable Government for a Peaceful and Beloved City.....	4-15
Figure 4.4-1	The SSDP's Core Pillars and the Malakal Development Strategies.....	4-17
Figure 4.4-2	Conceptual Fund Requirement for Restoration/Reconstruction Scenarios .....	4-18
Figure 4.6-1	High Density Development .....	4-35
Figure 4.6-2	Future Urban Function Distribution Patterns .....	4-37

Figure 4.6-3	Future Land Development Plan in Malakal Town.....	4-40
Figure 4.6-4	Proposed Land Use Zoning in 2022 .....	4-45

**Chapter-5**

Figure 5.4-1	Current Condition of Water Supply Service.....	5-5
Figure 5.5-1	Existing Water Treatment Plant in SSUWC-Malakal.....	5-12
Figure 5.9-1	Conceptual Image of the Comprehensive Plan on Water Sector .....	5-21
Figure 5.9-2	Trend of Water Production and Water Demand.....	5-22
Figure 5.10-1	Layout of the Proposed Treatment Plant .....	5-25
Figure 5.11-1	Demarcation Points of Responsibility for O&M.....	5-28
Figure 5.11-2	Recommended Organization for SSUWC-Malakal.....	5-30

**Chapter-6**

Figure 6.1-1	Organization Chart of Directorate of River Transport, Ministry of Transport, ROSS.....	6-1
Figure 6.1-2	Organization Chart of River Transport Department, MoPI&RD, UNS .....	6-1
Figure 6.4-1	Survey Location .....	6-6
Figure 6.4-2	Result of Boat Count Survey .....	6-7
Figure 6.4-3	Major Origin and Destination Points Found from the Boat OD Survey in Malakal Port .....	6-7
Figure 6.4-4	Vehicle Volume.....	6-10
Figure 6.5-1	Major River Ports along Nile River in ROSS.....	6-13
Figure 6.5-2	Layout of Malakal Port.....	6-14
Figure 6.5-3	Possible Berthing Area in Malakal Town .....	6-15
Figure 6.8-1	Regional Economic Cooperation of East Africa.....	6-18
Figure 6.9-1	Port Improvement Stages .....	6-22
Figure 6.9-2	Potential Locations for New Ports.....	6-25
Figure 6.9-3	Port Improvement of Western Bank .....	6-27
Figure 6.11-1	Deformation Chain of Jetty .....	6-39
Figure 6.11-2	Organization Plan for Maintenance Section.....	6-40

**Chapter-7**

Figure 7.1-1	Organization Structure of MoPI&RD.....	7-2
Figure 7.1-2	Organization Structure of Traffic Police.....	7-2
Figure 7.4-1	Major & Sub-Major Road Network in Malakal .....	7-5
Figure 7.4-2	Location of Transport Terminals and Bus Routes .....	7-7
Figure 7.6-1	Standard Cross Sections (Malakal Town Internal Main Roads).....	7-10
Figure 7.6-2	Location of Survey Point.....	7-13
Figure 7.6-3	Number of Vehicles at 3 Town Borders.....	7-14



Figure 7.7-1	Principal Roads Projects in UNS.....	7-16
Figure 7.9-1	Schematic Road Network Development Plan .....	7-24
Figure 7.9-2	New Land Development and Proposed Road Network.....	7-25
Figure 7.9-3	Typical Cross Section (Class 1).....	7-26
Figure 7.9-4	Typical Cross Section (Class 2).....	7-26
Figure 7.9-5	Typical Cross Section (Class 3).....	7-26
Figure 7.10-1	Bus Bay .....	7-27
Figure 7.10-2	Conceptual Bus Network.....	7-28
Figure 7.10-3	Conceptual Bus Network in Malakal Town.....	7-28
Figure 7.13-1	Organization of Operation and Maintenance Sector .....	7-34

### **Chapter-8**

Figure 8.1-1	Organizational Structure of The Directorate of Public Utilities, MoPI&RD .....	8-1
Figure 8.4-1	Existing Electricity Network in Malakal Town .....	8-3
Figure 8.4-2	Power Facilities .....	8-6
Figure 8.7-1	Transmission Plan of Southern Sudan 2010 – 2014.....	8-9
Figure 8.9-1	Key Single Line Diagram of Planned Malakal DEG Power Station.....	8-14

### **Chapter-9**

Figure 9.1-1	Organization Structure of DWSRD in MoPI&RD .....	9-2
Figure 9.1-2	Institutional Framework of Related Agencies in Sanitation Field in ROSS.....	9-2
Figure 9.4-1	Locations Surveyed on Sanitary Condition in Malakal Town.....	9-5
Figure 9.9-1	Schematic Concept of Comprehensive Plan for Sewage and Sanitation.....	9-15
Figure 9.9-2	Schematic Flow Sheet of Sludge Treatment Facilities .....	9-19
Figure 9.9-3	General Layout of Sludge Treatment Facilities.....	9-19

### **Chapter-10**

Figure 10.5-1	Standard Cross Section.....	10-3
Figure 10.5-2	Existing Drainage Network .....	10-6
Figure 10.6-1	Monthly Mean Rainfall .....	10-7
Figure 10.9-1	General Plan of Drainage System in New Urban Area .....	10-14
Figure 10.10-1	Reconstruction of Main Drains in Central Malakal (WD-1) .....	10-16
Figure 10.10-2	Typical Cross Section.....	10-17
Figure 10.10-3	Reconstruction of Main Drains (WD-2).....	10-18
Figure 10.10-4	Typical Cross Section.....	10-19
Figure 10.10-5	Construction of Trunk Drain 1 (WD-3).....	10-19
Figure 10.10-6	Construction of Trunk Drains 2 (WD-4) .....	10-20

### **Chapter-11**

Figure 11.1-1	Organization of Chart of MoH, UNS .....	11-1
Figure 11.1-2	Organization Chart of UNS .....	11-2

Figure 11.4-1	Solid Waste Flow (2012) .....	11-4
Figure 11.4-2	Location of Collection Points .....	11-7
Figure 11.9-1	Solid Waste Flow (2022) .....	11-14
Figure 11.9-2	Proposed Locations of Collection Points.....	11-18
Figure 11.9-3	Conceptual Layout of Landfill Site .....	11-19

**Chapter-12**

Figure 12.1-1	Organizational Chart of MoE, UNS .....	12-2
Figure 12.6-1	Location Schools in Malakal Town .....	12-11
Figure 12.10-1	Proposed Locations for New Primary Schools in Malakal Town.....	12-20

**Chapter-13**

Figure 13.1-1	Organization Structure of MOH, ROSS .....	13-1
Figure 13.1-2	Recommended Organization Structure for MoH, UNS.....	13-2
Figure 13.4-1	Location of Existing Health Facilities .....	13-7
Figure 13.5-1	Population by Counties in UNS .....	13-9
Figure 13.9-1	Proposed Locations of New PHCCs in Malakal Town .....	13-19

**Chapter-14**

Figure 14.1-1	Allocation of Classified Staffs among Ministries in UNS.....	14-2
---------------	--	------

**Chapter-15**

Figure 15.1-1	Stages of Economic Growth.....	15-1
Figure 15.1-2	Concept on Level of Involvement of Government and Private Toward Self-Sustaining Development.....	15-2
Figure 15.1-3	Stage-wise Economic Development Scenario of Malakal Town.....	15-4
Figure 15.2-1	Proposed East-West Transportation Corridor .....	15-5

**Chapter-17**

Figure 17.2-1	Inflationary Pressure in the Sudanese Economy (2000 – 2012).....	17-3
Figure 17.4-1	Economic Cost and Benefit Streams and EIRR (WS-2) .....	17-6
Figure 17.4-2	Economic Cost and Benefit Streams and EIRR (WS-4) .....	17-7
Figure 17.4-3	Economic Cost and Benefit Streams and EIRR (Water Transport) .....	17-8
Figure 17.4-4	Economic Cost and Benefit Streams and EIRR (Road Transport) .....	17-9
Figure 17.4-5	Economic Cost and Benefit Streams and EIRR (Energy) .....	17-10
Figure 17.4-6	Economic Cost and Benefit Streams and EIRR (Storm Water Drainage).....	17-11

**Chapter-18**

Figure 18.1-1	Organization Chart of the Ministry of Environment, ROSS .....	18-2
Figure 18.1-2	The Environmental Impact Assessment Procedure .....	18-4

**Chapter-19**

Figure 19.2-1	Flexibility in Time Horizon and Achievement Level .....	19-2
Figure 19.2-2	Features of Each Stage .....	19-3
Figure 19.3-1	Programmes under Malakal Infrastructure Development Strategy .....	19-4
Figure 19.3-2	Programmes under Region-wide Economic Development Strategy .....	19-7
Figure 19.3-3	Programmes under Social Development Strategy .....	19-8
Figure 19.3-4	Programmes under the Peacebuilding/Governance Strengthening Strategy .....	19-10
Figure 19.6-1	Annual Investment Plan .....	19-19
Figure 19.6-2	Annual Operation and Management Cost.....	19-19
Figure 19.6-3	Self-Sustained Provision of Public Services .....	19-21

## **Chapter-20**

Figure 20.1-1	Alternative 1 .....	20-2
Figure 20.1-2	Alternative 2 .....	20-2
Figure 20.1-3	Alternative 3 .....	20-2
Figure 20.1-4	Conceptual Layout of the Urgent Development Project.....	20-7
Figure 20.1-5	System of Water Provision in the Urgent Development Project.....	20-8
Figure 20.2-1	Water Taps Plan .....	20-10
Figure 20.4-1	Organization of SSUWC Malakal .....	20-13
Figure 20.4-2	O&M Structure of Water Truck Section .....	20-14

## **Chapter-21**

Figure 21.1-1	General Drawing of Steel Sheet Pile for Passenger Jetty .....	21-4
Figure 21.1-2	Outline Drawing of Passenger Jetty .....	21-4
Figure 21.1-3	Structure of Jetty .....	21-5
Figure 21.1-4	Plan of Jetty .....	21-5

## **Chapter-22**

Figure 22.1-1	Candidate List for Community Road Improvement Programme .....	22-3
Figure 22.1-2	Standard Cross Section Type-II (Community Roads) .....	22-5
Figure 22.1-3	Standard Cross Section Type-I (Local Roads).....	22-6
Figure 22.1-4a	CBR with Yellow Soil .....	22-6
Figure 22.1-4b	Swell with Yellow Soil .....	22-6
Figure 22.1-5a	CBR with Cement Treatment .....	22-7
Figure 22.1-5b	Swell with Cement Treatment .....	22-7
Figure 22.1-6a	CBR with Lime Treatment .....	22-8
Figure 22.1-6b	Swell with Lime Treatment .....	22-8
Figure 22.1-7	Typical Diagonal Herringbone Layout .....	22-9
Figure 22.2-1	Results of Reconnaissance Interview Survey on Pilot Works by LBT.....	22-13
Figure 22.3-1	Various Soil Balance Chart (Side Borrow Type Cut & Fill) for LBT (1/2).....	22-16
Figure 22.3-2	Various Soil Balance Chart (Side Borrow Type Cut & Fill) for LBT (2/2).....	22-17
Figure 22.4-1	Organization Chart of Directorate of Roads and Transport, MoPI&RD .....	22-23

Figure 22.4-2	Proposed Organization Chart of Operation & Maintenance Section.....	22-23
Figure 22.4-3	LBT Implementation Unit Type-I.....	22-24
Figure 22.4-4	LBT Implementation Unit Type-II .....	22-25
Figure 22.4-5	LBT Implementation Unit Type-III.....	22-25
Figure 22.4-6	LBT Implementation Unit Type-IV.....	22-26

**Chapter-23**

Figure 23.1-1	Formation of Relevant Organization (Example) .....	23-1
Figure 23.3-1	Asset Management .....	23-8

## LIST OF PHOTOGRAPHS

### Chapter-3

Photo 3.2-1	Returnees' Struggle to Win Back Land Ownership.....	3-6
Photo 3.2-2	Land Mine Clearance .....	3-6
Photo 3.2-3	Mine Clearance Confirmation .....	3-6

### Chapter-7

Photo 7.4-1	Road under Construction (Ring Road) .....	7-5
Photo 7.4-2	Public Transport Vehicles Used in Malakal Town.....	7-6
Photo 7.4-3	Traffic Facility and Traffic Management Equipment .....	7-9
Photo 7.6-1	Inventory Survey on Community Road.....	7-10
Photo 7.7-1	Southern Border Point of Malakal Town.....	7-16

### Chapter-8

Photo 8.4-1	Exiting Diesel Generators in Malakal Town .....	8-4
Photo 8.4-2	Electricity Distribution Lines in Malakal Town .....	8-5
Photo 8.8-1	Privately Owned Generators.....	8-10
Photo 8.10-1	Solar Power Lighting.....	8-16

### Chapter-9

Photo 9.4-1	Condition of Household and Sanitation Facilities Surveyed.....	9-6
Photo 9.4-2	Condition of Surveyed School Toilets .....	9-6
Photo 9.4-3	Public Toilets .....	9-7
Photo 9.4-4	Sanitation Facilities in Major Institutions .....	9-8
Photo 9.4-5	Vacuum Truck for Withdrawing Sludge .....	9-9

### Chapter-10

Photo 10.5-1	Site Pictures of Existing Main Drains .....	10-5
Photo 10.6-1	Rain Gauge .....	10-7
Photo 10.6-2	Water Gauge .....	10-8
Photo 10.6-3	Site Picture after Heavy Rain .....	10-8

### Chapter-11

Photo 11.4-1	Garbage Collection in Malakal Town.....	11-6
Photo 11.4-2	Sweeping Activities in Malakal Town.....	11-8
Photo 11.4-3	Disposal of Medical Waste .....	11-9

### Chapter-22

Photo 22.1-1	Actual Diagonal Herringbone Layout .....	22-9
Photo 22.2-1	Assossa in Southern Payam.....	22-14
Photo 22.2-2	Construction Work Jallaba.....	22-14



Photo 22.3-1	Progress of LBT Pilot Works (1/2).....	22-19
Photo 22.3-2	Progress of LBT Pilot Works (2/2).....	22-20
Photo 22.3-3	Quality Control Activities.....	22-21

## **LIST OF ABBREVIATIONS**

AES	: Alternative Education Systems
AFE	: Agro Forestry Education
AIDS	: Acquired Immune Deficiency Syndrome
ALP	: Accelerated Learning Program
ANC	: Ante Natal Care
ARC	: American Refugee committee
BALP	: Basic Accelerated Learning Program
BCS	: Black Cotton Soil
BHN	: Basic Human Needs
BOQ	: Bill of Quantities
CAD	: Computer-Aided Design
CBGS	: Community Based Girls School
CBD	: Central Business District
CBO	: Community Based Organizations
CBR	: California Bearing Ratio
CBTF	: Capacity Building Trust Fund
CD	: Capacity Development
CDO	: Community Development Officer
CES	: Central Equatorial State
CHW	: Community Health Worker
CIQ	: Customs, Immigrations and Quarantine
CITES	: The Convention on International Trade in Endangered Species of Wild Fauna and Flora
CM	: Community Midwife
COMESA	: Common Market for Eastern and Southern Africa
CoTAL	: Council of Traditional Authority Leader
CPA	: Comprehensive Peace Agreement
CPI	: Consumer Price Index
C/Ps	: Counterparts
DCPT	: Direct Cone Penetration Tests
D/D	: Detailed Design
DEG	: Diesel Engine Generator
DF/R	: Draft Report
DO	: Dissolved Oxygen
DOS	: Department of Survey
DP	: Development Partner
DPT	: Diphtheria-Pertussis-Tetanus
EAC	: East African Community
EC	: Electric Conductivity
ECG	: Environmental Cluster Group
E. Coli	: Escherichia Coli
EIA	: Environmental Impact Assessment
EIRR	: Economic Internal Rate of Return
EPI	: Expanded Programme on Immunization
EUR	: Euro
FAO	: Food and Agriculture Organization
FIRR	: Financial Internal Rate of Return
F/R	: Final Report

F/S	: Feasibility Study
GDP	: Gross Domestic Product
GIS	: Geographic Information System
GIZ	: Gesellschaft für Internationale Zusammenarbeit
GNI	: Gross National Income
GOJ	: Government of Japan
GOS	: Government of Sudan
GOSS	: Government of South Sudan
GPS	: Global Positioning System
GRDP	: Gross Regional Domestic Product
GSECD	: General Sanitation for Environmental corporation department
HHP	: Home Health Promoter
HIMS	: Health Information Management System
HIV	: Human Immunodeficiency Virus
HRIS	: Human Resource Information System
ICD	: Inland Container Depot
ICOR	: Incremental Capital Output Ratio
IC/R	: Inception Report
IDPs	: Internally Displaced Persons
IED	: Inland Container Depot
IEE	: Initial Environmental Examination
IGAD	: Inter-Governmental Authority on Development
ILB	: Inter Locking Block
IMR	: Infant Mortality Rate
IOM	: International Organization for Migration
IRI	: Interactive Ratio Instruction
IRR	: Internal Rate of Return
IT	: Information Technology
IT/R	: Interim Report
IUCN	: International Union for Conservation of Nature and Natural Resources
JCC	: Joint Coordination Committee
JICA	: Japan International Cooperation Agency
JPT	: JICA Project Team
JRPA	: Juba River Port Administration
KfW	: Kreditanstalt für Wiederaufbau (German Development Bank)
Km	: Kilometer
KVA	: Kilovolts Amperes
LAPSSET	: Lamu Port - South Sudan - Ethiopia Transport
LBT	: Labour Based Technology
LRMC	: Long-run Marginal Cost
LV	: Low Voltage
M&E	: Monitoring and Evaluation
MARF	: Ministry of Animal Resources and Fisheries
MBT	: Machine Based Technology
MCHW	: Maternal and Child Health Worker
M/D	: Man Day
M/D	: Minutes of Discussion
MDGs	: Millennium Development Goals
MDTF	: Multi Donor Trust Fund
MLIT	: Ministry of Land, Infrastructure, Transport and Tourism, Japan

M/M	: Man Month
MMR	: Maternal Mortality Rate
MoAF	: State Ministry of Agriculture and Forestry, UNS
MoARF	: State Ministry of Animal Resources and Fisheries, UNS
MoCTI	: State Ministry of Commerce, Trade and Investment, UNS
MoCYS	: State Ministry of Culture, Youth and Sports, UNS
MoE	: State Ministry of Education, UNS
MoEST	: State Ministry of Education, Science & Technology, UNS
MOWC&T	: Ministry of Wildlife Conservation & Tourism, ROSS
MOF	: Ministry of Finance, ROSS
MoF&EP	: State Ministry of Finance and Economic Planning, UNS
MOFA&IC	: Ministry of Foreign Affairs and International Cooperation, ROSS
MOFT&EP	: Ministry of Finance, Trade and Economic Planning, ROSS
MoG&SW	: State Ministry of Gender and Social Welfare, UNS
MOGEI	: Ministry of General Education and Instruction, ROSS
MOH	: Ministry of Health, ROSS
MoH	: State Ministry of Health, UNS
MOH&PP	: Ministry of Housing and Physical Planning, ROSS
MOHPP&E	: Ministry of Housing, Physical Planning and Environment, ROSS
MoI&C	: State Ministry of Information and Communications, UNS
MoLG&RE	: State Ministry of Local Government and Law Enforcement, UNS
MOLH&PP	: Ministry of Lands, Housing and Physical Planning, ROSS
MoLPS&HRD	: State Ministry of Labour, Public Service and Human Resource Development, UNS
MoPA	: State Ministry of Parliamentary Affairs, UNS
MoPI&RD	: State Ministry of Physical Infrastructure and Rural Development, UNS
MOT	: Ministry of Transport, ROSS
MoU	: Memorandum of Understanding
MOWC&T	: Ministry of Wildlife Conservation & Tourism
MOWRI	: Ministry of Water Resources and Irrigation, ROSS
M/P	: Master Plan
MT	: Motorized Transport
MVA	: Megavolts Amperes
MVTC	: Malakal Vocational Training Centre
NA (N/A)	: Not Applicable
NEC	: National Electricity Corporation
(I)NGO	: (International) Non-Government Organization
NMT	: Non-Motorized Transport
NOx	: Nitrogen Oxide(s)
NPV	: Net Present Value
NRW	: Non-Revenue Water
O&M	: Operation & Maintenance
OECD	: Organization for Economic Cooperation and Development
OJT	: On the Job Training
PCR	: Pupil Classrooms Ratio
PCU	: Passenger Car Unit
PDC	: Participatory Development Centre
PEP	: Pastoralist Education
PF	: Poor Flush
PG/R	: Progress Report
PHCC	: Primary Health Care Unit

PHCU	: Primary Health Care Centre
PLATUC	: Public Land and Air Transport Trade Union Cooperation
PMTCT	: Prevention of Mother to Child Transmission
PNA	: Peace building Need and Impact Assessment
PNC	: Pre Natal Care
PPIAF	: Public Private Infrastructure Advisory Facility
PPP	: Public Private Partnership
PSN	: Persons
PTextR	: Pupil Text Book Ratio
QCSC	: Quality Control Standard Code
RCMRD	: Regional Centre for Mapping of Resources for Development
R/D	: Record of Discussion
RFP	: The Request for Proposal
ROSS (RSS)	: Republic of South Sudan
ROW	: Right of Way
RWD	: Rural Water Department
RWSS	: Rural Water Supply and Sanitation
SACU	: South African Customs Union
SADC	: Southern African Development Community
SAF	: The Sudanese Armed Forces
SAVOT	: Project for Improvement of Basic Skills and Vocational Training in South Sudan
SCF	: Standard Conversion Factor
SI	: Solidarity International
SMASESS	: Strengthening Mathematics and Science Education in Southern Sudan
SO <sub>x</sub>	: Sulfur Oxide(s)
SPLA	: Sudan People's Liberation Army
SPLM	: Sudanese People's Liberation Movement
SPLM-DC	: Sudan People's Liberation Movement-Democratic Change
SPM	: Single Point Mooring
SS	: South Sudan
SSCCSE	: Southern Sudan Centre for Census, Statistics and Evaluation
SSDP	: South Sudan Development Plan
SSEC	: South Sudan Electricity Corporation
SSH	: South Sudan Hotel
SSP	: South Sudan Pounds
SSRRC	: South Sudan Relief and Rehabilitation Commission
SSRTC	: South Sudan River Transport Company
SSTNC	: South Sudan Trans Nile Company
SSUWC	: South Sudan Urban Water Corporation
TEU	: Twenty-foot Equivalent Units
TOC	: Total Organic Content
TOR	: Terms of Reference
TT	: Tetanus Toxoid
UN	: United Nations
UNDP	: United Nations Development Programme
UNHCR	: United Nations High Commissioner for Refugees
UNICEF	: United Nations Children's Fund
UNJLC	: United Nations Joint Logistics Centre
UNMAS	: United Nations Mine Action Service
UNMISS	: United Nations Mission in South Sudan

UNOCHA	: United Nations Office for the Coordination of Humanitarian Affairs
UNOPS	: United Nations Office for Project Services
UNS	: Upper Nile State
UNU	: Upper Nile University
USAID	: United States Agency for International Development
US\$	: United States Dollars
UWSS	: Urban Water Supply Sanitation
VA	: Volt Ampere
VAT	: Value Added Tax
VIP	: Ventilated Improved Pit
VTC	: Vocational Training Centre
WAC	: Weighted Average Cost
WASH	: Water, Sanitation and Hygiene
WB	: World Bank
WFP	: World Food Programme
WHO	: World Health Organization
WTP	: Water, Treatment Plant
YS	: Yellow Soil

## **GLOSSARY OF TERMS**

Boma:	the unit below Payam. Boma is also called Block and also loosely translated to ‘village’. In Malakal Town, the Boma chief is elected by its residents and approved by the corresponding Payam. The Boma chief is supported by Boma volunteers.
Dinka:	an ethnic group inhabiting the Bahr el Ghazal region of the Nile basin, Jonglei and parts of southern Kordufan and Upper Nile regions. Also called Jieng. The Dinka people are the largest group in South Sudan.
Greater Upper Nile Region:	the region consists of the states of Jonglei, Unity, and Upper Nile.
Malakal:	Malakal Town with its surrounding area including a new development area enclosed by an Outer Ring Road.
Malakal Town:	a city located in Upper Nile State bordering the Republic of Sudan and the Federal Democratic Republic of Ethiopia. Its area spans 3 km east to west by 8 km north to south, totalling 24 km <sup>2</sup> .
Nuer:	the second largest ethnic group in South Sudan. They are mainly concentrated in South Sudan, with some representatives also found in south-western Ethiopia.
Outer Ring Road:	runs north–south 4 km east from the Ring Road that is the current perimeter of Malakal Town.
Payam:	the administrative unit below the county in South Sudan. In Malakal Town, six administration officers are assigned by the State Ministry of Local Government and Law Enforcement.
Ring Road:	arterial road running north–south surrounding the current eastern and southern perimeter of Malakal Town.
Shilluk:	a major ethnic group of people in Southern Sudan, living on both banks of the White Nile in the vicinity of Malakal Town. The Shilluk were historically united in a single state headed by a king. Shilluk Kingdom existed in Southern Sudan from 1490 to 1865.



## **CONTENTS OF THE REPORT**

This report presents a roadmap for the mid-term social economic infrastructure and human resource development plan for Malakal Town (the Comprehensive Plan) and an outline of the Urgent Development Projects proposed by the Project Team. The main text is composed of the following four parts.

Chapter 1: Outline of the Project

### **<PART I> COLLECTION AND ANALYSIS OF DATA AND INFORMATION**

Chapter 2: Present Situation of the Project Area

Chapter 3: Peace Building Needs and Impact Assessment

### **<PART II> DEFINING CONCEPTS FOR THE COMPREHENSIVE PLAN**

Chapter 4: Conceptual Frame Works for Formulation of the Comprehensive Plan

### **<PART III> SECTOR ANALYSIS**

Chapter 5: Water Supply

Chapter 6: Water Transport

Chapter 7: Road Transportation

Chapter 8: Energy

Chapter 9: Sewage and Sanitation

Chapter 10: Storm Water Drainage

Chapter 11: Solid Waste Management

Chapter 12: Education

Chapter 13: Health

Chapter 14: Capacity Development

Chapter 15: Economic Development

Chapter 16: Social Welfare

### **<PART IV> FORMULATION OF THE COMPREHENSIVE PLAN**

Chapter 17: Economic and Financial Analysis

Chapter 18: Environmental and Social Impact Assessments

Chapter 19: The Comprehensive Plan

### **<PART V> URGENT DEVELOPMENT PROJECTS**

Chapter 20: Urgent Development Project in Water Supply Sector

Chapter 21: Urgent Development Project in Water Transport Sector

Chapter 22: Urgent Development Project in Road Transport Sector

### **<PART VI> RECOMMENDATIONS**

Chapter 23: Recommendations

A brief outline of each part and chapter is discussed in the following sections.

**Chapter 1** presents an outline of this project, including background, objectives, area, schedule, scope of the work and organizations implementing this project.

The Project Purpose is “By improving the social economic infrastructure in Malakal Town, local people obtain and enjoy benefit from peace dividends, and the capacity of Upper Nile State (UNS) for administrative services delivery is enhanced.”

The target outputs of the Project are;

- (i) Comprehensive planning on social and economic infrastructure development for Malakal Town targeting year 2022 is developed.
- (ii) Priority of social economic infrastructure development is identified, and projects with identified urgent needs are implemented.
- (iii) Enhancement of UNS human resources to enable the continuous implementation of social economic infrastructure development projects identified by the Comprehensive Plan.

The Project covers Malakal Town and surrounding areas.

This project commenced from February 2012 by Japan International Cooperation Agency (JICA) after the decision of implementation of the Project by Government of Japan in response to the request of South Sudan. The Project schedule was set from February 2012 to March 2014; however, Urgent Development Projects were cancelled midway during the construction work due to the occurrence of the internal conflict in December 2013.

The following agencies have been assigned from the Republic of South Sudan (ROSS) and UNS.

- Responsible Agency: Government of UNS
- Implementing Agency: Ministry of Physical Infrastructure and Rural Development (MoPI&RD), UNS
- Advisory Agency: Ministry of Housing and Physical Planning, ROSS

Joint Coordination Committee (JCC) was established for the management of the Project.

## **<PART I> COLLECTION AND ANALYSIS OF DATA AND INFORMATION**

In **Chapter 2**, the natural condition, and current socio-economic situation, including public services, relevant policies and strategies for local administrations/governments were studied. Issues were identified to be considered in the comprehensive social economic infrastructure development plan (the Comprehensive Plan).

It was reported that there were various ethnic people, as well as returnees and internally displaced persons (IDPs). Therefore, to study the population situation, number of households, composition of ethnic groups, livelihood, and public social economic infrastructure and so on, the Town Profile Survey was conducted. The Town Profile has five components, which are Household Survey, Boma Profile, Market/Factory Survey, and Land Use Survey, and 1:2,500 topographic survey. The Household Survey that covered Malakal Town and the eastern area of Ring Road revealed the service

levels of social economic infrastructure and identified the urgent needs for the social economic infrastructure.

**Chapter 3** discusses the peace and order situation in the project area and factors to be considered during the formulation of the Comprehensive Plan are identified as a part of the Peace Needs and Impact Assessment (PNA).

## **<PART II> DEFINING CONCEPTS FOR THE COMPREHENSIVE PLAN**

In Part II a development vision for Malakal, development strategies, and conceptual frameworks were formulated.

In **Chapter 4** a conceptual framework for the Comprehensive Plan is presented.

Firstly a future vision of Malakal Town “Vision Malakal for 2022” to which all efforts are directed was identified in the workshop with participants who are involved in the comprehensive social economic infrastructure planning.

Then based on “South Sudan Development Plan 2011-13” and “Upper Nile State Strategic Plan 2012-2014”, strategies to actualise the vision were established. Namely

- Malakal Infrastructure Development Strategy,
- Region-wide Economic Development Strategy
- Social Development Strategy
- Peace Building/Governance Strengthening Strategy

Two reconstruction/rehabilitation scenarios were envisaged and studied, one is reconstruction/rehabilitation oriented, and other is reconstruction/rehabilitation plus development oriented. After the evaluation of the two scenarios, the reconstruction/rehabilitation plus development oriented scenario was adopted. Furthermore the following frameworks were prepared: (i) Development Scenario, (ii) Socio-economic Framework, (iii) Spatial Development Framework, (iv) Conflict Prevention Measures and (iv) SEARNS.

## **<PART III> SECTOR ANALYSIS**

In Part III, the targeted sectors are presented and analysed; 1) Institutional Framework, 2) Policies and Strategies, 3) Financial Resources, 4) Operation and Maintenance Systems, 5) Facilities and Staffing, 6) Findings from Relevant Survey(s), 7) Programmes and Projects, and 8) Needs and Issues. And then, 9) development plans are formulated based on the present situation, needs and issues, and 10) projects are proposed from a technical point of view.

Chapter 5: Water Supply Sector

Chapter 6: Water Transport Sector

Chapter 7: Road Transportation Sector

Chapter 8: Energy Sector

Chapter 9: Sewage and Sanitation Sector

Chapter 10: Storm Water Drainage Sector

Chapter 11: Solid Waste Sector

Chapter 12: Education Sector

Chapter 13: Health Sector

Chapter 14: Capacity Development

Chapter 15: Economic Development

Chapter 16: Social Welfare

#### **<PART IV> FORMULATION OF THE COMPREHENSIVE PLAN**

Chapter 17: Economic and Financial Analysis

Chapter 18: Environmental and Social Impact Assessments

Chapter 19: The Comprehensive Plan

**Chapter 17** presents the result of a preliminary analysis of the projects identified in Part III from an empirical viewpoint. Results were used as criteria for integration of the identified projects into the Comprehensive Development Plan. Economic and financial analysis is also conducted for some projects identified as urgent to implement.

**Chapter 18** reviews EIA system in South Sudan and impact assessments of proposed projects are conducted and mitigation measures and degree of necessity are identified at IEE level to provide basic information for the formulating the Comprehensive Development Plan.

In **Chapter 19** based on the results in the previous Chapters, the proposed projects by sector were evaluated from viewpoints of urgency, economic impacts, beneficial population, maturity, necessity of socio-environmental consideration and relevance with other projects under the budgetary constraints, and formulated as a Comprehensive Development Plan. Some of representative projects are briefly discussed in a project sheet. Methods to meet the funds required for investment and the cost for operation and management such as the beneficiary pay principle or appeal to donor/international agency are proposed.

Urgent Development Projects are selected in this Chapter through consideration of the needs assessment results obtained in the household survey, technology transfer to the counterparts, JICA project scheme, and opinions of the UNS government officials. A small scale water supply project, port rehabilitation/construction projects and a community road improvement project were selected.

#### **<PART V> URGENT DEVELOPMENT PROJECTS**

Chapter 20: Urgent Development Project in Water Supply Sector

Chapter 21: Urgent Development Project in Water Transport Sector

## Chapter 22: Urgent Development Project in Road Transport Sector

In Part IV, an outline of the urgent development projects commenced in this Project are reported. The scope of work, construction plan, operation and management plan of the Urgent Development Projects were intended to be included in the supplementary report. However, due to the occurrence of the internal war all Urgent Development Projects were terminated before completion. Consequently no supplementary report will be prepared.

In **Chapter 20** Urgent Development Project in port sector is reported. The objective of the project is the rehabilitation of the present cargo jetty at Malakal port and a passenger jetty construction. The project was commenced in June 2013 with cooperation of JICA SSO. Operation and Management plan are to be prepared by another JICA technical cooperation project, “The Project for Enhancement of Operation and Management Capacity of Inland Waterway in South Sudan” (It is not known now whether this project will be continued or not.)

In **Chapter 21**, the scope of work, construction plan, operation and management plan of the Urgent Development Project in water supply sector is reported.

The contents of this project are the construction of a small scale water supply plant (150m<sup>3</sup>/day), public water taps at 22 locations and water tanks, and procurement of four water trucks. In 2013 the proposed “Rehabilitation Project of the Treatment Plant, Transmission & Distribution Facilities” was started with cooperation of JICA.

Construction work and procurement work were commenced from May 2013 and funded by JICA SSO. Water committees are formulated for each public tap for the operation and management of water supply. Capacity development of the water committees is entrusted to an NGO on a sub-contract basis under JPT. This sub-contract was also terminated.

In **Chapter 22**, the community road improvement by LBT was reported. Three community roads were selected from Northern Malakal, central Malakal and Southern Malakal. This project is for the improvement of community roads by residents of the community by LBT. Therefore this project can be considered a kind of community participatory project. The project started from March 2013 directly funded and managed by JPT. In February 2014, LBT-III Lot was already completed. However LBT-I Lot and LBT-II Lot were terminated with 1.8km remaining incomplete.

## <PART VI> RECOMMENDATIONS

In **Chapter 23**, recommendations were made for the formation of a social economic infrastructure plan and the implementation of Urgent Development Projects in planning, implementation and operation and management phases. Despite the ongoing internal war that started in December 2013 the planning stance for the formulation of comprehensive social economic infrastructure development

plan for reconstruction and rehabilitation of social economic infrastructure is unchanged. However amendment of projects and priorities in the Comprehensive Development Plan may be required. For instance, conflict prevention measures, project for self-supportive production in primary sector, emergency medical service project and BHN project for returnees may be more prioritized. The necessity of a prompt revision of the Comprehensive Development Plan is stressed.

Composition of this report with attention to the work flow is shown below.

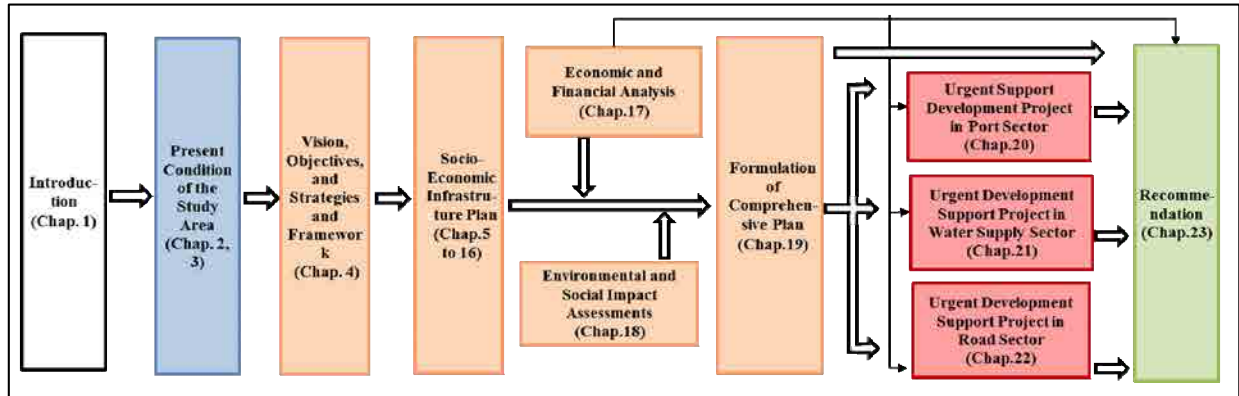


Figure 1 Composition of Draft Final Report

## **CHAPTER 1 OUTLINE OF THE PROJECT**

### **1.1 BACKGROUND OF THE PROJECT**

In July 2011, the Republic of South Sudan (ROSS) achieved independence, concluding what had been Africa's longest running civil war.<sup>1</sup> The prolonged conflict devastated the country, culminating in the need for large-scale development efforts to reconstruct the war-torn towns. After the signing of the Comprehensive Peace Agreement (CPA) in 2005, Juba, the capital city of South Sudan, as well as other regions, became the recipient of development assistance. However, most of this development assistance was concentrated in Juba, thereby causing disparity with the rest of the country. Given this situation, the new government is facing many challenges when it comes to development of the country.

Malakal Town, the target area of this Project, is situated in Upper Nile State (UNS) at a strategic location where international corridors lead to the Republic of Sudan in the north. The town also serves as an economic hub for the Greater Upper Nile Region of the country, with high economic development potential.

After 25 years of civil war, infrastructure was destroyed, and many people fled to other parts of the country or abroad. This situation has now changed after independence. Many returnees from abroad and Internally Displaced Persons (IDPs) are arriving in Malakal Town, resulting in rapid increases to the population, which is currently estimated at about 150,000. Even after the signing of the CPA, the town has been isolated from development support due to the geographical distance from Juba and unstable political situation.

In this context, ROSS requested technical cooperation from the Government of Japan (GOJ) to conduct the “Project for Comprehensive Planning and Support for Urgent Development on Social Economic Infrastructure in Malakal Town” (the Project). In response to the request, GOJ decided to implement the Project. The Japan International Cooperation Agency (JICA), the official agency tasked with implementing the technical cooperation programs of GOJ, organized a Project Team in accordance with the Scope of Work agreed to by the Preparatory Study Team, which was dispatched by JICA and ROSS in October 2011.

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<sup>1</sup> Background: South Sudan was a British Colony from late 19<sup>th</sup> Century to 1956, the year Sudan gained its independence. During the British era, Christianity and English were spread by missionaries in the southern part of Sudan while the northern part was under Arabic influence. When Sudan gained independence, there was anticipation that the Southerners would be able to participate in the political system as the Northerners had been. However, such anticipation was not actualised, leading to two prolonged periods of conflict (1955-1972 and 1983-2005). A series of peace talks, facilitated by the African Union and international society, resulted in a Comprehensive Peace Agreement (CPA), signed in January 2005. The CPA granted a six-year period of autonomy to the south to be followed by a referendum on final status. The result of this referendum, held in January 2011, was a vote of 98% in favour of secession. Thus, Independence was attained on 9 July 2011.



## **1.2 OUTLINE OF THE PROJECT**

The Project for Comprehensive Planning and Support for Urgent Development on Social Economic Infrastructure in Malakal Town.

### **1.2.1 Project Purpose**

- By improving social economic infrastructure in Malakal Town, local people will benefit from peace dividends, and the capacity of UNS for administrative services delivery will be enhanced.

### **1.2.2 Outputs of the Project**

- Development of a Comprehensive Plan for Social Economic Infrastructure Development for Malakal Town targeting the Year 2022
- Identification of priorities for social economic infrastructure development, and implementation of projects addressing identified urgent needs
- Enhancement of UNS human resources to allow continuous implementation of social economic infrastructure development projects identified by the Comprehensive Plan.

Hereinafter the above plan and social infrastructure projects with urgent needs are referred to as the Comprehensive Plan and the Urgent Development Projects respectively.

### **1.2.3 Project Area**

The Project covers Malakal Town and surrounding areas. The Project Area was identified at the initial stage of the Project after the existing resettlement activities of returnees/immigrants in this area were studied. The Project area is indicated in the Project Location Map.

### **1.2.4 Project Period**

The components of the Project and implementation period of each component are as follows. See **Table 1.3-2** for the project schedule.

Development of the Comprehensive Plan: February 2012 to September 2012

Planning and implementation of Urgent Development Projects: March 2012 to December 2013

Planning and undertaking of training: October 2012 to December 2013

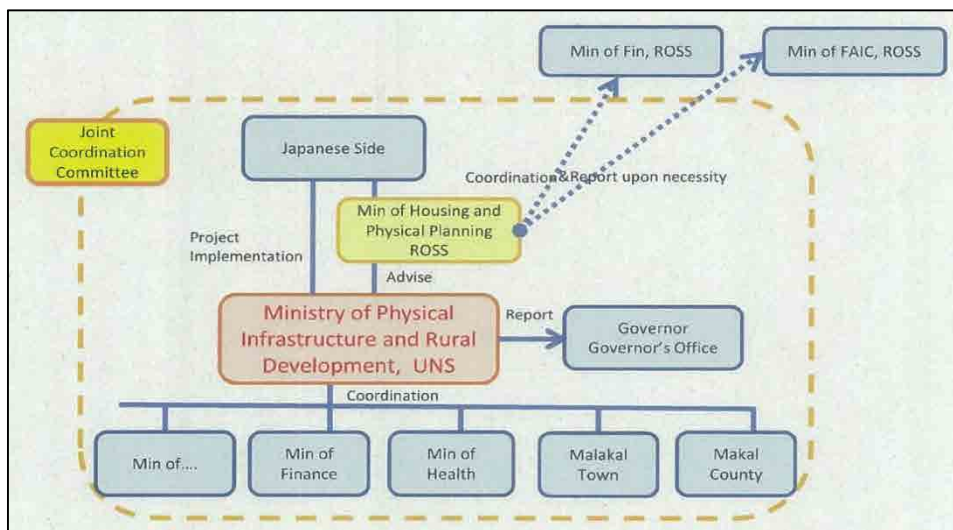
Three Urgent Development Projects were implemented, namely (i) Water Supply, (ii) Port, and (iii) Road projects, all of which were expected to be completed in July 2014. However, it was agreed by JICA and ROSS to discontinue the implementation of the Urgent Development Plan midway through construction work due to conflicts occurring in December 2013, first in Juba and rapidly spilling over to Malakal. Training was cancelled accordingly.

### 1.3 ORGANISATIONAL STRUCTURE OF THE PROJECT

The following agencies were assigned from ROSS and UNS:

- Responsible Agency: Government of UNS
- Implementing Agency: State Ministry of Physical Infrastructure and Rural Development, UNS, (MoPI&RD)
- Advisory Agency: Ministry of Housing and Physical Planning, ROSS

Each organisation was deemed responsible for issues under its authority and assigned counterpart personnel. The following project organisational structure was established to achieve the Project purpose.



Source: Record of Discussion on the “Project for Comprehensive Planning and Support for Urgent Development on Social Economic Infrastructure in Malakal Town”, October 18, 2011.

**Figure 1.3-1 Project Organisation**

The Project was implemented by the Project Team organised by JICA. **Table 1.3-1** shows a list of project team members.

**Table 1.3-1 Project Team Members**

Position/Assigned Task	Name
1. Team Leader/City Plan	Mr. Akio NAKAMURA (2012/2 ~2013/11)
2. Team Leader/Quick Impact Project Plan	Mr. Takao MITSUISHI (2013/11~2014/3)
3. Deputy Team Leader/Community Road Improvement (LBT) I/Quick Impact Project Plan Supervision	Mr. Kenji ISOMOTO (2012/2~2013/6)
4. Deputy Team Leader/Community Road Improvement (LBT) I/Quick Impact Project Plan Supervision	Mr. Yoshihisa NODA (2013/11~2014/3)
5. Social Economic Infrastructure Development Plan/Town Profiling I/Co-Team Leader	Mr. Haruo YAMANE
6. Local Administration/Social Research/Town Profiling III/Project Coordinator II	Ms. Tomoko SHIBA
7. Town Profiling II/Conflict Prevention Consideration	Ms. Yukiko HANEDA
8. Chief of Aero-Topography/Target Beacon Survey Supervision	Mr. Atsushi MASANO
9. Topographic Survey Supervision	Mr. Wataru TAKEDA
10. GIS Analysis	Mr. Bhoj Raj PANTHA
11. Water Supply and Distribution Plan/Quick Impact Project Plan (Water Supply)	Mr. Taketoshi FUJIYAMA
12. Construction Supervision (Water Supply)	Mr. Hiromi TSUNOJI
13. Water Treatment Plant/Plant Operation and Management/Capacity Building (Water Supply)/Sewer	Mr. Tsuyoshi ONOZATO
14. Capacity Building (Water Supply) II	Ms. Chieko YOSHIKAWA
15. Water Supply Plan	Mr. Katsumi FUJII
16. Community Road Improvement (LBT) II	Mr. Yasuhiro YAMAUCHI
17. Road Plan/Road Development Technology	Mr. Tetsuo IKENAGA
18. Road Operation and Management Plan/Equipment Plan/Construction Plan/Cost Estimate	Mr. Fumio HASHIMOTO
19. Drainage Plan	Mr. Kiyotake MIYAKE
20. Port Plan/Quick Impact Project Plan (Port)	Mr. Akihito HIURA
21. Construction Supervision (Port)	Mr. Ken NITTA
22. Social Economic Infrastructure Plan (Health)	Mr. Tamotsu NOZAKI
23. Social Economic Infrastructure Plan (Education)	Mr. Minoru FUKUMURA
24. Social Economic Infrastructure Plan (Power)	Mr. Atsuhito URUNO
25. Traffic Management/Public Transport	Mr. Ken NISHINO
26. Economic and Financial Analysis	Mr. Takao OZAKI
27. Waste Management Plan	Mr. Yoshinosuke HAMADA
28. Construction Supervision Assistance I	Mr. Dennis Oyoo WERE
29. Procurement	Mr. Shuichi MORITA
30. Natural Condition Survey	Mr. Keiji AOKI
31. Environmental and Social Consideration	Ms. Mitsue UMIGUCHI
32. Design Verification	Mr. Katsuaki MITANI
33. Project Coordinator I/Construction Supervision Assistance II	Mr. Masateru TOCHINAKA/Mr.Shuji ABE/ Mr. Ken NISHINO
34. Town Profiling III/Project Coordinator II	Ms. Nobuko MIYAKE/ Ms. Akiko MIYAKAWA/ Mr. Katsuhisa OTA
35. Public Relations	Mr. Hiroaki NAKATSUBO

Source: JICA Project Team



## **1.4 METHODOLOGY**

### **1.4.1 Methodology of the Project**

The following process was adhered to in the course of the activities of the Project. **Chapter 4** presents methodologies and procedures in details.

#### **(1) Data and Information**

The Project Team undertook a wide range of surveys of the targeted sectors in order to supplement insufficient data and information. Major surveys undertaken were a Malakal Town Profile Survey to illustrate the socio-economic situation of Malakal, and a Peace Needs and Impact Assessment (PNA) to analyse the post-conflict context. Findings of these surveys were incorporated in all procedures aforementioned.

#### **(2) “Vision Malakal 2022”**

“Vision Malakal for 2022” presents the approach to development for Malakal for the year 2022, namely “toward a peaceful, self-supporting, advanced and beloved city, co-existing with the Nile River”. It is formulated with reference to the situation of the Project Area, and in alignment with the national development plan *South Sudan Development Plan (SSDP) 2011-2013* and other relevant upper level development plans.

#### **(3) Development Strategies**

The Development Strategies are identified as necessary for the actualization of “Vision Malakal 2022”:

- Malakal Infrastructure Development Strategy
- Region-wide Economic Development Strategy
- Social Development Strategy
- Peacebuilding/Governance Strengthening Strategy

#### **(4) Sectors under the Strategies**

Each Development Strategy consists of several sectors, which are indispensable to pursuing the strategies. These are: 1-Water Supply, 2-Water Transportation, 3-Road Transportation, 4-Energy, 5-Sewage and Sanitation, 6-Solid Waste Management, 7-Storm Water Drainage, 8-Education, 9-Health, 10-Capacity Development, 11-Economic Development, and 12-Social Welfare.

The above sectors are presented in this report in terms of (i) Present Situation, (ii) Issues and Needs, and (iii) Proposed Project to address the identified issues and needs. While Sectors 1 to 10 are sectors pre-agreed to by ROSS and JICA, Sectors 11 and 12 were added later during the course of the Project.

**(5) The Comprehensive Plan**

The Comprehensive Plan consists of programs corresponding to the Development Strategies. The programs are made up of the proposed projects combined in a way that maximizes development.

**(6) Urgent Development Projects**

Three proposed projects were selected and implemented to meet the urgent needs of the target area and act as pilots for capacity development activities in relation to Project Output 3 for (i) water supply improvement, (ii) road rehabilitation and (iii) port rehabilitation.

**(7) Frameworks**

Three frameworks have been developed to provide the foundation for developing projects in each sector: (i) Development Scenario, (ii) Socio-economic Framework, (iii) Spatial Development Framework, and (iv) Conflict Prevention Measures,

**(8) Assessments**

The proposed projects were incorporated into the programs in line with the Comprehensive Plan. Assessments were conducted from two aspects in order to confirm the feasibility of the programs: (i) economic and financial analysis, and (ii) environmental and social considerations.

**(9) Scheduling**

After their formulation, the programs were prioritised according to need, and scheduling and budgeting were set.

**(10) Capacity Development**

In the course of planning and implementation of the Urgent Development Projects, capacity development needs of UNS personnel were identified and the necessary training was conducted in Japan and in a third country.

**1.4.2 Meetings, Seminars and Workshops**

A series of meetings, seminars and workshops were organised to share information and exchange opinions related to the Project as presented in **Table 1.4-1**.

**Table 1.4-1 Meetings, Seminars and Workshops**

No	Date	Name of Meeting/ Workshop	Themes	Venue	Participants
1	2012/02/12	1 <sup>st</sup> Workshop on Community Road Improvement	- Introduction of road contribution by LBT	MoPI&RD Conference Room	- Director General MoPI&RD, UNS - Director of Roads & Bridges, MoPI&RD, UNS
2	2012/02/14	Presentation of the Inception Report	- Introduction of JICA project to the counterpart and relevant agencies	MoI&C, UNS	- H.E. Deputy Governor - Hon. Agt. Minister, MoPI&RD, UNS - Hon. Minister, MoH, UNS - Hon. Minister, MAF, UNS - Director, Research & Training, MOH&PP, ROSS
3	2012/03/13	1 <sup>st</sup> JCC Meeting	- Confirmation of the contents of the JICA project	MoI&C, UNS	- H.E. The Governor, UNS - H.E. Deputy Governor, UNS - Hon. Minister, MoPI&RD, UNS - Hon. Minister, MoH, UNS - Hon. Minister, MoFT&EP, UNS - Chairperson, UNS Assembly - Acting Director General, MOH&PP, ROSS
4	2012/05/04	1 <sup>st</sup> Juba Workshop	- Presentation of JICA project to ROSS and international organisations - Presentation of current conditions by sector and discussion	Juba Bridge Hotel, Juba	- H.E. Deputy Minister, MOH&PP, ROSS - Director General, MOH&PP, ROSS - Director General, MoPI&RD, UNS
5	2012/07/23	Malakal Workshop on Pragmatic Project Affairs	- Presentation of and discussion on the draft Comprehensive Plan and the Urgent Development Projects	SSH, Malakal	- H.E. Deputy Governor, UNS - Hon. Minister, MoPI&RD, UNS
6	2012/08/30	2 <sup>nd</sup> JCC Meeting	- Presentation and confirmation of the draft Comprehensive Plan and the Urgent Development Projects at JCC Meeting	MoI&C, UNS	- H.E. Deputy Governor, UNS - Hon. Minister, MoPI&RD - Director, MOH&PP, ROSS - Director, MOFA&IC, ROSS - Deputy Director, MOR, ROSS - Ag. Director General, MOT, ROSS
7	2013/08/26	1 <sup>st</sup> Juba Seminar	- Presentation of the draft Comprehensive Plan and the Urgent Development Projects to ROSS and international organisations	Juba Bridge Hotel, Juba	- Hon. Minister, MOLHPP, ROSS - Hon. Deputy Minister, MOLHPP, ROSS - Hon. Undersecretary, MOLHPP, ROSS - Hon. Undersecretary, MOT, ROSS - Director General, SSUWC

Note: In addition, Bi-weekly meetings were held at the MoPI&RD Boardroom and JICA Compound in Malakal Town with the representatives of relevant Departments, UNS, and JICA Experts. Major agenda items were: to report work progress, to discuss and consult on issues, and also capacity building of counterparts and relevant agencies.



**< PART I >**

**COLLECTION AND ANALYSIS OF  
DATA AND INFORMATION**

## **CHAPTER 2 PRESENT SITUATION OF THE PROJECT AREA**

In this Chapter, the natural condition and socio-economic situation of the Project Area were studied and issues to be considered in the Comprehensive Plan were identified.

Malakal Town Profile Survey (the Town Profile) was conducted to illustrate the socio-economic situation of Malakal's residents. The Town Profile consisted of four components: Household Survey, Market/Factory Survey, Land Use Survey, and General Information collection. A 1:2,500 topographic survey was also conducted. The Household Survey, which covered area east of the Ring Road, revealed the livelihoods of Malakal residents, the level of public service delivery, and concerns of the people.

### **2.1 NATURAL CONDITIONS**

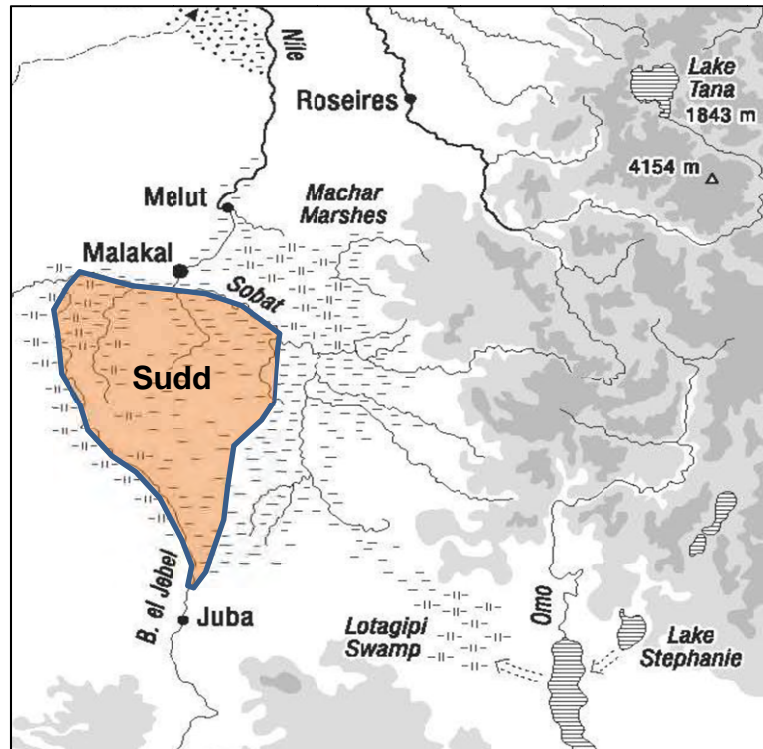
#### **2.1.1 Terrain**

South Sudan is a land-locked country located in East-Central Africa bordering with Sudan in the north, Ethiopia in the east, Uganda and Congo (Democratic Republic of) in the south, and Central African Republic in the west. Malakal is the capital of Upper Nile State (UNS) in South Sudan. It is situated about 500 km north of Juba, the capital of South Sudan, near the border with Sudan, and about 650 km south of Khartoum, the capital of Sudan.

The White Nile, which runs from south to north in South Sudan, connects Malakal with Juba and runs north to Khartoum and then to Egypt. The Nile River forms the "Sudd", which is a vast swamp in South Sudan lying between Juba and Malakal Town with an area of around 30,000 km<sup>2</sup> during the dry season and 130,000 km<sup>2</sup> during the rainy season. The location of the Sudd is shown in **Figure 2.1-1**. During the dry season, the Sudd becomes a flat lowland after evaporation of the water.

The geological structure of the centre of the African continent is very old. The basement rock of Central African Republic, which is to the west of South Sudan, is composed of Precambrian, Paleozoic, Mesozoic, Paleogene Paleocene, and Neogene deposits. Basement rocks around Juba are igneous and metamorphic rocks from the Precambrian period.

Malakal Town is located on a vast plain alongside the White Nile. This area is thought to be made from Quaternary clay and silt deposited by the White Nile for tens of thousands years. The geology of the area is defined by heavy clay soils, highly impermeable with a top layer of black cotton soil to a depth of 0.5-1.0 m. The JICA (Japan International Cooperation Agency) Project Team conducted a boring investigation to the depth of 24 m, which only found clay materials. According to relevant literature, sandy soils are found in depths of approximately 30 m or more.



Source: Williams and Adamson (1980), modified by JICA Project Team

**Figure 2.1-1 Location of Sudd and Malakal Town**

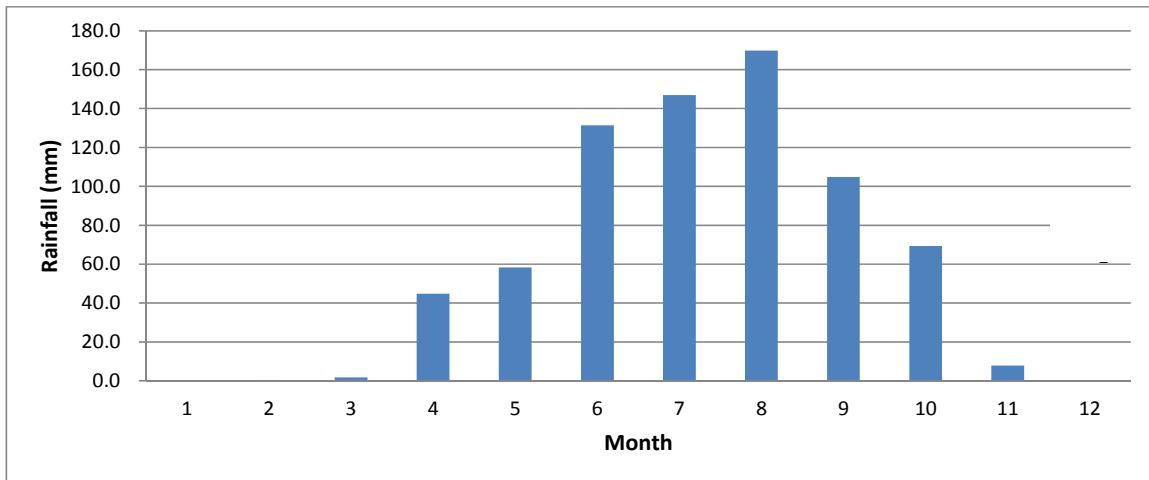
## 2.1.2 Climate

Rainfall, temperature, and wind direction data from the years 2000 to 2010 were collected from the Meteorological Services Section of Malakal Airport, Ministry of Transport, Republic of South Sudan (ROSS).

The temperature in Malakal Town and its vicinity does not fluctuate throughout the year, however the difference in rainfall between the dry season in winter and rainy season in summer is quite large. This meteorological characteristic is a typical “savanna” climate.

### (1) Rainfall

The rainfall data from 2000 to 2010 in Malakal is shown in **Figure 2.1-2**. The average annual rainfall is 736 mm. There is no rainfall during December and January. In February, March and November, there is less than 10 mm of rainfall. June to September is the rainy season, with August having the heaviest rainfall. The average monthly rainfall in August is 170 mm. The heaviest monthly rainfall in the past 11 years was recorded as 282 mm in August 2000.

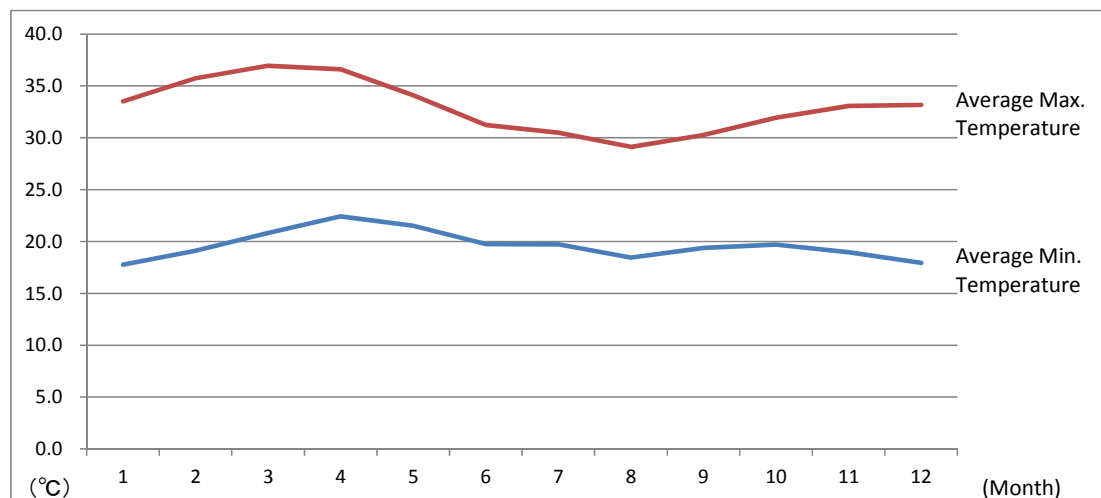


Source: Meteorological Services Section of Malakal Airport, Ministry of Transport, ROSS

**Figure 2.1-2 Average Monthly Rainfall in Malakal (2000 to 2010)**

**(2) Temperature**

The average maximum and minimum monthly temperatures between 2000 and 2010 in Malakal are shown in **Figure 2.1-3**. The average maximum annual temperature is 36.0 degrees Celsius (C) and the average annual minimum temperature is 21.4 degrees C. The highest monthly maximum temperature was 45.0 degrees C in February 2005, and the lowest monthly minimum temperature was 16.8 degrees C in January 2002.

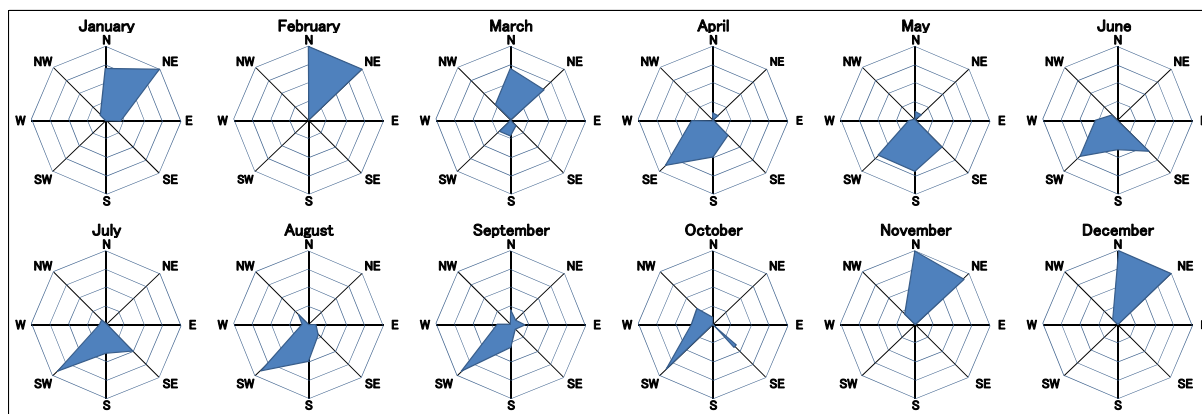


Source: Meteorological Services Section of Malakal Airport, Ministry of Transport, ROSS

**Figure 2.1-3 Average Maximum and Minimum Temperature in Malakal (2000 to 2010)**

**(3) Wind Direction**

The wind direction data from 2000 to 2010 in Malakal is shown in **Figure 2.1-4**. Wind generally blows from north or north-east during the dry season in November to March, and blows from south-east, south or south-west in the Sudd area during the rainy season in April to October.



Source: Meteorological Services Section of Malakal Airport, Ministry of Transport, ROSS

**Figure 2.1-4 Monthly Frequency of Wind Direction (2000 to 2010)**

## 2.2 SOCIO-ECONOMIC SITUATION

### 2.2.1 Population

The latest population data available for Malakal is that of 2008, which does not reflect recent demographic trends. The Project therefore utilised two deductive approaches, macroscopic and microscopic, to estimate the population of Malakal as of 2013. The estimate was calculated to be approximately 153,000.

#### (1) Baseline Data from 2008

*The Statistical Yearbook for South Sudan 2010* provides the population of each state and county in 2008 as shown in **Table 2.2-1**. The population of Malakal Town was about 115,000 in 2008. There were 15,700 households, which indicated the average household size was 7.3 persons. The male population was 53%, and the female population was 47%.

**Table 2.2-2** presents more detailed figures of the population of Makal County at the Boma level.

**Table 2.2-1 Population of Malakal Town in 2008**

Payam(Quarter)	Population			Number of Households	Population/ Household
	Total	Male	Female		
Northern Malakal	34,900	18,407	16,493	5,302	6.6
	100.0%	52.7%	47.3%		
Central Malakal	11,633	7,001	4,632	1,345	8.6
	100.0%	60.2%	39.8%		
Eastern Malakal	24,037	12,130	11,907	3,271	7.3
	100.0%	50.5%	49.5%		
Southern Malakal	43,958	22,902	21,056	5,814	7.6
	100.0%	52.1%	47.9%		
<b>Total</b>	<b>114,531</b>	<b>60,442</b>	<b>54,089</b>	<b>15,732</b>	<b>7.3</b>
	<b>100.0%</b>	<b>52.8%</b>	<b>47.2%</b>		

Source: *Statistical Yearbook for South Sudan 2010*, Southern Sudan Centre for Census, Statistics and Evaluation

**Table 2.2-2 Population and Number of Households of Makal County at Boma Level in 2008**

Payam/Quarter	Boma/Block	Population	Males	Females	Households	Number of Persons per Household
Northern Malakal	El Bethery	1,146	643	503	134	8.6
	Hai El Shatti	2,723	1,505	1,218	385	7.1
	Hai Dinka	2,042	1,124	918	298	6.9
	Hai El Matar	5,815	3,184	2,631	630	9.2
	Hai Nuba	2,138	1,218	920	336	6.4
	Hai Shulluk	2,313	1,259	1,054	365	6.3
	Hai Zande	2,632	1,505	1,127	450	5.8
	Thorat Luakat	10,349	5,043	5,306	1,559	6.6
	Thorat Malakia	5,742	2,945	2,797	795	7.2
	<i>Sub-total</i>	34,900	18,426	16,474	4,952	7.0
Central Malakal	Jallaba	3,237	2,080	1,157	307	10.5
	Muderia	6,897	4,066	2,831	722	9.6
	Ray El Maseri	1,499	801	698	159	9.4
	<i>Sub-total</i>	11,633	6,947	4,686	1,188	9.8
Eastern Malakal	Biathin	2,824	1,392	1,432	380	7.4
	Emtidad Jallaba	1,472	728	744	192	7.7
	Hai Saha	6,711	3,340	3,371	853	7.9
	Hai Television	7,105	3,680	3,425	897	7.9
	Thorat Jallaba	5,925	3,009	2,916	745	8.0
	<i>Sub-total</i>	24,037	12,149	11,888	3,067	7.8
Southern Malakal	Assossa	17,959	9,615	8,344	2,117	8.5
	Bum	6,116	3,055	3,061	763	8.0
	Dengershufu	8,541	4,590	3,951	1,132	7.5
	Goni	4,087	2,044	2,043	467	8.8
	Terawa	7,255	3,619	3,636	970	7.5
	<i>Sub-total</i>	43,958	22,923	21,035	5,449	8.1
Malakal Town Total		114,528	60,445	54,083	14,656	7.8
Lelo	Makal	1,635	838	797	370	4.4
	Obwa	3,220	1,737	1,483	581	5.5
	Werjuok	888	431	457	190	4.7
	<i>Sub-total</i>	5,743	3,006	2,737	1,141	5.0
Ogot	Ogot	1,014	540	474	224	4.5
	Padit	2,681	1,344	1,337	520	5.2
	Wau	2,517	1,372	1,145	351	7.2
	<i>Sub-total</i>	6,212	3,256	2,956	1,095	5.7
Outside Malakal Town Total		11,955	6,262	5,693	2,236	5.3
<b>Malakal County Total</b>		<b>126,483</b>	<b>66,707</b>	<b>59,776</b>	<b>16,892</b>	<b>7.5</b>

Source: Statistical Office of UNS Government

## (2) Macroscopic Approach

The population in Malakal in 2012 was estimated using a macroscopic approach as 153,000, with reference to data from 2008. Consideration was also given to the number of returnees to Malakal and those leaving for other destinations, whose data was obtained from the South Sudan Relief and Rehabilitation Commission (SSRRC) in Malakal.

**Table 2.2-3** shows the number of returnees arriving in UNS and Malakal Town, and those leaving for other destinations between January 2009 and May 2012. The number of returnees includes both government organised and spontaneous returnees. The total number of returnees to Malakal was 16,862 during this period, while those who left for other destinations were 231 households or 1,386 persons (assuming 6.0 persons per household). The number of government-organised returnees has been constantly increasing, whereas that of spontaneous returnees has continued to decline. The total number of the returned in 2012 is expected to exceed more than double the 2011 level if the trend seen between January 2009 and May 2012 continues until December 2012.

Estimation of the population of Malakal in 2012 was made based on the following assumptions:

- i) Those returnees who left for other destinations were assumed to be 20% of the total number of returnees arrived at Malakal. This figure takes into consideration the SSRRC's view that the actual number of returnees left for other destinations is likely to be higher than the recorded 9.6%. This indicates that the resettlement of the returnees is still in a state of flux.
- ii) The rate of natural increase in population is assumed at 2.2% per year based on the United Nations Children's Fund (UNICEF) statistics for Sudan for 2010.
- iii) The population living to the eastern side of the town boundary along the Ring Road is included.

The population of Malakal Town in 2008-2013 is thus macroscopically updated to estimate the population in 2012 as 153,000, as shown in **Table 2.2-4**.

**Table 2.2-3 Inflow and Outflow of Returnees to UNS and Malakal Town**

Period	Number of Returnees						Number of Returnees Leaving for Other Destinations by Onward Transportation Assistance (OTA)		
	To Upper Nile State			To Malakal Town			Out of Upper Nile State	Out of Malakal Town	
	Government Organized	Spontaneous	Total	Government Organized	Spontaneous	Total		Households	Persons
1 January to 31 December 2009	8,300	4,201	12,501	1,700	3,015	4,715	1,270	80	480
1 January to 31 December 2010	16,800	14,350	31,150	2,130	1,500	3,630	2,017	47	282
1 January to 31 December 2011	12,860	18,280	31,140	2,760	1,117	3,877	4,280	72	432
1 January to 31 May 2012	9,630	4,340	13,970	4,370	270	4,640	6,800	32	192
Total	47,590	41,171	88,761	10,960	5,902	16,862	14,367	231	1,386

Source: South Sudan Relief and Rehabilitation Commission, Malakal

## (3) Microscopic Estimation

The Boma-level population in Malakal in 2012 was extrapolated from a comparative analysis of



the 2008 population and recent expansion of the residential area in each Boma. In March 2012, the Project conducted an aerial photo survey of Malakal Town. Photographs of residential areas were compared to 2005 QuickBird Satellite images.

**Table 2.2-5** presents the results of the microscopic estimation. Boma in which residential areas were rapidly expanding were Hai El Matar in Northern Payam, Hai Television in Eastern Payam, and Assossa, Terawa and Dengershufu in Southern Payam. Such geographical distribution of Bomas shows that residential areas were expanding toward the east.

The rate of expansion was assumed to be 100% for the rapidest case, 20% for the moderate case and 5% for the least rapid case for a period of seven years between 2005 and 2012. These rates were used to extract that of five years between 2008 and 2012 by multiplying them by 0.57 (4 years divided by 7 years). The rate for the high case between 2008 and 2012 was 57 %, then rounded to 50 % considering the number of the total population the macroscopic approach derived: 153,000.

**Table 2.2-4 Estimate of 2012 Malakal Population by Macroscopic Approach**

Item	Value	Remarks
<b>Existing Population in 2011</b>		
a. Population in 2008	114,528 Persons	<i>Statistical Yearbook of South Sudan 2010</i>
b. Assumed Proportion of Number of Those Having Left for Other Destinations	20 %	<i>Assumed</i>
Number of Returnees 2009 to May 2012	14,367 Persons	
Those Leaving for Other Destinations with IOM Support	1,386 Persons	<i>IOM (231 Households Times 6 Person/Household)</i>
Proportion	9.6%	
c. In-Migration (Returnees)		
2009	4,715 Persons	<i>SSRRC</i>
2010	3,630 Persons	<i>SSRRC</i>
2011	3,877 Persons	<i>SSRRC</i>
2012 (Until End of May)	4,640 Persons	<i>SSRRC</i>
2012 (January to December)	11,136 Persons	<i>Jan-May Figure Extrapolated.</i>
Total	16,862 Persons	
(Having Left for Other Destinations)		
2009	943 Persons	<i>50% of Returnees Assumed</i>
2010	726 Persons	<i>50% of Returnees Assumed</i>
2011	775 Persons	<i>50% of Returnees Assumed</i>
2012	2,227 Persons	
Total	3,372 Persons	<i>50% of Returnees Assumed</i>
(Net)		
2009	3,772 Persons	
2010	2,904 Persons	
2011	3,102 Persons	
2012	8,034	
Total	13,490 Persons	
c. Rate of Natural growth between 2007 and 2011	2.20% %/year	<i>UNICEF Statistics for Suddan 2010</i>
e. Population in 2008, 2009, 2010 and 2011		
2009		
Natural Growth	2,520 Persons	
Migration	3,772 Persons	
Total	120,820 Persons	
2010		
Natural Growth	2,658 Persons	
Migration	2,904 Persons	
Total	126,382 Persons	
2011		
Natural Growth	2,780 Persons	
Migration	3,102 Persons	
Total	132,264 Persons	
2012		
Natural growth	2,910	
Migration	8,034 Persons	
Sub-Total	143,208 Persons	<i>within Malakal Town Boundary</i>
Population in the Eastern Part of the Ring Road	10,624 Persons	<i>Estimated Based on the Number of Houses Counted on the Satellite Image. (a)</i>
Total	153,832	
Rounded	153,000	

Note (a): The number of houses counted on satellite image was 681. Houses not shown on the satellite image such as Tukul hut, were assumed to be the same at 681. The total of 1,362 is multiplied by 7.8, the average number of household members based on the Town Profile survey. This gives 10,624 as the population in this area.

Source: Estimated by JICA Project Team based on the data source noted in the Remarks column.

**Table 2.2-5 Population of Malakal Town by Boma Estimated in 2012**

Payam/Quarter	Boma/Block	Population in 2008	Level of Population Increase from 2008 to 2012	Population in 2012	Remarks
Northern Malakal	El Bethery	1,146	Low	1,179	
	Hai Shathi	2,723	Low	2,801	
	Hai Dinka	2,042	Low	2,100	
	Hai Mathar	5,815	High	8,723	
	Hai Nuba	2,138	Low	2,199	
	Hai Shulluk	2,313	Low	2,379	
	Hai Zande	2,632	Low	2,707	
	Luakat	10,349	Moderate	11,487	
	Sora Malakia	5,742	Low	5,906	
	<i>Sub-total</i>	<i>34,900</i>	-	<i>39,481</i>	
Central Malakal	Jalaba	3,237	Low	3,329	
	Muderia	6,897	Moderate	7,656	<i>Ingaz and Muderia Shabia included</i>
	Ray Elmaseri	1,499	Low	1,542	
	<i>Sub-total</i>	<i>11,633</i>	-	<i>12,527</i>	
Eastern Malakal	Biathin	2,824	Moderate	3,135	
	Entidad Jalaba	1,472	Low	1,514	<i>Shown Dinia included</i>
	Hai Sah	6,711	Moderate	7,449	
	Hai Television	7,105	High	10,658	<i>Munathelin and Asalam North included</i>
	Sora Jaraba	5,925	Low	6,094	
	<i>Sub-total</i>	<i>24,037</i>	-	<i>28,850</i>	
Southern Malakal	Assosa	17,959	High	26,939	
	Bum	6,116	Moderate	6,789	<i>Shohada and Northern part of Asalam South included</i>
	Dengershufu	8,541	High	12,812	<i>Hai Tenmia, Lulthern and Academic included</i>
	Goni	4,087	Moderate	4,537	
	Thrawa	7,255	High	10,883	<i>Southern part of Asalam South included</i>
	<i>Sub-total</i>	<i>43,958</i>	-	<i>61,958</i>	
<b>Total</b>		<b>114,528</b>	-	<b>142,816</b>	<i>Total for the Malakal Town Area Corresponding to 2008 Census</i>
Eastern Part of Ring Road		-	-	10,624	<i>Area Outside of the Malakal Town Boundary, but where Population is Extending into. Estimated Based on the Number of Houses Counted on the Satellite Image.</i>
<b>Grand Total</b>		-	-	153,440	
			<i>Rounded</i>	<b>153,000</b>	
<b>Rate of Expansion of Residential Area</b>			<b>Level of Population Growth between 2008 and 2012</b>		
	<u>2005-2012</u>	<u>2008-2012</u>	High	1.50	times or 10.7% per year
	<u>Increment</u>	<u>Increment</u>	Moderate	1.11	times or 2.6% per year
High	100%	57%	Low	1.03	times or 0.7% per year
Moderate	20%	11%			
Low	5%	3%			
The level of population growth between 2005 and 2012 was assessed by comparing the housing distribution pattern in 2005 QuickBird satellite images and 2012 aerial photo images for each Boma of Malakal Town. The level of population growth between 2005 and 2012 thus assessed was converted to the level between 2005 and 2012 by multiplying by the ration of 0.57 (4 years divided by 7 years) first and then adjusted to a round number representing the high case.					
<b>Cross-checking with Macro Projection</b>					
Census 2008 Total		114,528			
Macro Projection 2012 Rounded		153,000			
<b>Total Above Rounded</b>		<b>153,000</b>			

Source: JICA Project Team

### **2.2.2 Livelihoods - Findings from the Household Survey**

A household survey was conducted as part of the Town Profile Survey to obtain a general picture of people's lives in Malakal Town. Some 30 samples were selected in each Boma. A total of 918 samples were collected, which is equivalent to about 6% of Malakal's estimated population of 153,000 in 2012. The survey was conducted in May to August 2012 and February 2013. The samples covered all possible types of households in the Project Area to ensure reliability of the survey.

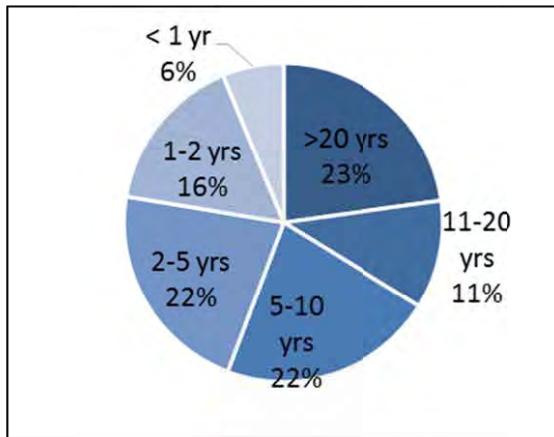
The Town Profile Survey revealed a number of critical issues that should be considered during preparation of the Comprehensive Plan for Malakal Town. Those were a strong dissatisfaction of people over the present condition of public services, water problem especially, limited opportunities for job and income generation, and the existence of vulnerable people. The findings suggested that the water problem should be responded firstly than other public services, and then economic development should be promoted to raise incomes and to create a social safety net for vulnerable people.

The major findings of the Town Profile Survey are presented below. Details are presented in **Appendix A-1**.

#### **(1) Family Composition**

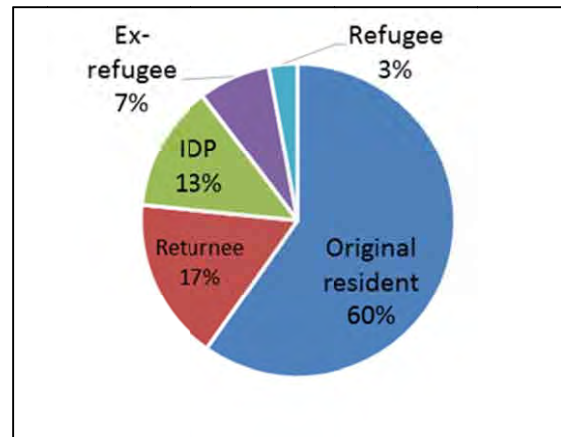
The average household size was 7.7 persons, similar to the 7.3 persons reported in the 2008 Population Census. Widow- and child-headed households accounted for 21%. In consideration of the severe economic and social conditions in Malakal and this high ratio, special attention is required for those vulnerable households in any planning development for Malakal Town.

Those living in Malakal for more than five years slightly exceeded half (57%) as shown in **Figure 2.2-1**. Those living in Malakal for two years or fewer reached 22%, which implied continuous arrival of returnees in recent years. Those claiming to be original Malakal residents were 60%, while the remaining included returnees (17%), Internally Displaced Persons (IDPs) (13%), ex-refugees (7%), and refugees (3%) as shown in **Figure 2.2-2**. More than half of residents were born in places other than Malakal (53%). The places where returnees came from were diverse, with the highest proportion coming from Khartoum (31%), followed by Makal County outside Malakal Town (21%), Ethiopia (12%). Returnees came to Malakal with assistance either from the government, relatives or people of the same ethnic group.



Source: JICA Project Team

**Figure 2.2-1 Duration of Time Living in Malaka**

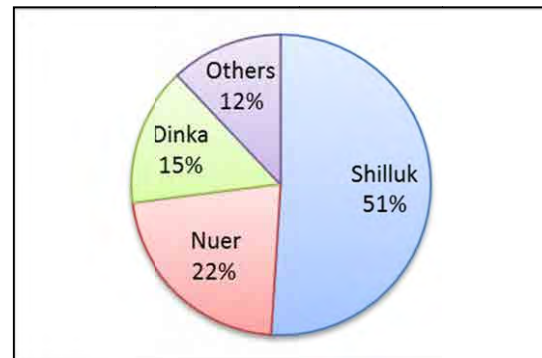


Source: JICA Project Team

**Figure 2.2-2 Status of Residents**

## (2) Ethnic Diversity

In terms of ethnicity, the majority of the interviewees were Shilluk (51%), followed by Nuer (22%), Dinka (15%), and other ethnic groups (12%) as shown in **Figure 2.2-3**. Those living with people of other ethnic groups were 72%. 93% of the respondents answered that they were not experiencing conflict with other ethnic groups while 7% answered that they had experienced ethnic conflict in the past.

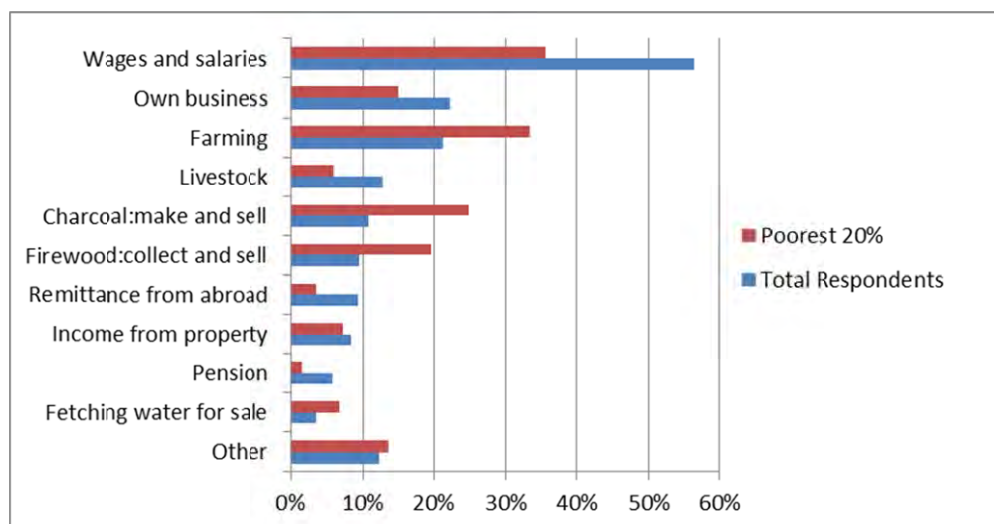


Source: JICA Project Team

**Figure 2.2-3 Ethnic Distribution**

## (3) Source of Income

**Figure 2.2-4** shows the means of livelihood of all respondents, and those of the poorest 20%. Sources of livelihood were diverse. The most common was wages and salaries (57%), followed by owning business enterprises (22%), crop farming (21%), animal husbandry (13%), charcoal burning (11%), collection and sale of firewood (10%), remittances (9%), property income (8%). Conversely, for the poorest 20% of respondents, the ratio of wages and salaries was 36%, which was lower by some 20% than the overall group. The ratios of farming, charcoal making, and firewood collection were much higher.



Source: JICA Project Team

**Figure 2.2-4 Means of Livelihood**

**Table 2.2-6** shows the distribution of households by income level. The original income strata in terms of monthly household income in South Sudan Pounds (SSP) was converted to daily personal income in US\$ to assess the incidence of poverty in Malakal, which assumed 7.7 persons per household and SSP 2.95 per US\$.

**Table 2.2-6 Household Income and Equivalent Income/Person/Day**

(As of January 2013)

Average Income		Number of Samples	%
SSP/Household/Month	US\$/Person/Day		
Below SSP 500	Below US\$ 0.73	327	37.4%
SSP 500-1000	US\$ 0.73-1.47	306	35.0%
SSP 1000-5000	US\$ 1.47-7.34	201	23.0%
SSP 5000-10000	US\$ 7.34-14.67	39	4.5%
More than SSP 10000	More than US\$ 14.67	2	0.2%
Total		875	100.0%

Note: Monthly household income (unit SSP) is converted to individual household member/day (unit US\$)

Source: Town Profile Survey undertaken by JICA Project Team, 2013

The Millennium Development Goals defines the poverty line at US\$1 per person per day. According to this standard, the incidence of poverty in Malakal seems quite high. The results of the survey showed 37.4 % of the respondents are below US\$ 0.73/person/day, which is close to 40% of the responded.

More people were dissatisfied with the current economic situation (65%) than those who were satisfied (9%). The reasons for dissatisfaction were mainly income-related such as inadequate income (61%), no job opportunities (48%), and being able to manage only basic needs (40%). Inflation was also cited by 35% of respondents.

There were many households with young people who were willing but were not able to get a job (69%). The reasons included low education levels, no connections, lack of specific skills, no work experience and lack of English ability.

#### **(4) Housing Conditions and Property**

In terms of land and house ownership, those owning land and a house constituted the majority (land 69% and house 72%). Three-bedroom houses were the most common living situation, accounting for 55% of respondents. Those satisfied with their present housing conditions were 40%, while those dissatisfied were 21%. The remaining respondents were neither satisfied nor dissatisfied. The most serious problem concerning housing was the high cost of building materials (66%) followed by difficulties in acquiring land (45%), inadequate sizing of houses (35%), and the high cost of rent (23%).

Those households with a mobile phone were 68%, with a radio/transmitter 47%, and with TV 33%.

#### **(5) Public Services**

In the Household Survey, 61.4% of respondents answered “no water” as a difficulty encountered in living in his/her Boma, and 65.3% of the respondents felt water was the highest need. The lack of electricity (22%) and flooding (12%) followed as other problems. In terms of priorities, medical facilities (11%), schools (9%), electricity (7%), paved roads (6%), and police post (3%) followed.

**Water** Respondents not satisfied with the condition of water were 44%. There were a number of problems related to water cited such as bad quality of water for drinking and cooking (64%), high cost (56%), instability in supply (52%), and distance to water sources (52%).

**Sanitation** Nearly half of respondents were not satisfied with the present sanitation conditions (48%).

**Education** More than half of children attending primary school were spending 15 to 30 minutes to get to school (52%). Secondary schools were further: with those spending more than 45 minutes to get to secondary school accounted for 60%. A little more than half were not satisfied with the present education situation (54%). The major reasons cited were the high cost of education (86%), lack of qualified teachers (33%), no time to go to school (31%), and distances too great to get to school (22%). Although the educational level of household heads varied widely, it was relatively high overall. Those who completed post-secondary school were 28%, followed by university not completed (18%), never been to school (18%), and secondary school completed (17%) as shown in **Figure 2.2-4**. More than half were able to write and read simple English sentences (53%). Those who received vocational training were 37%. Major subjects studied included computing, carpentry, bricklaying and electronics.

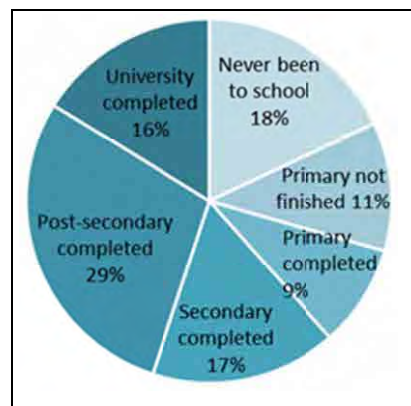
**Road** Nearly 60% were dissatisfied with the present road conditions with the major reasons cited as inadequacy of roads for walking (80%) and dustiness (30%). In terms of transportation, high transportation costs were the greatest problem, far exceeding other problems (80%).

**Energy** Those dissatisfied with the current energy services were 37%. High energy costs were the biggest problem (65%).

**Garbage** The current garbage collection service was not satisfactory for 39% of respondents, mainly due to low frequency of collection (30%), and distance to the dumping point (20%).

**Security Problem** About one third of respondents experienced security problems (34%) including robbery, land conflict, extortion/demand money, military recruitment of young people, and so on.

**Means and Reasons of Loan/Debt** Most people have never borrowed money (90%). Sources of loans were banks (51%), traditional systems (31%), and micro-finance institutions (17%). Respondents borrowed money to cover family health care (32%), business expenses (30%), to improve their dwelling (12%), education (11%), and so on. Major positive reasons for not borrowing money were their unwillingness to be in debt (52%) and no need (21%), while passive reasons included no knowledge on where and how to borrow money (35%), no financial institution (22%) and not knowing a lender (11%).



Source: JICA Project Team

**Figure 2.2-5 Education Level of the Household Head**

### 2.2.3 Economic Situation and Findings from the Malakal Market Survey

#### (1) Economy of South Sudan

**Table 2.2-7** presents the Gross Domestic Product (GDP) and Gross National Income (GNI) of South Sudan from 2008 to 2010 in 2013 prices. GDP in 2010 was SSP 30,488 million, while GNI was SSP 19,395 million. The large gap between GDP and GNI is due to the income of mainly foreign entities related to oil production. The share of exports remained high in the past three years: 33%, 26% and 32% in 2008, 2009 and 2010 respectively. GDP per capita and GNI per capita also showed a large gap in 2010: SSP 3,564 for the former and SSP 2,267 for the latter for the same reason.

The per capita GNI of South Sudan was US\$ 984 in 2010, which was significantly higher than other countries in East Africa according to World Bank data and the *Statistical Year Book of South Sudan, 2011* as shown in **Table 2.2-8**.



**Table 2.2-7 Gross Domestic Product (GDP) and Gross National Income (GNI) of South Sudan in 2008, 2009 and 2010**

(unit: mil. SSP unless otherwise stated)

Items	Value			%		
	2008	2009	2010	2008	2009	2010
<b><u>GDP at Current Prices</u></b>	<b><u>28,505</u></b>	<b><u>24,946</u></b>	<b><u>30,488</u></b>	<b><u>100.0%</u></b>	<b><u>100.0%</u></b>	<b><u>100.0%</u></b>
GDP at Current Prices (US\$ million)	13,630	10,800	13,227	-	-	-
GDP per Capita (SSP)	3,451	2,967	3,564	-	-	-
GDP per Capita (US\$)	1,650	1,285	1,546	-	-	-
Balance of Payment Out Flows	9,603	7,701	11,093	-	-	-
<b><u>GNI at Current Prices</u></b>	<b><u>18,902</u></b>	<b><u>17,245</u></b>	<b><u>19,395</u></b>	-	-	-
GNI at Current Prices (US\$ million)	9,038	7,466	8,415	-	-	-
GNI per Capita (SSP)	2,288	2,051	2,267	-	-	-
GNI per Capita (US\$)	1,094	888	984	-	-	-
<b><u>Final Consumption Expenditure</u></b>	<b><u>14,263</u></b>	<b><u>14,472</u></b>	<b><u>16,820</u></b>	<b><u>50.0%</u></b>	<b><u>58.0%</u></b>	<b><u>55.2%</u></b>
<b>Private</b>	<b>9,619</b>	<b>10,493</b>	<b>11,145</b>	<b>33.7%</b>	<b>42.1%</b>	<b>36.6%</b>
Households	9,231	9,864	10,156	32.4%	39.5%	33.3%
NPISHs*1	388	629	989	1.4%	2.5%	3.2%
<b>Public</b>	<b>4,644</b>	<b>3,978</b>	<b>5,674</b>	<b>16.3%</b>	<b>15.9%</b>	<b>18.6%</b>
GOSS*2	3,488	2,164	3,302	12.2%	8.7%	10.8%
GOSS off Budget	315	710	1,116	1.1%	2.8%	3.7%
States	841	1,105	1,256	3.0%	4.4%	4.1%
<b><u>Investment Expenditure</u></b>	<b><u>4816</u></b>	<b><u>3921</u></b>	<b><u>4,005</u></b>	<b><u>16.9%</u></b>	<b><u>15.7%</u></b>	<b><u>13.1%</u></b>
<b>Private</b>	<b>2,873</b>	<b>2,545</b>	<b>2,418</b>	<b>10.1%</b>	<b>10.2%</b>	<b>7.9%</b>
Oil	2,270	1,849	1,643	8.0%	7.4%	5.4%
Non-Oil	603	696	775	2.1%	2.8%	2.5%
<b>Public</b>	<b>1,943</b>	<b>1,377</b>	<b>1,587</b>	<b>6.8%</b>	<b>5.5%</b>	<b>5.2%</b>
GOSS	1,610	981	1,055	5.6%	3.9%	3.5%
Goss off Budget	175	188	296	0.6%	0.8%	1.0%
States	158	207	236	0.6%	0.8%	0.8%
<b><u>Export of Goods and Services</u></b>	<b><u>21,325</u></b>	<b><u>16,837</u></b>	<b><u>21,973</u></b>	-	-	-
Goods (f.o.b*3)	21,135	16,618	21,729	-	-	-
Services	190	219	244	-	-	-
<b><u>Imports of Goods and Services</u></b>	<b><u>11,899</u></b>	<b><u>10,284</u></b>	<b><u>12,310</u></b>	-	-	-
Goods (f.o.b**)	8,914	7,245	8,719	-	-	-
Services	2,985	3,039	3,591	-	-	-
<b>Net Exports (Balance of Trade)</b>	<b><u>9,426</u></b>	<b><u>6,553</u></b>	<b><u>9,663</u></b>	<b><u>33.1%</u></b>	<b><u>26.3%</u></b>	<b><u>31.7%</u></b>

Source: Statistical Yearbook of South Sudan 2011

\*1NPISHs:Non-profit institutions serving households, \*2GOSS:Government of South Sudan, \*3f.o.b:Freight on Board

**Table 2.2-8 GNI per capita of East African Countries**

Country Name	GNI per capita (USD)	
	2009	2010
South Sudan	888	984
Burundi	190	200
Ethiopia	320	340
Kenya	780	800
Rwanda	470	510
Tanzania	500	530
Uganda	400	460

Source (World Bank Web Page: <http://data.worldbank.org/indicator/NY.GNP.PCAP.CD>) and *Statistical Year Book of South Sudan, 2011*

The high GNI per capita of South Sudan compared with neighbouring countries could be interpreted as being caused by the high proportion of national entities engaged in the production and export of oil. The GNI per capita of South Sudan would likely be lower if these oil-related activities were excluded.

## (2) Economy of Malakal Town - Findings from the Market Survey

Although data showing economic activities in Malakal Town is scarce, the number of formal businesses by state capital is listed in the *Statistical Year Book for South Sudan in 2010 Final Report*, the Southern Sudan Centre for Census, Statistics and Evaluation (SSCCSE). According to the data, 894 business entities were registered in 2010 in Malakal, which was about one third of those in Juba making Malakal the third largest in terms of the registered number after Juba and Wau. Such accumulation of business entities implies capital concentration in Malakal. In the meantime, above statistical report did not show the number of business entities by industry.

The only source of information that shows the detailed economic situation of Malakal is the Town Profile Survey conducted as a part of this Project. The survey was conducted in May 2012, and a total of 1,213 samples were collected. See **Appendix A-1** for the details of the Town Profile Survey. The Market Survey provides a general picture of economic activities in Malakal Town: manufacturing was almost non-existent in Malakal except for ice making, for example. Malakal was characterised as a tertiary industrial town specialising in wholesale, retail and public services, including military and police.

Services constituted the main activities in Malakal Town as shown below. Food product shops accounted for 43%, followed by beauty and personal care related services (24%), and leisure and recreation (11%). The majority of beauty and personal care related services businesses were clothes sellers (**Table 2.2-9**).

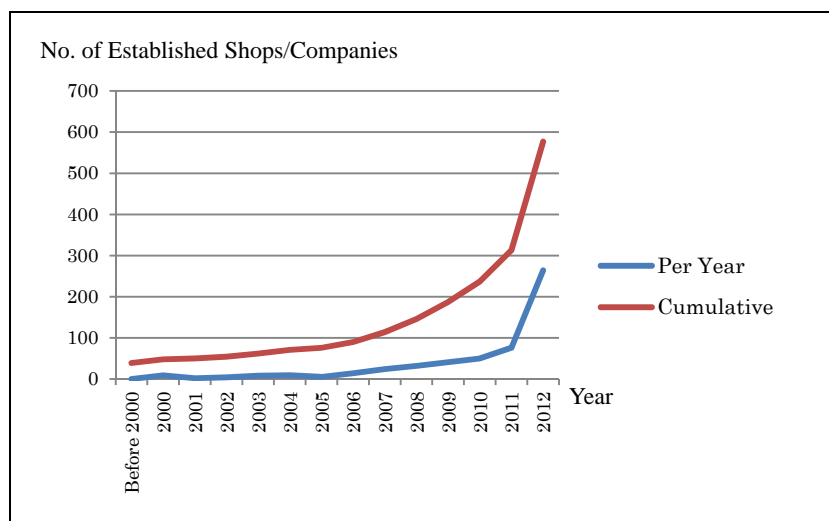
**Table 2.2-9 Type and Number of Businesses Interviewed in the Market Survey**

(As of January 2013)

Type of Business	No.	%
Food Product Shops	500	43
Beauty and personal care related services	277	24
Leisure and Recreation	127	11
Transport and Storage	84	7
Finance and Insurance	73	6
Construction	58	5
Housing and other Social Business	42	4
<b>Total</b>	<b>1,161</b>	<b>100</b>

Source: Town Profile Survey (Market Survey), JICA Project Team

In terms of business size, small-scale operators were dominant. Shops or companies with employees of 10 or less accounted for 94%. In terms of capital, those with less than SSP 10,000 (USD 2,000) accounted for 71%. **Figure 2.2-1** shows the establishment year of each business. Business activities rapidly expanded after the CPA was signed in 2005. Shops or companies established since 2005 account for 88%. Conversely, 6.8 % or 39 shops or companies established their business before 2000. It should be noted that the number of shops/companies that had ceased operations as of January 2013 was not included.



Source: Town Profile Survey JICA Project Team, 2013

**Figure 2.2-6 Number of Shops/Companies Established in Malakal Town**

As for the nationality of business operators, those from South Sudan accounted for 52% of all the surveyed business persons, followed by Sudan (35%), Ethiopia (10%), Uganda (3%) and Kenya (0.2%).

The perceptions of business operators in regards to business trends were collected as described below in **Table 2.2-10**.

Business operators who perceived the economic situation positively surpassed those perceiving it negatively, but by a small margin.

**Table 2.2-10 Business Trends Perceived by Business Operators**

(as of January 2013)

	Positive Perception	Negative Perception	Remarks
Business prospects over the next six months	48.9%	40.6%	Unknown 10.5%
Annual sales this year compared to last year	51.3%	30.4%	Same 12.7% Unknown 5.5%
Profitability this year compared to last year	46.1%	45.2%	Same 7.7% Unknown 1.0%

Source: Town Profile Survey (Market Survey), JICA Project Team

In terms of price levels, those who saw increasing of prices in the last two months accounted for 71%. Of those, “moderate increases” accounted for 46% and “drastic increases” for 25%. Most shops/companies have never applied for a bank loan (97%), while the major reason for applying for bank loans was to increase capital (52%), followed by purchasing equipment or machinery (33%) and reviving business (9%).

Nearly half of shops or companies purchased goods from Juba (48%), while others bought from Khartoum (29%) and Ethiopia (12%). These ratios roughly corresponded to the nationalities of business operators as mentioned earlier.

More than three quarters of business operators perceived that Malakal Town has the potential for industrial development in terms of market availability (76%).

In terms of the business environment, issues perceived as the most crucial were transportation-related ones, such as high transportation costs (60%), poor condition of roads (45%), and limited access to goods and commodities (36%). Too many different taxes were also an issue (36%). The absence of financial institutions was cited by 19% of business operators. Corruption was pointed out by 5% of respondents. Although the high cost of cooling equipment was mentioned by only 2% of business operators, this issue is likely to become increasingly important in the future as the trade of agro-related and dairy products expands.

## 2.3 ADMINISTRATIVE FRAMEWORK

### 2.3.1 Layers of Government and the Local Government

The local government system in South Sudan was designed during the formulation of the Local Government Act, which came into effect in 2009. The system consists of three layers of government as follows.

**Table 2.3-1 Layers of Government and Administrative Units**

Government Level		Institutions Related to Local Government	Number*	Responsibility
1	Government of the Republic of South Sudan	Local Government Board	1	Corporate policy making legislation and regulation
2	State	State Ministries of Local Government and Law Enforcement	10	Functional policy making, legislation, regulation and coordination
3	Local Government	Local Government Councils (County and City)	78*	Service delivery planning, programming and implementation
Administrative Level Under the Local Government in Malakal City				
Payam (Quarter)		Under jurisdiction of County or City. "Quarter Office" has officers sent by City/County. Several Payam are included in a County or City.		
Boma (Block)		A Payam is made of several Boma.		

Source: Compiled by JICA Project Team 2013 with reference to collected information.<sup>1</sup> \*The number in the above table is subject to change according to the application of the Local Government Act.

#### (1) Upper Nile State Government

As of October 2013, the UNS Government consists of the following 13 state ministries:

- i) State Ministry of Finance and Economic Planning (MoF&EP)
- ii) State Ministry of Commerce, Trade and Investment (MoCTI)
- iii) State Ministry of Information and Communication (MoIC)
- iv) State Ministry of Education (MoE)
- v) State Ministry of Health (MoH)
- vi) State Ministry of Physical Infrastructure and Rural Development (MoPI&RD)
- vii) State Ministry of Agriculture and Forestry (MoAF)
- viii) State Ministry of Animal Resources and Fisheries (MoARF)
- ix) State Ministry of Culture, Youth and Sports (MoCYS)
- x) State Ministry of Gender and Social Welfare (MoG&SW)
- xi) State Ministry of Labour, Public Services and Human Resource Development (MoLPS&HRD)
- xii) State Ministry of Local Government and Law Enforcement (MoLG&LE)
- xiii) State Ministry of Parliamentary Affairs (MoPA)

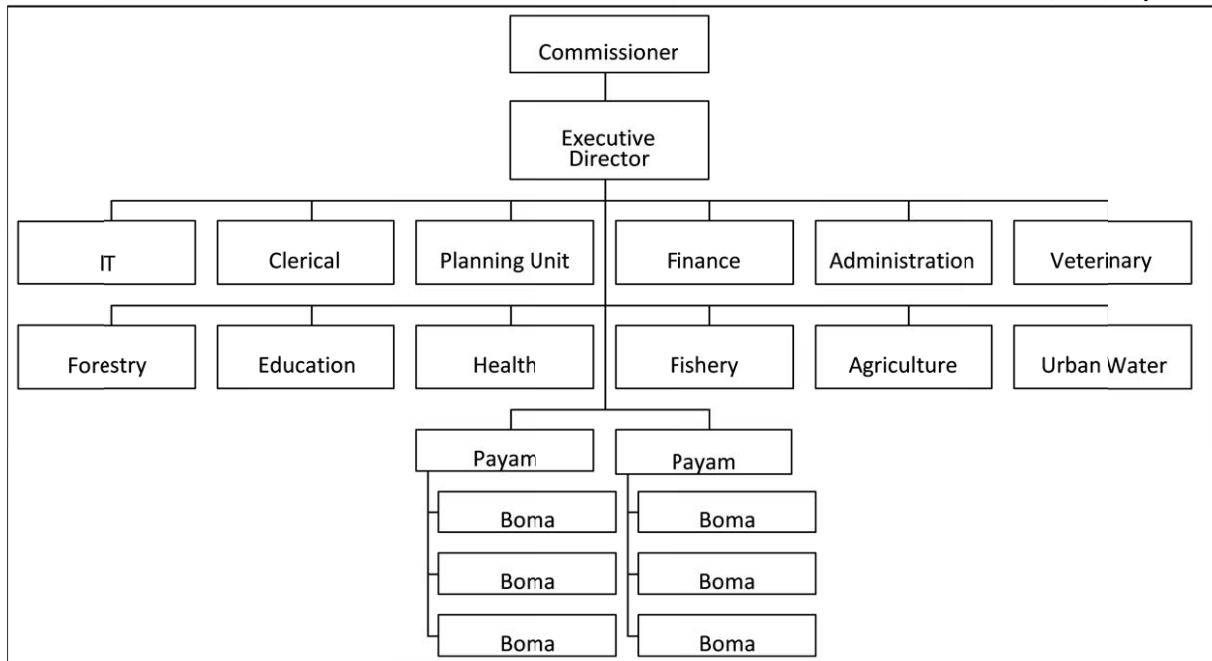
<sup>1</sup> De Klerk, Marianne at el. 2009, "A scan of the current state of affairs of local government in southern Sudan (October-November 2009)", VNG International, p.10

## (2) Makal County

The organisational structure of Makal County is shown in **Figure 2.3-1**.

Originally, Makal County had jurisdiction over five Payam (Northern, Central, Southern, Lelo and Ogot). After Malakal City was established by three Payam (Northern, Central and Southern) in January 2012, two Payam remain under the jurisdiction of Makal County.

(As of May 2012)



Source: Makal County

**Figure 2.3-1 Organisational Structure of Makal County**

## (3) Malakal City Council

In accordance with the Council of Ministers' resolution No. 58 dated 25 November 2011, read together with Article 53, 57 and 63 of the Local Government Act 2009, the Governor of UNS decreed the full establishment, structure, powers and the function of the City or Municipal Council of Malakal City in 5 January 2012.

In accordance with Section 53 of the Local Government Act 2009, a Mayor is elected by direct election for a four-year term. However, at present the State Government appoints the Mayor of Malakal. The Paramount Chief, who represents traditional authorities, is assigned as an advisor to the City Council.

The functions and responsibilities of Malakal City are:

- i) to be responsible for security, maintain law and order in the City, and execute policies and by-laws enacted by the Legislative Council;
- ii) to mobilise and organise the general public to play an effective role in service delivery and development in the Municipality;

- iii) to be responsible for all taxes in the Municipal Council of Malakal City;
- iv) to ensure safe custody of all City or Municipal Council records and funds; and
- v) to coordinate Government, non-governmental organisations (NGOs), and private and community activities and functions in the City or Municipal Council.

In practice, although the Malakal City Municipal Council intends to develop its activities, its functions are still limited to the maintenance of roads, sewage and security.

As mentioned earlier in the previous section, Malakal City consists of three Payam that had previously been under the jurisdiction of Makal County. They are Northern, Central and Southern Payam as shown in **Table 2.3-2**. Later, these three “Payam” were divided into four “Quarters”

The organisational structure of the Malakal City Council is shown in **Figure 2.3-2**.

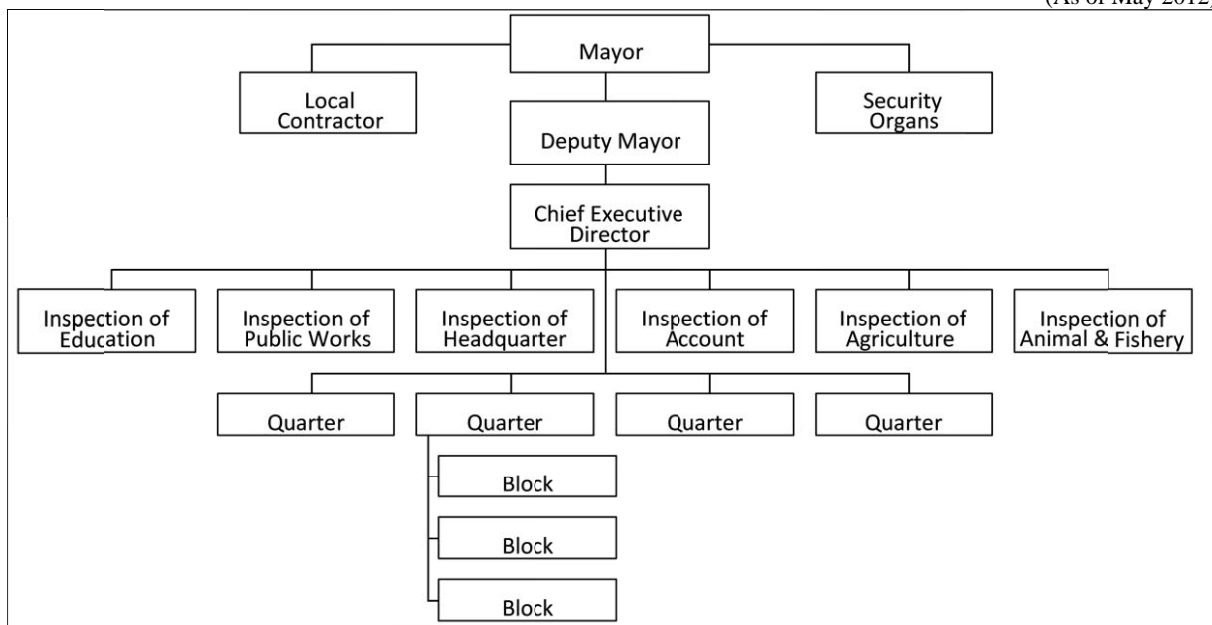
**Table 2.3-2 New Jurisdiction of Payam in Makal County and Malakal City**

(As of April 2012)

Payam	New Jurisdiction
Central Payam	Malakal City Council
Northern Payam	Malakal City Council
Southern Payam	Malakal City Council
Lalo Payam	Makal County
Ogod Payam	Makal County

Source: Malakal City Council

(As of May 2012)



Source: Malakal City Council

**Figure 2.3-2 Organisational Structure of the Malakal City Council**

#### (4) Function of Payam (Quarters) and Boma (Blocks)

There are two administrative units in Malakal City, which are traditionally called “Payam” and “Boma”. Boma is the subsidiary administrative unit under Payam, and is the smallest

administrative division. A Payam is constituted by a group of Boma. Although the labels “Payam” and “Boma” were changed to “Quarter” and “Block” respectively, they are still commonly referred to in Malakal<sup>2</sup>.

Each Payam has a “Payam (Quarter) Office” to which six administration officers are assigned by the MoLG&LE: one executive officer, one officer, and four administration staff. They are classified as staff and employed by the MoLG&LE. Other staffs working in the office are unclassified staff like bookkeepers and drivers, employed using tax revenue of Malakal City. Quarters in Malakal City have a regional court and a town bench court.

Each Boma has a Boma chief who is elected by its residents and approved by the corresponding Payam. The term of service for Boma chiefs is variable, and some Boma chiefs have served for more than 10 years. The Boma chief is supported by Boma volunteers. The usual function of a Boma leader is offering advice for solving problems and settling disputes within the community in the traditional manner. Some Boma leaders are also traditional leaders, but it has not proven to be a problem for local governments so far. The number of Boma in Malakal Town has been set to 32. The MoPI&RD is working to redefine Boma boundaries under the fixed number of Boma to meet the expansion of Malakal Town. Boma spelling varies since they are pronounced in Arabic and English.

#### **(5) Council of Traditional Authority Leaders (CoTAL)**

A significant number of studies and cases show that the integration of traditional authorities into modern government structures is an effective approach to complement weak state performance in Africa, particularly in post-conflict contexts. This is because traditional authorities are closer to their people than newly founded “state”, which makes traditional authorities well suited for the provision of basic services and the improvement of social and economic conditions at the local level. South Sudan is not an exception to such cases, which is why the Council of Traditional Leaders was formed.<sup>3</sup>

The Transitional Constitution of the ROSS stipulates that national and state levels shall provide for the establishment, composition, functions and duties of councils for traditional authority leaders. Traditional authorities shall function in accordance with the Transitional Constitution of the ROSS, the State Constitutions and the laws.

According to the Council of Traditional Authority Leaders (CoTAL) Bill of the UNS passed in 2011, each county selects three members from existing traditional authorities. The CoTAL is composed of a total of 39 members from 13 counties.

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<sup>2</sup> Considering the widespread usage of the traditional terms in the Project Area, this report uses Payam and Boma for Quarter and Block.

<sup>3</sup> See “2.3. Land Use” and “Chapter 3 PEACE BUILDING NEEDS AND IMPACT ASSESSMENT” for related information on the traditional system.



The roles of the CoTAL are:

- i) to be a forum for dialogue and a consultative body at the state level on matters regarding customs, culture, peace, co-existence and welfare of communities;
- ii) to prevent and resolve local conflicts based on customary and traditional mechanisms and intervention;
- iii) to facilitate understanding of the diversity of ethnicity in the State;
- iv) to promote and protect culture, languages, traditions and customs;
- v) to support and cooperate with the government in enforcing public policies and carrying out development projects; and
- vi) to support the government to maintain law and order.

Representatives of kingdoms are selected or appointed as members according to customary laws. In chiefdoms, however, members are selected by the paramount chief representing the county, head chiefs, and sub-chiefs. In Makal County, three members from the Shilluk people, including one woman, were selected.

The council is to be held quarterly, but will be called as the need arises.

### **2.3.2 Financial Resources of Local Governments and Administration**

#### **(1) State Budget**

In 2011, the total budget of UNS was South Sudan Pounds (SSP) 343,133,090. State revenues consisted of:

- i) block transfers from ROSS (SSP 170,562,438, 49.7%);
- ii) resources collected by the State (SSP 168,415,818, 49.1%); and
- iii) resources collected by the counties (SSP 4,154,833, 1.2%).

Transfers from ROSS to state governments can be divided into two categories: block transfers (grants) and conditional transfers (grants). The same amount is provided as block transfers to each state regardless of population and number of counties. Conditional transfers are for salaries of employees within the line Ministries and costs associated with public service provision.

Transfers to counties are undertaken in two ways: one from ROSS via the State (SSP 350,000/county) in a block transfer, and another directly from the State. Renk County received the largest transfer (total SSP 3,499,294), and Akoka County received the smallest (total SSP 722,575). The transfer to Makal County was SSP 2,788,616.

The resources collected by the State are from tax revenues (stamp duty, personal income tax (PIT)), crop marketing, and agriculture tax), non-tax revenues (marketing and sale of land, health fees, and licenses), and oil revenues. Indeed, about 90% of revenue came from oil income (2% of petroleum income is allocated to the oil production state.).

The breakdown of the 2011-12 budget spending was 61% for salaries, 10% for operations and 29% for capital expenditure. In terms of breakdown of the budget by ministry, SSP 47,233,129 (or 13.76% of the total budget) was allocated to the MoE and SSP 45,750,000 (or 13.33% of the total budget) to the MoPI&RD.

## **(2) Local Sources of Revenue within the City Council**

In accordance with Decree No.1/2012, Malakal City Council can establish the following local taxes and fees in order to collect revenue. 40% of tax revenue goes to the State Government, and the remaining provides the income of Malakal City Council.

- i) Council property tax
- ii) Council land tax
- iii) Council sales tax
- iv) User services charges
- v) License fees
- vi) Administrative fines
- vii) Royalties
- viii) Permits
- ix) Contract fees
- x) Auction fees
- xi) Any other fees and charges as may be authorised by any other laws, rules and regulations

In addition to the above local sources, about SSP 3 million per year is allocated to Malakal City as an operational cost from MoF&EP, UNS.

### **2.3.3 Existing Policies and Strategy Related to Local Administration**

#### **(1) Decentralisation**

The fundamental policy regarding local administration in ROSS is decentralisation. In the preamble of the Transitional Constitution 2011, it is stated that “We, the people of South Sudan, committed to establishing a decentralized democratic multi-party system of governance.”

Clause 36 (1) states that “all levels of government shall promote democratic principles and political pluralism, and shall be guided by the principles of decentralization and devolution of power to the people through the appropriate levels of government where they can best manage and direct their affairs”.

In addition, Clause 48 provides that the central government shall respect devolution to state and local government levels.

## **(2) Mobilisation of External Funds and Organisations**

It is vital to mobilise and utilise public financial resources and external funds for the implementation of programmes and projects where budget allocation from the central government and collected local revenue were insufficient to meet local needs. The *Upper Nile State Strategic Plan 2012-2014* provides that funds from (Non-Government Organizations) NGOs and United Nations (UN) agencies fill such critical gaps while reducing duplication among projects and programmes. The Governor's Office, UNS, is designing a programme that focuses on resource mobilisation and donor coordination to maximise resources and avoid duplication of activities by bringing all development parties together to share plans.

## **(3) Re-organisation of Administrative Bodies**

The structure of the UNS Government (including at the county level) is still in a transitional phase. Directions for the re-organisation of local administrative bodies are stated in the *County Strategic Plan 2012-2014* of Makal County as follows:

- i) construction of five Payam headquarters
- ii) extension of line ministry branches down to Payam level
- iii) equipment of Payam with qualified cadres
- iv) construction of three police stations in Ogot and Lelo Payam
- v) provision of mobility to the police force
- vi) arrangement for the conduct of elections for a local legislative council
- vii) election of customary law council

### **2.3.4 Existing Projects in the Local Administration**

The United Nations Development Programme (UNDP) funded "Support to Development Planning and Public Finance Management," conducted from 1 January 2012 to 31 December 2013. The 2012 budget for the annual work plan was about US\$ 23 million, covering technical assistance, training/workshops and equipment. The responsible bodies were the MoF&EP, National Bureau of Statistics, Local Government Board, MoLG&LE, MoPI&RD, and county administrations.

The overall objective was to support all three layers of government (national, state and county) to implement a poverty-sensitive development agenda by building capacity for evidence-based planning, budgeting, programme execution, and resource mobilisation and allocation, and to ensure sound accounting of internal and external resources.

In UNS, the United Nations Development Programme (UNDP) allocates international consultants to the MoF&EP, MoLG&LE, MoH and MoPI&RD as part of its annual work plan. The two experts allocated to the MoF&EP and the two experts allocated to the MoLG&LE supported UNS to establish its Strategic Development Plan. The Plan was authorised by the State Assembly in August 2013. UNDP also allocates one expert to the MoPI&RD, who works for the Department of Urban

Development, and one expert to the MoH, who is in charge of rehabilitation of the physical infrastructure of hospital and clinics.

### **2.3.5 Issues Related to Local Administration and Government**

Delivery of public services is a critical milestone after independence, and local government must play a leading role in this area. However, it is evident that the devolution of powers to the local government in South Sudan is very limited although it is stipulated in the Constitution. The following are issues found commonly in the local administrations and government.

#### **(1) Limited Decentralisation at Sub-State Level**

While all the legislation indicates that the Government of South Sudan intends to develop a decentralised system of governance, decentralisation has been limited to the state level. In practice only states enjoy a large degree of autonomy from ROSS. Sub-state level governments (the county and city level) are largely dependent on state governments.

In general, inconsistent regulations and lack of technical capacities at all level of public bodies in South Sudan complicate the understanding and implementation of the regulatory framework. This is due, among other factors, to a lack of resources, their remoteness, and the lack of infrastructure. States are not likely to release their autonomy of civil services and budgeting to the sub-state level.

In terms of the capacity, county-level governments are especially challenged. Given the lack of political autonomy, the longer term sustainability of sub-state governments as viable entities for service delivery is unclear.

#### **(2) Structural Reform still Underway**

Structural reforms to transform local government bodies into effective units of government are still underway and will take time. The “Local Government Act, 2009” provides little elaboration on critical responsibilities of local governments such as taxation, public administration and provision of public services, and is not fully translated in practice. Furthermore, roles and responsibilities of the different layers of local government, such as county, city council, Payam and Boma are also unclear on the ground. Additionally, local government officers are transferred frequently, without sufficient opportunity to institutionalise administrative knowledge and skills.

#### **(3) Limited Institutional Capacity for Basic Functions**

The institutional capacity of states and counties is significantly low, which hinders their ability to perform even basic functions such as tax collection and accounting. In addition, there is a lack of basic information systems, inadequate accountability, and low citizen participation.

**(4) Overstaffing**

There is a serious problem of overstaffing; government employment is perceived as a kind of welfare mechanism to absorb former Sudan People's Liberation Army (SPLA) combatants. In the absence of a comprehensive disarmament, demobilisation and reintegration programme, the incorporation of former combatants into the government payroll may help stability, but hinders allocation of already limited budgets for public service delivery. Political implications limit the ability of states and local governments to deliver civil services efficiently.

**(5) Prolonged Security Problems**

Security issues remain a very serious obstacle to local governments performing their functions. Because of insecurity, public officers do not have access to certain areas and thus cannot provide services or collect taxes in those areas. Robbery is common and detrimental to many local economies. Traditional ethnic and tribal conflicts, a high rate of unemployment and the absence of a comprehensive disarmament, demobilisation and reintegration programme contribute to this problem. Tensions between north and south are seen as a source of insecurity.

**(6) Lack of Coordination between NGOs and Public Entities**

NGOs play an important role in providing public services. At the same time, governmental officers at all levels recognised lack of coordination between NGOs and public entities. NGO representatives explained their hesitance in implementing programmes through the government given the lack of initiative and inefficiency. In this context, some donors such as UNDP are contributing to building the capacity of local governments.

**(7) Structures and Systems Contradictory to the Local Government Act**

ROSS's commitment to the principle of sub-state government entities providing key services was confirmed with the adoption of the Local Government Act enacted in March 2009. The Act, however, calls for a confusing and possibly contradictory array of structures and systems, which might undermine its decentralising intent.

The content of the Act also exceeds its scope, while providing very little elaboration on critical local government matters such as taxation, public administration and provision of public services. The Act requires commissioners or mayors to report on financial plans and expenditure to County Councils to increase opportunities for fiscal accountability.

**(8) Low Quality of Service Delivery at Sub-State Level Government**

Sub-state governments have limited de facto coordinative authority in the service deliveries. With apparent ad hoc exercise of this authority, the absence of performance standards and the lack of resources are hindering the delivery of services.

## 2.4 LAND USE

### 2.4.1 Administrative and Regulatory Framework for Land Use

#### (1) General Framework for Land Use

This section presents a general land use management system as a reference for Malakal prior to reviewing the actual land use management system adopted in Malakal Town.

The zoning system is used to manage urban land use along with other approaches for better urban land use as shown in **Table 2.4-1**.

**Table 2.4-1 Zoning System and Other Approaches for Realising Future Visions**

Approaches	Aims/Functions
1. Zoning System	<ul style="list-style-type: none"> <li>To control/promote individual land development activities/building construction through legalised regulations (Zoning Plan)</li> </ul>
2. Development/Improvement of Urban Infrastructure and Public Facilities	<ul style="list-style-type: none"> <li>To guide/stimulate individual urban activities through improving the road network, water supply system, sewerage system, schools and hospitals, and so on</li> </ul>
3. Implementation of Urban Development/Renewal Projects	<ul style="list-style-type: none"> <li>To realise future visions for development articulated in master plans, such as industrial areas, affordable housing, urban renewal for commerce/businesses and green zone and town housing, etc.</li> <li>The public sector will make efforts to activate/attract/involve the private sector (community, stakeholders, investors, etc.), as well as international donors</li> </ul>

Source: JICA Project Team

The zoning system has several components as presented in **Table 2.4-2**: (a) preparation of urban master plan; (b) formulation of a regulation plan, and (c) organisation of an everyday work system to review or inspect land development/building construction activities and examine the applications.

**Table 2.4-2 Components of Administrative Framework for Land Use Management**

General Components	Components and Role
a. Urban Master Plan	<p>Long-term Urban Development Policy and Urban Master Plan</p> <ul style="list-style-type: none"> <li>The Urban Development Policy defines future urban areas (to be urbanised in the next 10 years) and non-urban areas to be reserved/ protected for the environment, historical/cultural heritage, green area and agriculture, and future urban development resources.</li> <li>The Urban Master Plan, covering the whole urban area, states the future vision for the area, and defines the land use plan, infrastructure and public utility development plan, the development programme, etc.</li> </ul> <p>The Local Plan or Action Area Plan identifies priorities in each neighbourhood/community and planning items for the improvement in living conditions and economic activities. It is prepared for local people to understand easily.</p>
b. Regulation Plan (Zoning Plan)	<ul style="list-style-type: none"> <li>The Regulation Plan in urban areas defines codes to regulate individuals' actions relating to building/land development in small sub-areas. It is reviewed every five years.</li> </ul>
c. Everyday Work System	<p>Everyday Work System for implementing land use management</p> <p>Expected activities are:</p> <ul style="list-style-type: none"> <li>Review/inspection of applications for land development and building construction</li> <li>Permission for land development/building construction after review</li> <li>Inspection of land development/building construction after permission</li> <li>Data compilation</li> <li>Monitoring of land development/building construction</li> </ul>

Source: JICA Project Team

## **(2) Existing Frameworks for Land Management and Use**

“The Land Act, 2009” provides the legal framework for land ownership in South Sudan after independence. In addition to the stipulations in this land act, detailed information about land management in Malakal Town is summarised in the succeeding sections.

### **(a) Land Ownership**

Land in Malakal Town is privately owned. However, public land for schools, health centres, and government offices is owned by the UNS. The Malakal Airport also belongs to the UNS.

As for roads, inter-state roads including the Outer Ring Road skewing Malakal Town belong to the central government. The Ring Road and roads within Malakal Town including community roads belong to the UNS. The river port is designated as a concurrent C-type that requires both the central government and the State to discuss ownership together. The land for markets is usually privately owned.

The land area to the east of Malakal Town out to the Outer Ring Road currently belongs to the State Government after an agreement with the Shilluk people.

### **(b) Land Registration**

The land registration system in South Sudan is under the management of the Ministry of Land, Housing and Physical Planning (MOLH&PP), ROSS. If an individual encloses land with a fence in protest or to contest ownership, the validity or legitimacy of claims will be legally investigated through verification of registration documents. The government will also investigate at each level of administration.

### **(c) Government Land Control**

At present, there is no law, decree or customary law that regulates the use of privately owned land other than “The Land Act, 2009”. However, the “Upper Nile State Physical Planning and Development Regulation” is now under preparation by the State, which regulates land use in order to realise its land use plan.

Legal affairs regarding land expropriation are settled by the Commission of Land and the MOLH&PP, ROSS. Land expropriation is implemented by the MOLH&PP. Public consultations are held for large-scale land expropriation cases between the government, community or private persons. Other than the central government, only the State Government and relevant ministry have the authority to expropriate land.

**Table 2.4-3 Permissible Development**

Zone Type	Components and Roles
<b>A. Classified Use</b>	
1. Residential Zones	<ul style="list-style-type: none"> <li>Residential development is generally permitted within residential zones only. Exceptions may be allowed in other land use zones where complementary residential use does not exceed more than 20% of the gross floor area of the designated land use area. Developments of no more than 7.8 m in height may be permitted.</li> </ul>
2. Commercial Zones	<ul style="list-style-type: none"> <li>Commercial developments are generally permissible in commercial zones.</li> <li>In other land use zones where retail trading activity is allowed, developments of no more than 700 m<sup>2</sup> of space each and a maximum height of 7.7 m may be permitted. Locations are to be considered on merit but are subject to other relevant provisions of this Regulation.</li> <li>In other land use zones, informal activities such as those specified in Schedule 6 to this Regulation may be permitted at locations considered on merit.</li> </ul>
3. Industrial Zones	<ul style="list-style-type: none"> <li>Industrial developments are generally permitted in industrial zones only. Exceptions for other land use zones may be permitted for non-offensive or noisy service workshops not exceeding 650 m<sup>2</sup> gross floor area and 6 m double volume height. Locations are to be considered on merit and subject to other relevant provisions of this Regulation.</li> </ul>
4. Agricultural Zones	<ul style="list-style-type: none"> <li>Agricultural related uses are generally permitted in agricultural zones only. Exceptions for other land use zones for subsistence farming on vacant lands may be permitted for animal husbandry such as cultivation of pigs, poultry, cow and sheep. Goat rearing is not to be practiced.</li> <li>No development is allowed in agricultural zones except where the development is complementary to activities related to agriculture, farming, animal husbandry, and other conditions that are stipulated in "The Land Act, 2009" and the approval of the Land Use Plan, or the State Region Plan.</li> </ul>
5. Recreational Zones	<ul style="list-style-type: none"> <li>No development is allowed in designated recreational land except where such development is of complementary use and does not exceed 10% of the major use.</li> </ul>
6. Institutional	non offensive
<b>B. Mixed Use</b>	
	<ul style="list-style-type: none"> <li>Mixed development for residential/commercial and other approved uses may be allowed after being considered on its own merits. Maximum coverage is not to exceed 60%, and the development ratio of the designated land use to the non-designated land use must be 70% to 30%.</li> </ul>
<b>C. Special Applications</b>	
	<ul style="list-style-type: none"> <li>All special applications shall require a written application to provide planning information to the relevant authority. Planning information is required for all applications for change of use and approval as a general rule.</li> </ul>
<b>D. Other Zones</b>	
	<ul style="list-style-type: none"> <li>Developments within other zones not stated above, including conservation, forestry, etc., are to be strictly undertaken in accordance with the approved state regional land use plan and must relate to an approved scheme/layout, or planning order.</li> <li>In order to minimise dust, the minimum extent and the minimum width of plots for different classes of buildings shall be regulated according to the limits specified in this Regulation.</li> <li>Approval orders shall be issued from time to time for new schemes, layouts and urban renewal schemes.</li> </ul>

Source: "Upper Nile State Physical Planning and Development Regulation", UNS (2012 Draft)

The valuation of land to be expropriated is handled by the MoF&EP. Other organisations may also be involved in land valuation. For example, the MoCTI may be involved in commercial land cases. The MoAF may also be involved in agricultural land cases. Authorisation of master plans is given by the Council of Ministers. The laws, regulations and decrees for the implementation of the master plan are not well defined as yet.

#### **(d) Land Development**

Land development plans for the east of Malakal Town were prepared by the Town Planning



Department and Survey Department, MoPI&RD. The Land Department of the MoPI&RD sells land right titles. The Town Planning Department, Survey Department and Land Department propose land prices of new development areas to the Minister of the MoPI&RD. The proposed land prices are approved by the Council of Ministers.

Land ownership rights for the eastern side of the Ring Road are transferred at SSP 500 for third class plots (20 m x 20 m), SSP 700 for second class plots (20 m x 25 m), and SSP 1,000 for first class plots (20 m x 30 m).

**Table 2.4-4 Land Classes in Malakal Town**

	Class 1	Class 2	Class 3/4
Gross Population Density (person / ha)	100	120	150
Minimum Plot Size	20 × 30 m	20 × 25 m	20 × 20 m
Purchase Price per Plot (SSP)	1,000	700	500

Source: MoPI&RD, UNS

**(e) Residential Areas for Internally Displaced Persons**

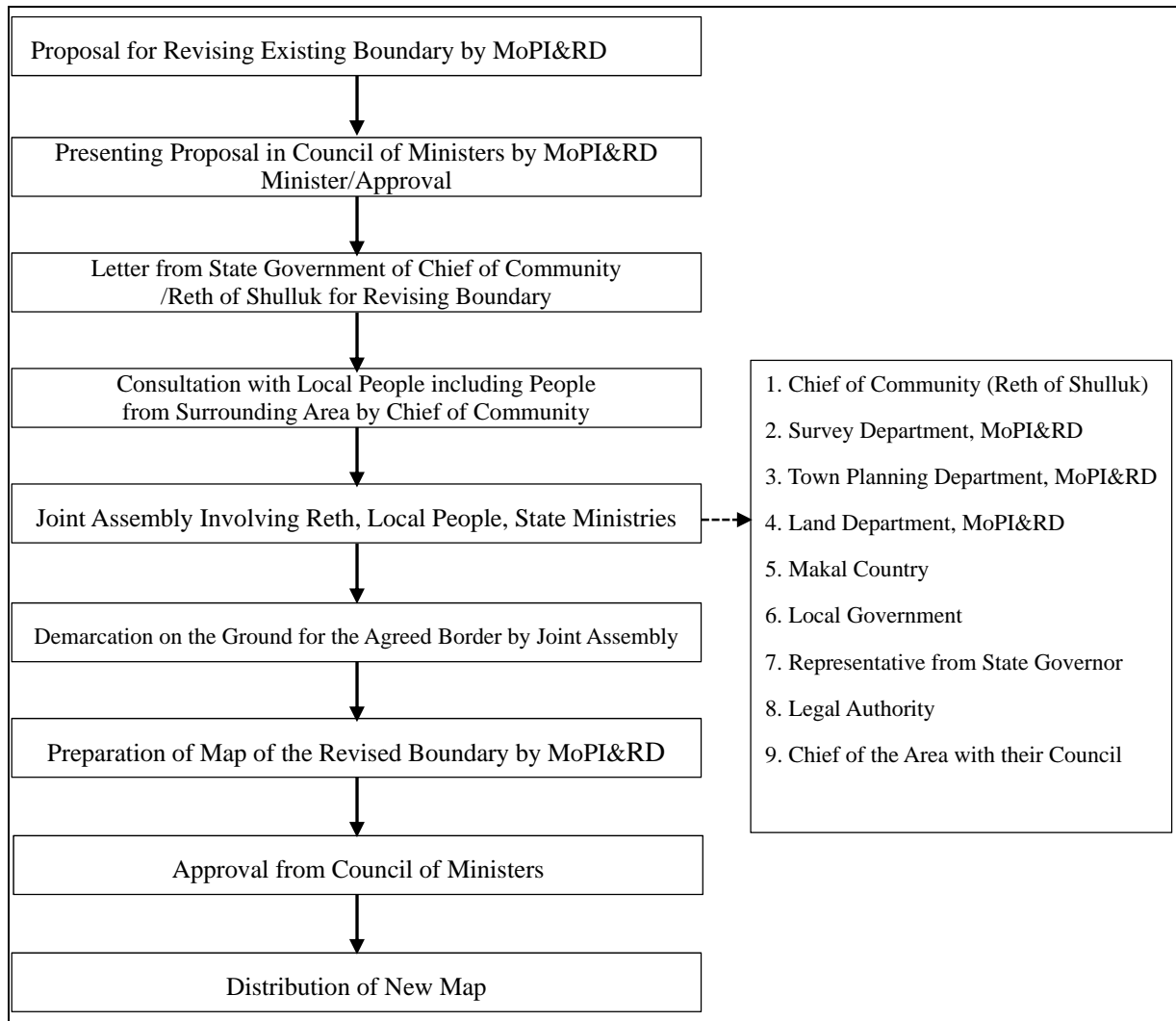
The South Sudan Government adopts a policy to provide or purchase land for IDPs. However, it is not easy to realise this policy in all states. Although the UNS agreed to provide land to IDPs, no specific measures have been taken meaning that IDPs are treated as ordinary residents.

IDPs coming to Malakal Town usually rely on their relatives and friends for support. Groups of IDPs cared for by the International Organization for Migration (IOM) are first sent to the designated point for repatriation, and then to their individual final destinations. The United Nations High Commission for Refugees (UNHCR) also provides support to IDPs in South Sudan.

Presently more than 3,000 houses (except Tukul hut) have been constructed to the east of Malakal Town beyond the Ring Road. The Permanent Land Allocation Board began issuance of registration documents for houses in the new development area in June 2012. Land ownership fees are to be paid to the Land Department, MoPI&RD. Occupants of land beyond the Ring Road where no land rights have been sold are regarded as illegal occupants. The State Government is in the process of normalisation of land ownership.

**(f) Administrative Boundaries**

The urbanisation of Malakal Town is currently underway. The administrative boundary was expanded to the east of the town after consultation with local people. The procedure for endorsement of redefinition of any administrative boundary is shown in **Figure 2.4-1**.



Source: Interview with Survey Department, MoPI&RD (July 2012)

**Figure 2.4-1 Procedure for Endorsement of Administrative Boundaries in Malakal**

The MoPI&RD will prepare a proposal for redefinition of an administrative boundary if needs arise and submit it to the Council of Ministers for approval. If the Council of Ministers approves the proposal, the State Government will submit a letter to the Chief of Community (Reth of Shilluk) to announce the decision of the Council of Ministers. The Reth of Shilluk (King) will consult with local people and call for a general assembly for intensive discussion among stakeholders. If the assembly endorses the proposal, the decision will be sent to the Council of Ministers for the final approval. After approval from the Council of Ministers, a new map will be prepared and distributed to relevant authorities.

The proposal on the new boundary of Malakal Town was approved by the Council of Ministers in 2010.

## **2.4.2 Present Land Use**

### **(1) Land Use Survey and Geographic Information Systems (GIS) Data Development**

A land use survey was conducted by the Project through fieldwork and interpretation of aerial and satellite imagery. Fieldwork was conducted by using printed satellite imagery and Global Positioning System (GPS) devices. The coordinates of major locations were noted by GPS. The land use category of each land plot was confirmed by the residents. Names of facilities were noted by confirming with local people. Local enumerators familiar with the local situation were mobilised during the field survey. The target area of the land use survey was limited to within the former administrative boundaries of Malakal Town, namely on the western side of the Ring Road.

**Figure 2.4-2** illustrates the target area in aerial and satellite images, which were taken in February 2012 and October 2011 respectively.

Topographical maps of Malakal Town and the surrounding area were prepared by digitising aerial and satellite imagery. Topographic features such as administrative boundaries, transportation facilities, buildings, water bodies, open spaces, vegetation and elevation data were compiled. Various data analyses were performed by Geographic Information Systems (GIS) to prepare several maps and plans including an existing land use map, population density map, future land use plan, social infrastructure map and future infrastructure development plan. Some social data collected for the Town Profile was also utilised in the GIS analyses. Thus, the GIS database was formulated by incorporating topographical map data, land use data (existing and future plans) and social survey data.



Source: Land Use Survey by JICA Project Team

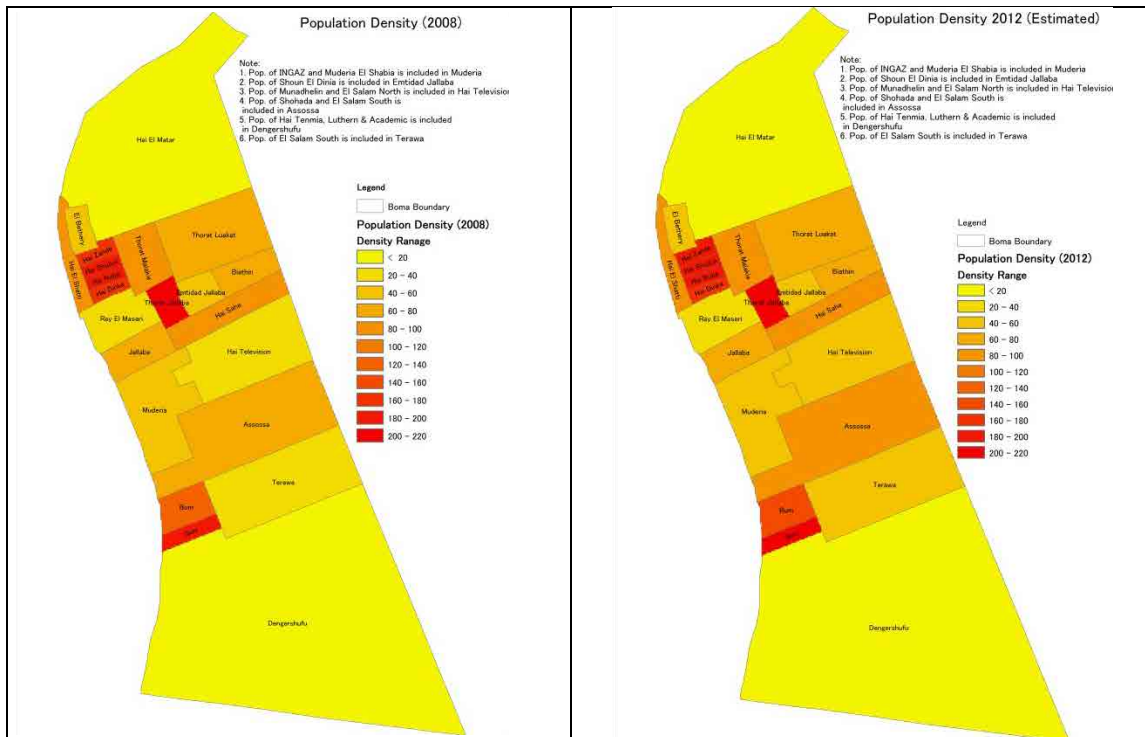
**Figure 2.4-2 Target Area for Existing Land Use Survey**

## **(2) Overview of Existing Land Use in Malakal Town**

### **(a) Administrative Structure and Population Density**

The total area of Malakal Town at the time of the survey was 3,365 ha. The town was divided into four Payam and 32 Boma. As stated earlier in Section 2.2.1 Population, according to the latest population census conducted in 2008, the total population was 114,528. The Project estimated the population as of 2012 as 153,000.

The 2008 total population was recorded by Boma; 22 Boma existed at that time, while the proposed restructuring of Malakal town referred to 32 Boma (See Table 2.2-5 Population of Malakal Town by Boma Estimated in 2012). The population density (person/ha) in 2008 and 2012 is shown in **Figure 2.4-3**. Thorat Jallaba Boma has the highest population density. Boma in Southern Payam had the lowest population density in both 2008 and 2012. It can be observed that human settlement in the central area is relatively high.



Source: (1) Population (2008): *Statistical Yearbook for South Sudan 2010*, (2) Population (2012) Estimated: JICA Project Team, (3) Administrative Boundary: Survey Department, MoPI&RD

**Figure 2.4-3 Population Density of 22 Boma**

**(b) Land Use Composition**

The existing land use composition was investigated through a field survey using satellite and aerial imagery. The existing land use map by land use category is shown in **Figure 2.4-4**. Approximately 41% of the town area is being utilised for private residential purposes whereas only 1.2% of the land is being used for public residential purposes including government residences, university hostels and residences of international organisations. Open space/undeveloped areas make up 25.2% of the total land. The share of land used for commercial and industrial purposes is about 2.5%.

The existing land use categories by Boma are shown in **Table 2.4-5**.

**(c) Land Use Patterns**

Most public and commercial services are located in Central Payam. The northern part of the town is mainly used for Malakal Airport, Upper Nile University and residential purposes.

**Table 2.4-5 Land Use Composition by Boma in 2012**

(As of August 2012)

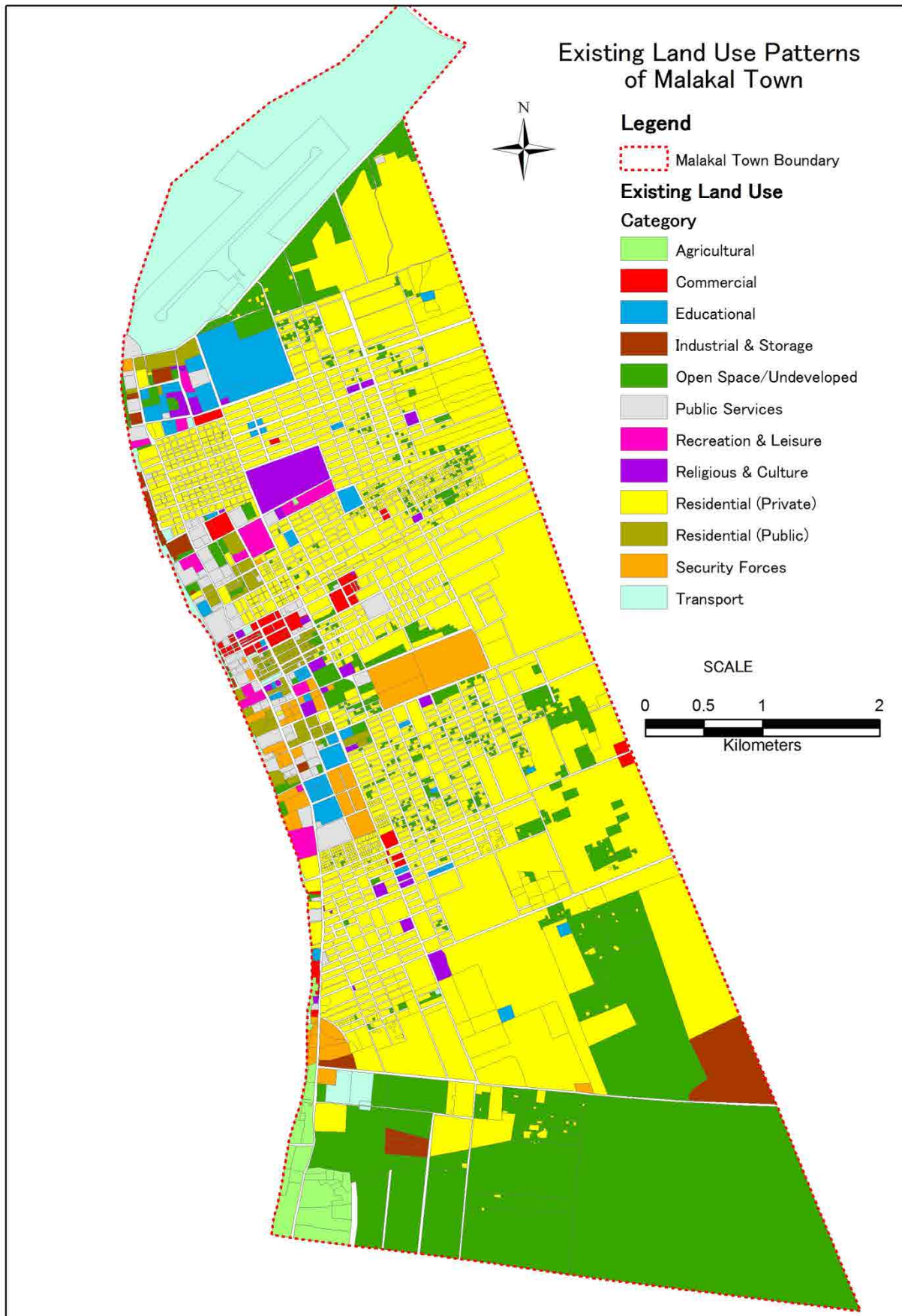
Name of Payam	Name of Boma	Area (ha)	Private Residential (ha)	Public Residential (ha)	Public Services (ha)	Commerce (ha)	Educational (ha)	Industrial & Storage (ha)	Security Forces (ha)	Religious & Culture (ha)	Recreation & Leisure (ha)	Transport (ha)	Agriculture (ha)	Open Space/ Undeveloped (ha)	Road & Tracks (ha)
Northern	El Bethery	26.81	3.06	4.60	0.31	-	6.15	1.98	-	2.52	0.97	0.44	-	2.98	3.80
	Hai El Shatti	33.31	10.62	0.41	7.20	-	-	3.89	0.88	-	0.98	2.02	-	1.62	5.68
	Hai Dinka	12.75	7.38	-	0.88	-	0.36	-	-	0.12	-	-	-	0.12	3.90
	Hai El Matar	598.80	157.43	2.79	2.59	-	42.90	-	-	2.00	1.47	300.54	-	51.38	37.71
	Hai Nuba	11.26	7.45	-	-	-	-	-	-	-	-	-	-	0.03	3.78
	Hai Shulluk	12.64	8.35	0.05	-	-	-	-	-	-	-	-	-	-	4.24
	Hai Zande	14.80	8.68	-	-	-	1.82	-	-	-	-	0.04	-	0.26	4.00
	Thorat Luakat	158.06	115.99	-	-	-	0.48	-	-	2.15	-	-	-	4.93	34.50
	Thorat Malakia	63.45	25.07	-	-	0.38	1.16	-	-	22.39	-	-	-	-	14.45
<i>Sub-Total</i>	<i>931.88</i>	<i>344.05</i>	<i>7.85</i>	<i>10.98</i>	<i>2.20</i>	<i>51.05</i>	<i>5.87</i>	<i>0.88</i>	<i>29.17</i>	<i>3.41</i>	<i>303.04</i>	-	<i>61.32</i>	<i>112.05</i>	
Central	Jallaba	53.87	16.02	-	10.13	9.46	0.22	0.22	0.13	1.00	-	1.78	-	0.95	13.96
	Muderia	144.05	12.05	21.92	19.67	-	14.21	0.85	24.32	3.31	5.44	1.40	-	13.73	27.15
	Ray El Maseri	73.29	10.81	8.87	14.29	3.47	2.22	2.95	0.27	0.63	8.87	2.89	-	6.02	12.01
	<i>Sub-Total</i>	<i>271.21</i>	<i>38.88</i>	<i>30.79</i>	<i>44.09</i>	<i>12.93</i>	<i>16.65</i>	<i>4.01</i>	<i>24.71</i>	<i>4.95</i>	<i>14.31</i>	<i>6.07</i>	-	<i>20.70</i>	<i>53.12</i>
Eastern	Biathin	42.60	29.98	-	-	-	-	-	-	-	-	-	-	4.31	8.31
	Entidad Jallaba	32.25	18.63	-	-	0.51	2.92	-	-	0.49	-	-	-	1.54	8.16
	Hai Saha	74.68	53.37	-	0.18	4.38	-	0.91	-	0.10	-	-	-	0.62	15.12
	Hai Television	192.48	123.01	-	3.31	-	-	-	35.20	1.11	-	-	-	7.24	22.61
	Thorat Jallaba	29.41	17.09	-	-	-	-	-	-	0.00	4.72	-	0.21	0.16	7.23
	<i>Sub-Total</i>	<i>371.41</i>	<i>242.08</i>	-	<i>3.49</i>	<i>4.89</i>	<i>2.92</i>	<i>0.91</i>	<i>35.20</i>	<i>1.70</i>	<i>4.72</i>	-	<i>0.21</i>	<i>13.87</i>	<i>61.43</i>
Southern	Assossa	276.04	172.90	1.92	5.54	2.46	1.85	-	3.94	1.28	3.81	0.31	-	31.87	50.16
	Bum	44.11	28.20	-	1.46	0.39	-	-	-	1.10	-	0.07	-	0.95	11.95
	Dengershufu	1,230.14	356.66	-	0.31	0.77	2.52	45.15	12.96	3.59	-	10.88	50.99	705.46	40.85
	Goni	22.21	13.17	-	0.45	0.95	0.76	-	-	0.98	-	-	0.00	-	5.90
	Terawa	218.56	173.70	-	0.11	2.30	1.50	-	-	1.14	-	-	-	15.56	24.24
	<i>Sub-Total</i>	<i>1,791.07</i>	<i>744.63</i>	<i>1.92</i>	<i>7.86</i>	<i>6.87</i>	<i>6.63</i>	<i>45.15</i>	<i>16.90</i>	<i>8.08</i>	<i>3.81</i>	<i>11.26</i>	<i>50.99</i>	<i>753.83</i>	<i>133.10</i>
<b>Total</b>		<b>3,365.57</b>	<b>1,369.64</b>	<b>40.56</b>	<b>66.42</b>	<b>26.90</b>	<b>77.26</b>	<b>55.95</b>	<b>77.69</b>	<b>43.91</b>	<b>26.25</b>	<b>320.37</b>	<b>51.20</b>	<b>849.71</b>	<b>359.70</b>

Source: Land Use Survey by JICA Project Team

Note:

1. INGAZ and Muderia El Shabia are included in Muderia Boma.
2. Munadhelin and El Salam North are included in Hai Television Boma.
3. Shoun El Dinia is included in Emtidad Jallaba.
4. Shohada and El Salam South are included in Assossa Boma.
5. Hai Tennia, Luthern & Academic are included in Dengershufu.
6. El Salam South is included in Terawa Boma.





Source: Land Use Survey by JICA Project Team (August 2012)

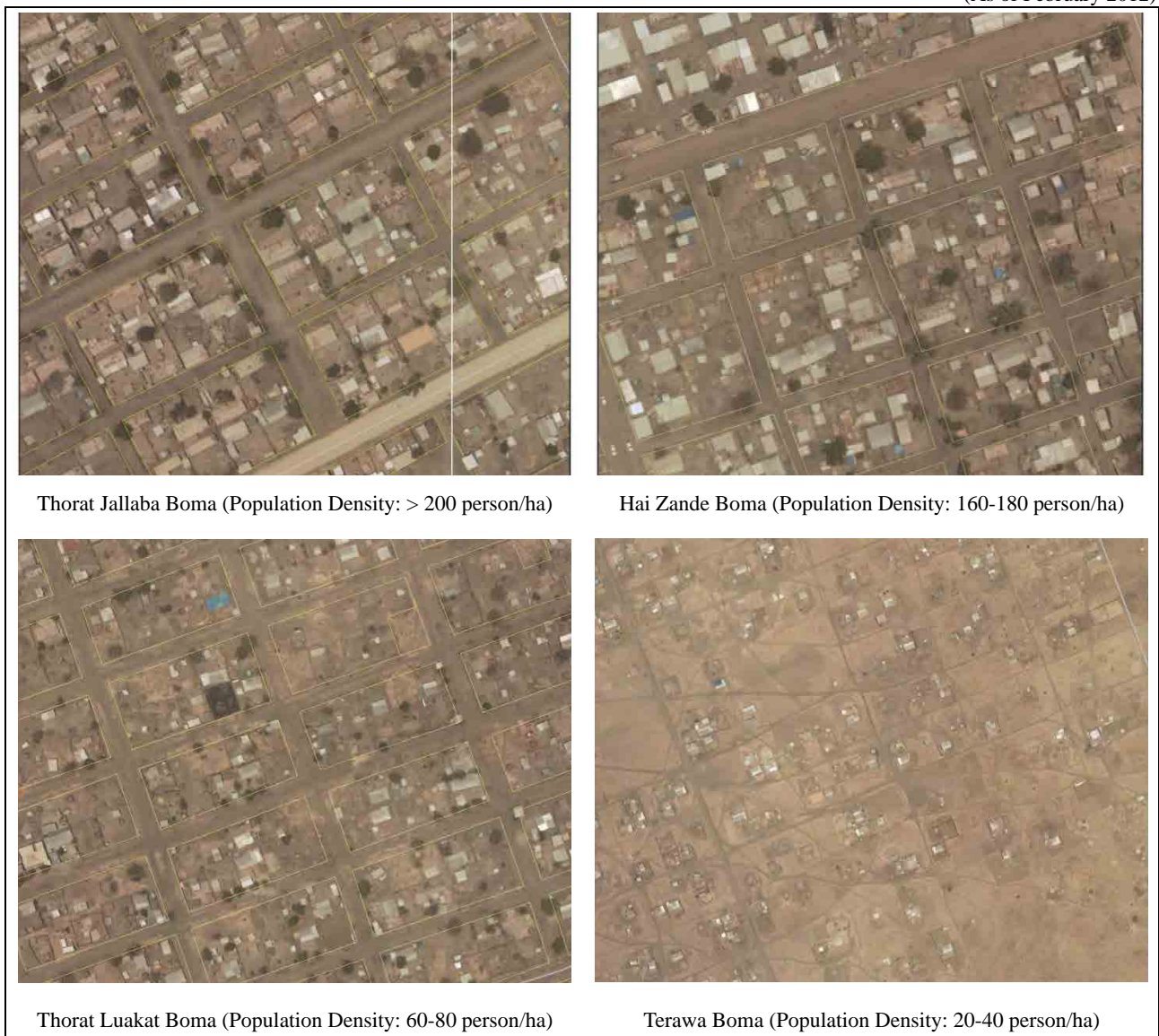
**Figure 2.4-4 Existing Land Use Composition**

The eastern side of the town (north to south) is mainly used for residential purposes (with relatively low population density). The southern part of the town still has a significant number of vacant land parcels (undeveloped). The residential area is now expanding in the southern and eastern part of the town. A very minimal number of the land parcels is being used for agriculture. These land parcels are mainly located along the Nile River.

**(d) Land Occupancy and Housing Patterns**

Land occupancy in the western part of the town is relatively high because of better accessibility to water and transport systems. Land occupancy by area is illustrated in **Figure 2.4-5**.

(As of February 2012)



Source: Aerial photographs from Topographic Survey undertaken by JICA Project Team

**Figure 2.4-5 Housing Patterns by Population Density**

The images used for illustrating current land occupancy patterns are recent aerial photographs taken in April 2012. Land parcels in the town are developed in a grid pattern. However, the housing





### **2.4.3 Existing Land Use and Planning Issues**

The following issues were identified after analysing the present condition of land use and planning processes. These issues mainly concern land use development without consideration to the social and economic infrastructure in Malakal Town.

#### **(1) Insufficient Land Provision for IDPs**

A large number of IDPs have been returning to Malakal. Due to a lack of proper land provisions, some of them are living together with their relatives, some are living in UNHCR camps, and some are living as ordinary people (without any special support from the Government or agencies). One year has passed since South Sudan gained independence and the issue of IDPs must be settled as early as possible to enable IDPs to return to normal living environments.

#### **(2) Arbitrary Settlement**

In the absence of proper land management, arbitrary settlement has developed within and in surrounding areas of Malakal Town. This issue needs to be addressed as early as possible otherwise it will become more difficult to solve in the future.

#### **(3) Lack of Methodology for Controlling Construction Activities**

Despite the preparation of “Upper Nile State Physical Planning and Development Regulation, 2012”, no actual zoning system was established, and no enforcement power for building activity control has been formulated as yet. Due to this lack of strict control of construction activities, many buildings have been built haphazardly, which will eventually affect land use management in the future.

#### **(4) Housing Development without Social Infrastructure to the East of the Ring Road**

Housing development east of the Ring Road has begun. Houses in this area are increasing in number without any legal guidance or restrictions and infrastructure planning. No road network has been developed in this area even though a significant number of houses has already been built.

#### **(5) Immature Land Market Management**

Since the Department of Town Planning and Department of Survey, MoPI&RD prepared the Land Development Plan and the Council of Ministers approved land prices, the land market in Malakal and surrounding areas is expected to increase gradually. Land market management (setting land prices and selling land right titles) remains basic in Malakal Town.

#### **(6) Insufficient Budget Allocation (Funding) for the Development of Social Infrastructure**

Social infrastructure such as roads, water supply, sewerage systems and electricity are indispensable to sustainable urban land development. Insufficient budget was allocated for the development of social infrastructure in the new land development area. This infrastructure was not integrated into land development and planning from the beginning.

**(7) Administrative Boundary**

The extension of the Malakal Town area continues. The direction in and extent to which administrative boundaries will change has not been confirmed. Although the expansion to the north and south along the Nile River is popularly practiced, such expansion is not practical or expected because of land custody issues.

## **CHAPTER 3 PEACEBUILDING NEEDS AND IMPACT ASSESSMENT (PNA)**

This chapter presents findings of the Peacebuilding Needs and Impact Assessment (PNA), which covers ethnic diversity, repatriation and resettlement, land ownership, and land mines. The chapter also presents issues to be noted as conflict prevention measures: resettlement and infrastructure, ownership and utilisation of land, and livelihood and employment.

### **3.1 INTRODUCTION OF JICA PEACEBUILDING NEEDS AND IMPACT ASSESSMENT**

The Peacebuilding Needs and Impact Assessment (PNA) is a tool developed by JICA in 2010–2011 for design, monitoring and evaluation of JICA projects and programmes in post-conflict situations. The objectives of the PNA are (i) to analyse the situation of the target area from security, social, political, economic and administrative viewpoints, (ii) to identify factors that may affect the project and vice versa, and (iii) to design JICA's intervention in a way that maximises good and/or does no harm in post-conflict situations. Considering the whole situation surrounding the project area, the PNA was carried out as an integral activity of the Project. Findings of the PNA and its implications for implementation of development projects are presented as well.

### **3.2 PEOPLE AND ETHNICITY**

#### **3.2.1 Ethnic Distribution of UNS**

The Dinka, Nuer and Shilluk are the three main ethnic groups of South Sudan. In Upper Nile State (UNS), the Dinka people live in Bailet County, Akoka County, Melout County and Renk County; the Nuer people live in Nassir County, Ulang County (Jikany Nuer), Longochuk County and Maiwut County (Gajaak Nuer); while the Shilluk people live in Panyikang County, Fashoda County and Manyo County.

Some ethnic groups, such as Shilluk, live under “kingdoms” represented by a King who is neither administratively nor politically recognised under the current constitution, yet still retains influence over the people.<sup>1</sup>

There have been numerous ethnic conflicts involving land ownership in UNS and its surrounding areas. In the Frangak District bordering the states of Upper Nile and Jonglei, the Padang Dinka (a group in the Dinka) and the Shilluk continue to fight over the former border from the Sudanese era and the new state boundary set after the Comprehensive Peace Agreement (CPA). Within UNS, intertribal land disputes continue in the counties of Fashoda and Akoka, Makal (Malakal) and Bailet, Panikang and Bailet.

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<sup>1</sup> See “2.3 Administrative Framework”, and “2.4 Land Use”, in Chapter 2 for integration of traditional systems into the current political and administrative system.

### **3.2.2 Ethnic Distribution of Malakal Town**

According to the Household Survey,<sup>2</sup> a component of the Town Profile Survey conducted by the Project Team, Malakal Town is inhabited by Shilluk, Nuer, Dinka and others ethnic groups such as Anuak, Nuba, Maban, and Ethiopians.

The aggregated data for the “Ethnic Balance of Boma” revealed that the Shilluk people formed the majority of residents in all Boma, except in Jallaba and Muderia. Hai Saha Boma had the highest concentration of Shilluk while Muderia Boma had the lowest concentration. Several ethnic groups co-existed in all Boma, and no specific group dominated a particular Boma. 72.4% of households surveyed replied that “other ethnic group members also live” within their residing Boma. The interviews also confirmed that “the residents live with other tribal and ethnic groups”, “many marry with someone from another ethnic group”, and “there are no particular problems with living with other ethnic groups”.

As for security problems in various Boma, conflicts were generated by factors such as land problems, business problems or differences of opinion. In Malakal Town, the Dinka and Shilluk both claim ownership of land and the two tribes collided during the CPA commemorative ceremony in 2009. There have been no major incidents of violence since then, however the situation needs to be monitored due to the possibility of this conflict turning into a factor of instability.

### **3.2.3 Returnees in Upper Nile State**

According to the International Organization for Migration (IOM), around 2 million South Sudanese have returned home since February 2007. The number of returnees reached its peak at around 450,000 in 2009 and was about 420,000 in 2010.

Repatriation from Sudan was through two methods: (i) “organised return” set up by IOM and the South Sudan Relief and Rehabilitation Commission (SSRRC), and (ii) “voluntary return” on an individual basis. The returnees under the “organised return” system registered in Khartoum and Kosti in Sudan and were given ID cards. Modes of transport used for the trip back to their home villages were barges and boats on rivers, buses or trucks on roads, and planes. Way stations and transit sites were set up on major repatriation routes within the country.

There are several views on the future number of returnees. Some estimated that it had peaked and others speculated that repatriation would continue. A United Nations agency estimated that around 700,000 South Sudanese still live in Sudan. The timeframe for remaining there was still an unknown issue.

In the case of UNS, as of May 2012, there were 88,761 SSRRC registered returnees, of which 16,862 had returned to Malakal Town. However, it was difficult to track down exactly where the returnees had gone and where they had settled. By September 2013, 94,425 persons were

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<sup>2</sup> Survey was conducted by Participatory Development Centre (PDC) on 889 households.

registered as returnees, which made UNS seventh among ten states in terms of the number of returnees.

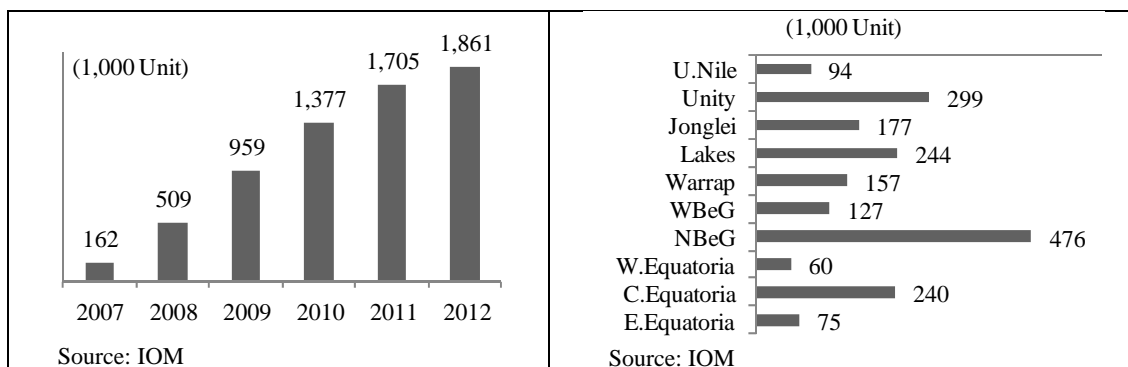


Figure 3.2-1 Number of Returnees to South Sudan

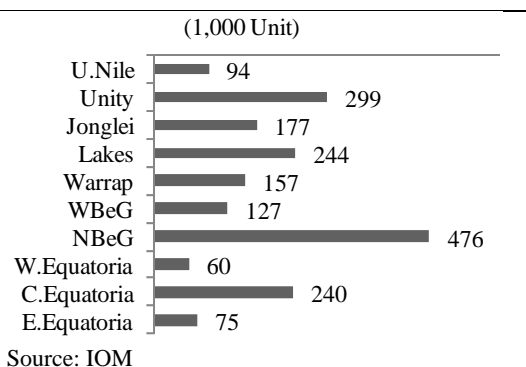


Figure 3.2-2 Number of Returnees by State (February 2007 – September 2013)

### 3.2.4 Repatriation and Resettlement in Malakal

In Malakal Town, 48,083 persons were registered as returnees between 2009 and September 2013. Because of the highly fluid situation, it was difficult to track down the final destination of the returnees.

Table 3.2-1 Population of Makal County and Returnees

No.	Payam (Quarter)	Population 2013	Returns 2009–2012	Returns 2013	Returns 2009–Sept. 2013
1	Central (+Eastern)	54,123	42,777	2,112	48,083
2	Northern	44,351		1,426	
3	Southern	63,892		1,768	
4	Lelo	25,757		0	
5	Ogot	28,098		0	
	Total	216,221		5,306	

Source: Makal County via SSRRC

The Household Survey under the Project revealed the profile of the returnees and Internally Displaced Persons (IDPs) in the Project Area: 16.9% of the surveyed were returnees from Sudan, 13.1% were IDPs, 7.4% were returnees from countries other than Sudan, 2.9% identified themselves as refugees at the time of the survey, while 59.7% were “original residents” who had resided in Malakal Town over a period of time.

In terms of areas of residence, 47.1% answered that they were natives of Malakal Town, while “other places” were the majority at 52.9%. Those who replied “other places” were asked further questions about where they had lived previously, and the breakdown was found as follows: “UNS, but not Makal County” 36.7%, “Khartoum” 25.3%, “Makal County, but not Malakal Town” 18.7%, “Ethiopia” 8.9%, “South Sudan, but not UNS” 6.3%, “Sudan, but not Khartoum” 2.6%, and “Kenya” 1.5%. “UNS, but not Makal County” was the highest percentage at 36.7%. This could be explained by migration from rural areas to Malakal Town within UNS. The factors contributing to the current population growth in Malakal Town were not only repatriation and resettlement of returnees from Sudan and other countries, but it seems also an increase in the number of migrants

from rural farming areas to the city.

As to the number of years of residence in Malakal Town, 42.2% lived there for “more than five years” and 57.8% lived there for “less than five years”. In some Boma, the majority of residents had lived there for less than five years: 50.1% in Hai El Shatti and 52.0% in Hai Zande in the Northern Payam, 59.3% in Muderia in the Central Payam, 64.4% in Dengershufu in the Southern Payam, and 92.9% in the east of the Ring Road of the Ring Road. Analysis of the tribal groups among the residents who have lived in Malakal Town for more than five years is as follows: Shilluk 61.7%, Dinka 58.1%, and Nuer 42.7%. In the current population of Malakal Town, the Nuer account for 23.3% and the Dinka 15.4%. The Nuer people are considered to be the most recent residents of Malakal Town.

**Table 3.2-2 Length of Stay of Residents by Boma**

(As at January 2013)

Boma name (Payam)	No. of Samples	Length of Stay by Boma (%)										
		< 1 yr	1-2 yrs.	2-5 yrs.	5-10 yrs.	10-20 yrs.	>20 yrs.	No answer	Total	>5 yrs.	<5 yrs.	Total
1 Hai El Matar	55	1.8	12.7	25.5	34.5	20.0	5.5	0.0	100.0	40.0	60.0	100.0
2 Hai El Shatti	38	5.3	13.2	31.6	13.2	15.8	18.4	2.6	100.0	50.0	50.0	100.0
3 El Bethery	25	0.0	28.0	20.0	12.0	8.0	20.0	12.0	100.0	48.0	52.0	100.0
4 Hai Zande	25	8.0	16.0	28.0	12.0	12.0	24.0	0.0	100.0	52.0	48.0	100.0
5 Hai Shilluk	27	11.1	18.5	11.1	11.1	18.5	29.6	0.0	100.0	40.7	59.3	100.0
6 Hai Nuba	25	0.0	16.0	8.0	16.0	8.0	52.0	0.0	100.0	24.0	76.0	100.0
7 Hai Dinka	31	16.1	9.7	12.9	9.7	16.1	35.5	0.0	100.0	38.7	61.3	100.0
8 Thorat Malakia	54	5.6	20.4	18.5	14.8	11.1	29.6	0.0	100.0	44.4	55.6	100.0
9 Thorat Luakat	33	9.1	15.2	21.2	6.1	12.1	36.4	0.0	100.0	45.5	54.5	100.0
Northern Payam Sub-total	313	6.3	16.6	19.6	14.4	13.5	27.9	1.6	100.0	42.6	57.4	100.0
10 Ray El Maseri	41	9.8	7.3	29.3	24.4	9.8	19.5	0.0	100.0	46.3	53.7	100.0
11 Jallaba	37	0.0	5.4	21.6	37.8	5.4	29.7	0.0	100.0	27.0	73.0	100.0
12 Muderia	54	3.7	35.2	20.4	27.8	7.4	5.6	0.0	100.0	59.3	40.7	100.0
Central Payam Sub-total	132	4.5	16.0	23.8	30.0	7.5	18.3	0.0	100.0	44.2	55.8	100.0
13 Assosa	55	3.6	14.5	12.7	30.9	10.9	27.3	0.0	100.0	30.9	69.1	100.0
14 Bum	35	8.6	11.4	20.0	22.9	8.6	28.6	0.0	100.0	40.0	60.0	100.0
15 Goni	25	0.0	16.0	4.0	20.0	28.0	32.0	0.0	100.0	20.0	80.0	100.0
16 Dangershufu	87	10.3	17.2	36.8	23.0	4.6	8.0	0.0	100.0	64.4	35.6	100.0
17 Terawa	38	10.5	18.4	15.8	31.6	10.5	13.2	0.0	100.0	44.7	55.3	100.0
Southern Payam Sub-total	240	6.6	15.5	17.9	25.7	12.5	21.8	0.0	100.0	40.0	60.0	100.0
18 Thorat Jallaba	29	0.0	10.3	34.5	13.8	17.2	24.1	0.0	100.0	44.8	55.2	100.0
19 Emtidad Jallaba	35	8.6	11.4	8.6	8.6	8.6	42.9	11.4	100.0	28.6	71.4	100.0
20 Biathin	25	4.0	8.0	20.0	48.0	16.0	4.0	0.0	100.0	32.0	68.0	100.0
21 Hai Saha	25	0.0	4.0	12.0	32.0	12.0	40.0	0.0	100.0	16.0	84.0	100.0
22 Hai Television	65	4.6	12.3	24.6	18.5	10.8	29.2	0.0	100.0	41.5	58.5	100.0
23 East of the Ring Road	25	16.0	48.0	28.0	8.0	0.0	0.0	0.0	100.0	92.0	8.0	100.0
Eastern Payam Sub Total	204	5.5	15.7	21.3	21.5	10.8	23.4	1.9	100.0	42.5	57.5	100.0
G. Total/Average	889	5.7	15.9	20.6	22.9	11.1	22.8	0.9	100.0	42.3	57.7	100.0

Source: Town Profile Survey by JICA Project Team

### **3.2.5 Land Ownership**

During the Sudanese era, Malakal Town was divided into two areas, one which was classified as residential and the other as industrial area by the urban planning framework. Despite this, after the civil war people built temporary houses in whichever vacant land they could find to the east of the Ring Road of Malakal Town. Thus, the Malakal Town area has expanded beyond the urban planning framework.

According to the Household Survey, residents who owned land in Malakal Town accounted for 68.9% of those surveyed. However, according to the State Ministry of Physical Infrastructure and Rural Development, UNS (MoPI&RD), land ownership remains a confusing issue and data is inaccurate since there are large numbers of people who have settled without going through any official procedures. For example, some people have not registered their land even after living there for over 30 years. Furthermore, boundaries between properties are not determined accurately, and some plots of land are registered under multiple owners. Land ownership remains unstable in a considerable area of Malakal Town.

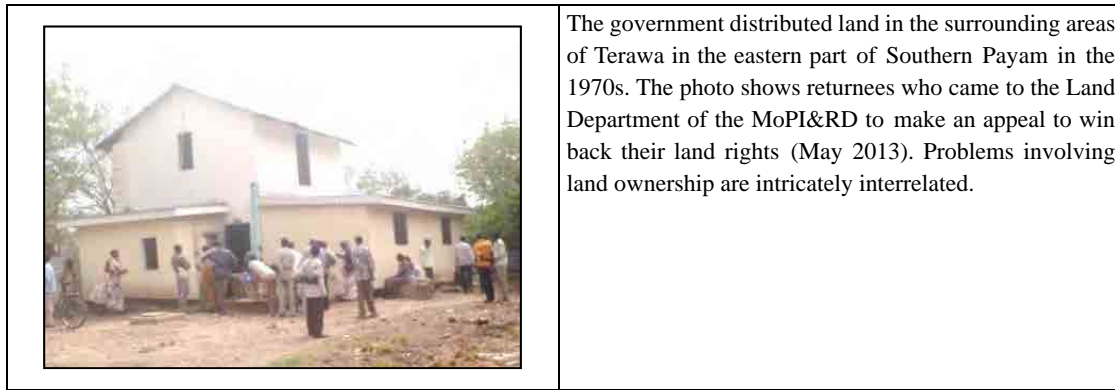
For some time now, returnees and migrants from rural farming areas have been settling in vacant areas on the east side of the Ring Road without officially obtaining land rights. As the area is commonly considered a squatter settlement, the MoPI&RD assigns land titles to those who have built houses with solid materials if they pay the required fees.

In order to respond to the needs of an increasing population, the MoPI&RD negotiated with the Shilluk authority to expand the boundary of Malakal Town to the Outer Ring Road. The MoPI&RD was granted authorisation for land rezoning work. By December 2012, the Town Planning Department and the Survey Department of the MoPI&RD had surveyed the new land site located to the east of the Ring Road, Naivasha Phase I and Naivasha Phase II. All the plots for 1,000 households were sold.

In early 2013, the survey work for new land development was suspended due to austerity measures imposed by the government due to the border closure with Sudan, but recuperation of public funds is now expected as the sale of oil resumed in May 2013. More survey work is expected in 2014. More than 5,000 households, who are currently renting rooms from their relatives, are waiting for the development of plots.

Another issue for the MoPI&RD involves the relocation of illegal residents in the area of Terawa in the Southern Payam. There are cases of returnees who obtained land in Terawa during a period of land distribution in the 1970s. Many people returned from Khartoum, where they had moved during the civil war, to find that someone else was living on their land, resulting in conflict with the new resident. The MoPI&RD is taking steps to provide alternative land for the squatting residents.



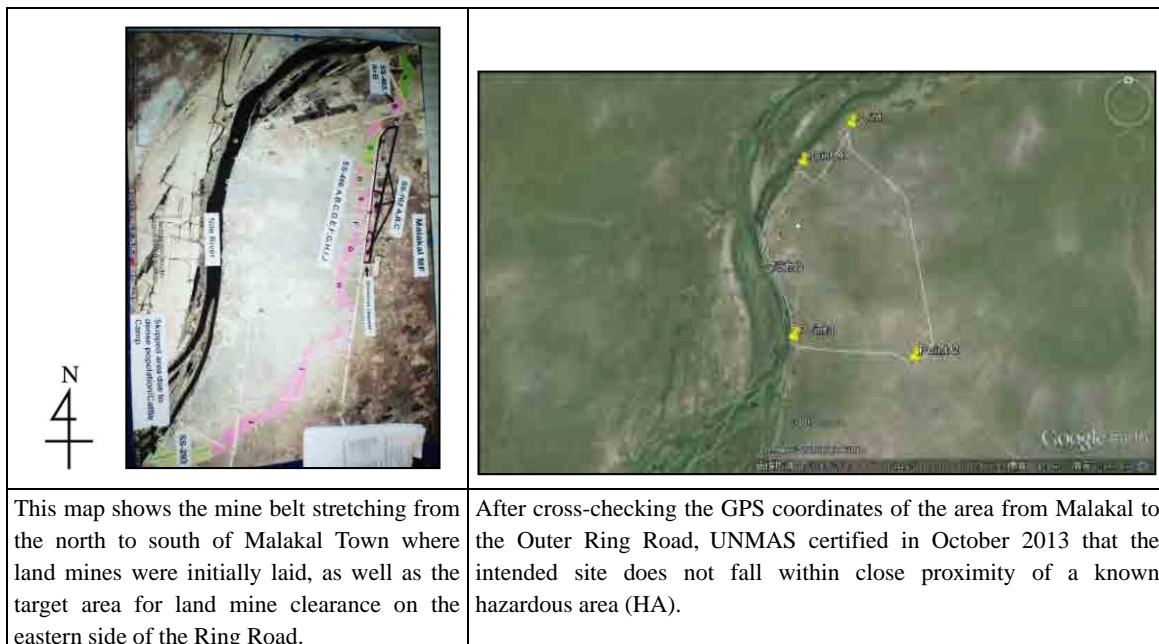


**Photo 3.2-1 Returnees’ Struggle to Win Back Land Ownership**

### 3.2.6 Land Mines

Since the start of operations of the United Nations Mine Action Service (UNMAS) to clear land mines and buried unexploded bombs in 2006 until 2010, 3,000 landmines were cleared in and around Malakal. These included the landmines laid in the vicinity of Malakal Town parallel to the Nile River over a span of 14 km. As a number of returnees began to settle to the east of the Ring Road<sup>3</sup>, the governor of UNS called for action and an operation took place to clear the land mines from that area.

According to UNMAS, they have not found any land mines or other explosive items around the Malakal Town area since the last demining activities. However, when returnees began to settle in the area, people who came across land mines started removing and discarding them further inland instead of destroying them. UNMAS warns there is still a possibility that land mines exist outside the settled zones and one must be careful when entering uninhabited areas.



**Photo 3.2-2 Land Mine Clearance**

**Photo 3.2-3 Mine Clearance Confirmation**

<sup>3</sup> This area is called Eastern Block of the Ring Road sometimes.

### **3.3 CONFLICT PREVENTION MEASURES - UTILISATION OF THE PEACEBUILDING NEEDS AND IMPACT ASSESSMENT**

With the signing of the CPA in May 2004, extensive reconstruction works have been implemented at a rapid pace. However, as the majority of such works were concentrated in Juba, there has been a widening gap in terms of reconstruction between Juba and other areas. Furthermore the massive repatriation and resettlement of IDPs from Sudan and other countries, which began around the time of the referendum vote in 2009, has become another agenda item of the newly independent South Sudan, especially given that this issue requires a quick and appropriate response.

The following sections present issues that should be noted before and during implementation of development projects that have been extracted from the PNA and other surveys conducted by the Project. The main objective of the following presentation is to ensure that future projects will not provoke unrest or cause any further conflict (conflict prevention, do no harm), and actively minimise/eliminate potential conflict factors to promote peace wherever possible. The issues are categorised into three perspectives: (i) resettlement and infrastructure improvements, (ii) ownership and utilisation of land, and (iii) livelihood and employment. Needless to say, such issues in most post-conflict situations are related and interwoven, making it impossible to single out one particular issue and clearly show an immediate solution. Therefore, it is strongly recommended that projects are examined from several perspectives, such as the three identified.

#### **3.3.1 Resettlement and Infrastructure Improvements**

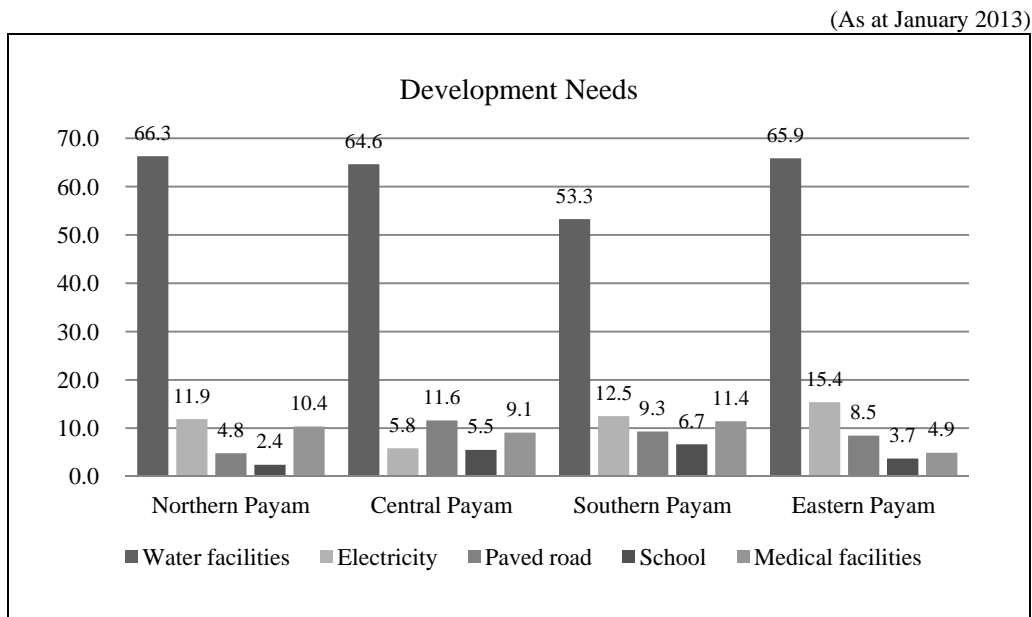
##### **(1) Infrastructure for Basic Human Needs**

According to the survey conducted by the Project Team, water (62.5% of respondents), electricity (11.4%), medical facilities (8.9%), paved roads (8.6%), and schools (4.6%) accounted for the top five “biggest needs for the Boma”. The results indicated an urgent need for basic infrastructure development to encourage resettlement of returnees.

In the Northern and Central Payam, there is evidence of infrastructure projects such as water systems, power stations, distribution lines, and paved roads carried out under the Republic of the Sudan. Because of the incidence of conflict over a long period, this infrastructure has deteriorated and is now obsolete. Furthermore, basic infrastructure and services hardly exist in the newly expanded areas, particularly in the Eastern and Southern Payam near the Ring Road, where returnees and immigrants from rural areas have settled in rapidly. According to the residents there, they have to fetch water from the Nile River, which is 2 km away from their residential area. Schools and health facilities are only located in the western part of Malakal Town.

The survey also showed that people who live in the newly expanded areas are economically vulnerable, and development is necessary in order to avoid further deterioration in the lives of the poor majority.

As for “access to water”, the level of need varied between Payam, from 66.3% to 53.3%. It is of interest that the Northern Payam showed the highest percentage, although it is located relatively close to the Nile River. People explained that water had been available during the Sudanese days via a piped water system, and that most of the local women in Northern Payam had never needed to fetch water from the river. However, deterioration of the water system is now forcing the residents to fetch the water for the Northern Payam, which explains why “access to water” is mentioned as the highest need.



Source: Town Profile Survey by the Project Team

**Figure 3.3-1 Five Highest Development Needs**

In the Boma analysis of “access to water”, the East of the Ring Road in the Eastern Payam showed the highest need at 96%, while Terawa in the Southern Payam had the lowest need at 53.3%. The East of the Ring Road shows a higher requirement for “access to water” as it is located further than 2 km from the Nile River.

In the case of Terawa, it is speculated that even though “access to water” is still needed, due to the location of the Boma, which is relatively close to the Nile River, the residents consider electricity and paved roads to be a higher priority.

**Table 3.3-1 Biggest Development Needs in Boma**

(As at January 2013)

Boma (Payam)		Development Needs by Boma (%)										
		No. of samples	Water facilities (%)	Electricity (%)	Paved road (%)	School (%)	Medical facilities (%)	Shops (%)	Religious facilities (%)	Others (%)	N.A (%)	Total (%)
1	Hai El Matar	55	69.1	16.4	1.8	5.5	7.3	0.0	0.0	0.0	0.0	100.0
2	Hai El Shatti	38	47.4	21.1	0.0	7.9	21.1	0.0	0.0	0.0	2.6	100.0
3	El Bethery	25	48.0	20.0	12.0	0.0	12.0	0.0	0.0	0.0	8.0	100.0
4	Hai Zande	25	68.0	8.0	4.0	0.0	8.0	0.0	8.0	0.0	4.0	100.0
5	Hai Shilluk	27	63.0	18.5	3.7	3.7	7.4	0.0	3.7	0.0	0.0	100.0
6	Hai Nuba	25	80.0	0.0	4.0	0.0	8.0	0.0	0.0	8.0	0.0	100.0
7	Hai Dinka	31	64.5	16.1	12.9	0.0	6.5	0.0	0.0	0.0	0.0	100.0
8	Sora Malakia	54	87.0	3.7	1.9	1.9	1.9	0.0	0.0	0.0	3.7	100.0
9	Thorat Luakat	33	69.7	3.0	3.0	3.0	21.2	0.0	0.0	0.0	0.0	100.0
Northern Payam Sub-total		313	66.3	11.9	4.8	2.4	10.4	0.0	1.3	0.9	2.0	100.0
10	Ray El Maseri	41	61.0	4.9	14.6	7.3	9.8	0.0	0.0	2.4	0.0	100.0
11	Jalaba	37	81.1	10.8	5.4	0.0	2.7	0.0	0.0	0.0	0.0	100.0
12	Muderia	54	51.9	1.9	14.8	9.3	14.8	0.0	0.0	7.4	0.0	100.0
Central Payam Sub-total		132	64.6	5.8	11.6	5.5	9.1	0.0	0.0	3.3	0.0	100.0
13	Assosa	55	49.1	7.3	14.5	3.6	10.9	0.0	0.0	14.5	0.0	100.0
14	Bum	35	42.9	5.7	5.7	17.1	25.7	0.0	0.0	0.0	2.9	100.0
15	Goni	25	76.0	16.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
16	Dangershufu	87	56.3	4.6	0.0	12.6	12.6	0.0	0.0	2.3	11.5	100.0
17	Terawa	38	42.1	28.9	18.4	0.0	7.9	0.0	0.0	0.0	2.6	100.0
Southern Payam Sub-total		240	53.3	12.5	9.3	6.7	11.4	0.0	0.0	3.4	3.4	100.0
18	Thorat Jallaba	29	51.7	48.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
19	Emtidad Jallaba	35	60.0	8.6	20.0	5.7	5.7	0.0	0.0	0.0	0.0	100.0
20	Biathin	25	80.0	8.0	4.0	4.0	4.0	0.0	0.0	0.0	0.0	100.0
21	Hai Saha	25	52.0	12.0	16.0	4.0	12.0	0.0	0.0	0.0	4.0	100.0
22	Hai Television	65	55.4	15.4	10.8	4.6	7.7	0.0	0.0	4.6	1.5	100.0
23	East of the Ring Road	25	96.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	100.0
Eastern Payam Sub-total		204	65.9	15.4	8.5	3.7	4.9	0.0	0.0	0.8	0.9	100.0
G Total/Average		889	62.5	11.4	8.6	4.6	8.9	0.0	0.3	2.1	1.6	100.0

Source: Town Profile Survey by the Project Team

In order to respond to population increases, the MoPI&RD has started a new land development project in the East of the Ring Road and Southern Payam, however they are concerned about the lack of infrastructure in the new plots.

The urban infrastructure development should be given a high priority to respond to basic human needs (BHN). There is a risk that unfulfilled BHN in the daily lives of returnees who have returned to their motherland full of hope may become a source of discontent towards the government. Access to a water supply, which is the most important of all the BHN, together with improvement of sanitary conditions should be the highest priority.

Furthermore, from the perspective of building a new nation, accommodating BHN will contribute positively towards building a relationship between the government and its citizens, including all the returnees.

## **(2) Cohesion of People**

According to research on security issues within communities, 66.1% answered, “there is no problem with security in my community”. Among the 33.9% who answered that “there is a problem”, 49.3% reported theft, 22.3% had problems with land ownership, 12.2% with extortion, 9.4% had been persuaded to join the army, 4.3% had ethnic problems, 1.4% had intertribal disputes, and 1.1% had business problems.

Different ethnic groups co-exist in Malakal Town, and it appears that relations between ethnic groups are relatively stable. However, since these groups are not completely free from inter-community rivalry, it will be necessary to make an effort to further strengthen communities and to promote co-existence among ethnic groups.

The Emergency Community Road Project implemented by JICA in 2012 is a good example of how people worked together to strengthen community awareness in their respective communities. The participants of the project confirmed they worked perfectly well together towards a common objective despite their different tribal and ethnic backgrounds.

Community projects are useful to help consolidate the co-existence of local people. On a larger scale, Malakal Town is encouraged to promote cultural activities and organise mass sporting events to promote the peaceful co-existence of different ethnic and tribal groups. Cultural events serve to promote local heritage and foster a culture of respect and understanding among different ethnic and tribal groups. Sport is also considered to be a driving force in achieving development and national peacebuilding. It would be ideal to establish a Cultural Centre as a symbol of Malakal Town to hold cultural events. If this is not possible, then the open space or the stadium located in the centre of Malakal Town would be useful for such events.

### **3.3.2 Ownership and Utilisation of Land**

#### **(1) Introduction of Statutory Law for Land Management**

Although statutory law was applied in Malakal Town under the jurisdiction of the Sudanese Government, 98% of the population of southern Sudan lived in rural farming areas and a joint land ownership scheme based on customary law continued to be practiced. As a measure to move away from the previous land management scheme, a historical statutory land management scheme to replace customary law was introduced when the CPA was signed. Following the CPA, “The Land Act, 2009” formulated by the South Sudan Land Commission (SSLC) (which commenced in 2006) was approved by the Parliament in 2009. In formulating policies for implementing “The Land Act, 2009”, SSLC held discussions in all ten states in 2010, and the policies was drafted in 2013.

The main characteristics of “The Land Act, 2009” pertaining to urban planning are as follows:

- **Chapter 2, Article 7 (1)** All land in Southern Sudan is owned by the people of Southern Sudan and its usage shall be regulated by the Government, and (2) Land may be acquired, held and

transacted through the following tenure systems (a) customary, (b) freehold (as hereditary right or tenure for life) and (c) lease hold

- **Chapter 3**, Article 9 All land in Southern Sudan shall be classified as public, community, or private land
- **Chapter 8**, Article 53 (2) Land collectively or individually owned in Southern Sudan shall be registered and given a title in accordance with this Act

## **(2) Land Ownership and Land Management of Public Land**

Ownership of public land is split among the central government of the Republic of South Sudan (ROSS), state government and local government, and each unit of infrastructure is managed differently. For example, Malakal Airport is owned by the state government and its operation is jointly managed by ROSS and the State Ministry of Transport and Roads, UNS. In the case of roads, extensive roads are owned by the central government while the roads connecting the counties within a state and roads within Malakal Town are owned by the state government.

Management of land ownership of private land is carried out by each state. In Malakal Town, it is under the jurisdiction of the MoPI&RD.

## **(3) Procedure for Land Distribution**

As soon as its budget becomes available, the MoPI&RD plans to resume the land development survey of the East of the Ring Road of the Ring Road and the southern part of Malakal Town, and registration and sale of land will be processed for those who have applied. A new application form was prepared in English in 2013, but its introduction is still being discussed as most people do not communicate well in English and confusion must be avoided.

In the UNS, both men and women can apply for land of any classified size. The size of the family or length of stay is not stated as a prerequisite. The price of land is determined after approval by the Ministerial Council and the Cabinet Minister of the MoPI&RD. The sale (or leasing) of land is handled by the Land Department of the MoPI&RD.

There has been some confusion regarding previous land distribution. According to the official registration procedure, the land fee has to be paid to register the land after submission of the application, but many people failed to pay on time and missed the chance to obtain the land title. There were also some errors on the part of the MoPI&RD. When payment was not made for registration of the land, the MoPI&RD went ahead and sold the land to other applicants.

Land registration documents have been kept at designated courts since the Sudanese era, but their authenticity is uncertain since there are some incidences of counterfeits and duplicated copies. Under the current registration system, registration forms must be duly prepared for each institution concerned and following up on the registration process is time consuming. The Land Planning Department of the Ministry of Land, Housing and Physical Planning (MOLH&PP) in Juba is

considering simplifying the land registration forms but this needs to be approved by the Ministerial Council.

#### **(4) Urban Planning and Land Expropriation for Implementation of the Project**

When a new area of land to the east of the Ring Road was developed, the MoPI&RD secured a part of the land for building schools, parks and churches. Despite this, people started building houses on public grounds without any land rights.

In the future, if the owner of the land comes forward and claims ownership over the project site, it will be necessary to request this person to present the land registration documents and to verify them. The procedure concerning expropriation of land is as stated in **Chapter 12**, Article 74 of “The Land Act, 2009”. It requires discussions with the community or with individuals, and in the case of a large-scale expropriation, public hearings should be held.

In the event of land expropriation, the evaluation of land and compensation is decided by the Ministry of Finance and Economic Planning and the Ministry of Commerce, Industry and Investment in accordance with the market value of the land. Multiple ministries and government offices including the Ministry of Agriculture and Forestry are in charge of agricultural land.

It should be noted that the law concerning land in South Sudan remains ambiguous in some areas; even “The Land Act, 2009” contains extracts of laws from the Sudanese era and is in need of improvement. It is absolutely essential to clarify land ownership when implementing the Project.

#### **(5) Land Use Restrictions for Urban Planning**

In order to formulate urban planning and to implement projects that are adaptable to population growth, which is assumed to continue in the future, the subject of land use restrictions must be thoroughly discussed with the government during the social economic infrastructure planning stage.

The government’s urban planning and implementation of projects are approved by the Ministerial Council. The UNS is in the process of formulating the “Upper Nile State Physical Planning and Development Regulation”. This is because the UNS considers that it is necessary to restrict land use in Malakal Town in the future in order to guarantee the feasibility of the urbanisation plan.

### **3.3.3 Livelihood and Employment**

Malakal Town was the centre of the Greater Upper Nile region during the Sudanese era. It used to provide factories for processing seafood and lemon juice, and dairy production. These industries no longer exist in Malakal Town. Today, most goods have to be brought in from Juba (48%), Khartoum (12%), Ethiopia (14%), and others (26%) as shown by a market survey that was part of the Town Profile Survey conducted in this Project. Consequently, the price of commodities has

become higher than those in the capital, Juba.

Currently, there are only small-scale businesses with informal business styles in Malakal Town. The types of trades include retail and wholesale stores, street stalls, fishmongers, carpenters, furniture shops, transport services (delivery by cargo load), water delivery (on donkeys) and hair salons. As for the origin of merchants who are engaged in commercial activities, they are South Sudanese (51%), Sudanese (35%) and others (14%, Ethiopian, Ugandans and Kenyans). The participation of South Sudanese in these commercial activities is limited to only half of those surveyed.

As for the household<sup>4</sup> income of Malakal Town residents, just over one third of the households surveyed has an average monthly income of less than South Sudan Pounds (SSP) 500. See “(3) Source of Income” under “ 2.2.2 Livelihoods – Findings from the Household Survey”

As for the largest income group representing each Payam, in the Northern Payam the group within the SSP 500-1,000 income range accounts for 36.6% of the survey group. In the Central Payam SSP 1,000-5,000 accounts for 33.1%, and in the Eastern and Southern Payam SPP 0-500 accounts for 40.7% and 46.5% respectively. On the Boma scale, households within the range of SSP 0-500 are represented the most in the East of the Ring Road outside the Ring Road at 72.0%, followed by Hai Saha in the Eastern Payam at 60.0% and Assossa in the Southern Payam at 50.9%. The survey clearly shows that the residents of the Eastern and Southern Payam are economically more impoverished.

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<sup>4</sup> The average number of persons per household in Malakal Town is 7.8.



**Table 3.3-2 Average Monthly Income by Boma**

(As at January 2013)

Boma (Payam)		No. of Samples	Monthly Income (%)						Total
			SSP 0-500	SSP 500-1,000	SSP 1,000-5,000	SSP 5,000-10,000	More than SSP 10,000	No answer	
1	Hai El Matar	55	32.7	50.9	14.5	1.8	0.0	0.0	100.0
2	Hai El Shatti	38	26.3	31.6	28.9	5.3	0.0	7.9	100.0
3	El Bethery	25	44.0	20.0	16.0	4.0	0.0	16.0	100.0
4	Hai Zande	25	32.0	32.0	20.0	8.0	0.0	8.0	100.0
5	Hai Shulluk	27	44.4	14.8	40.7	0.0	0.0	0.0	100.0
6	Hai Nuba	25	16.0	52.0	28.0	4.0	0.0	0.0	100.0
7	Hai Dinka	31	45.2	51.6	0.0	0.0	0.0	3.2	100.0
8	Sora Malakia	54	33.3	51.9	9.3	0.0	1.9	3.7	100.0
9	Thorat Luakat	33	30.3	24.2	42.4	3.0	0.0	0.0	100.0
Northern Payam Sub-total		313	33.8	36.6	22.2	2.9	0.2	4.3	100.0
10	Ray El Maseri	41	22.0	43.9	17.1	7.3	0.0	9.8	100.0
11	Jalaba	37	27.0	43.2	21.6	2.7	2.7	2.7	100.0
12	Muderia	54	14.8	9.3	63.0	11.1	0.0	1.9	100.0
Central Payam Sub-total		132	21.3	32.1	33.9	7.0	0.9	4.8	100.0
13	Assosa	55	50.9	38.2	7.3	0.0	0.0	3.6	100.0
14	Bum	35	31.4	17.1	37.1	8.6	0.0	5.7	100.0
15	Goni	25	36.0	32.0	24.0	8.0	0.0	0.0	100.0
16	Dangershufu	87	37.9	20.7	25.3	8.0	0.0	8.0	100.0
17	Terawa	38	47.4	36.8	13.2	0.0	0.0	2.6	100.0
Southern Payam Sub-total		240	40.7	29.0	21.4	4.9	0.0	4.0	100.0
18	Thorat Jallaba	29	37.9	37.9	17.2	0.0	6.9	0.0	100.0
19	Emtidad Jallaba	35	25.7	34.3	17.1	5.7	0.0	17.1	100.0
20	Biathin	25	48.0	28.0	24.0	0.0	0.0	0.0	100.0
21	Hai Saha	25	60.0	28.0	8.0	0.0	0.0	4.0	100.0
22	Hai Television	65	35.4	41.5	18.5	3.1	0.0	1.5	100.0
23	East of the Ring Road	25	72.0	24.0	0.0	0.0	0.0	4.0	100.0
Eastern Payam Sub-total		204	46.5	32.3	14.1	1.5	1.1	4.4	100.0
Grand Total/Average		889	35.6	32.5	22.9	4.1	0.6	4.4	100.0

Source: Town Profile Survey by JICA Project Team

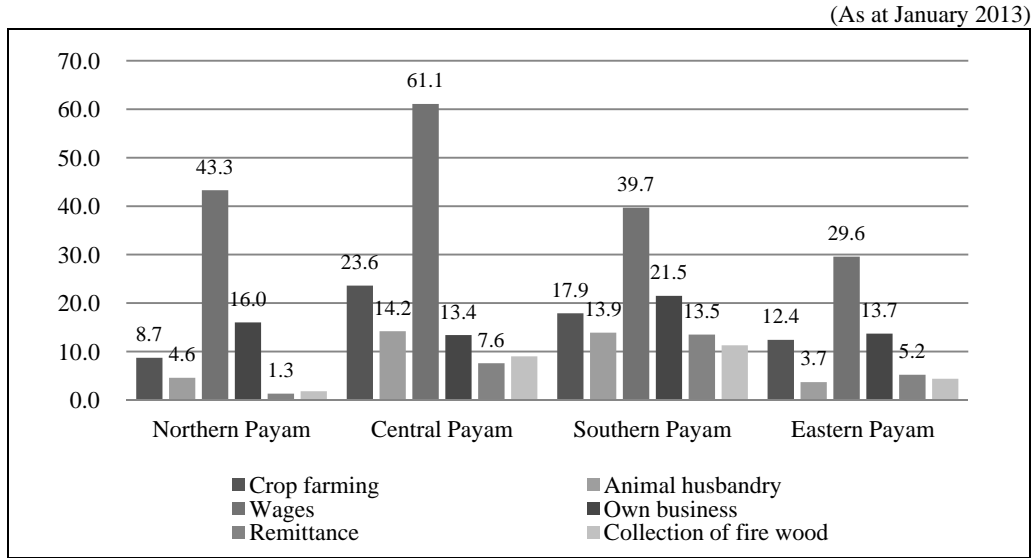
From the occupational survey, it was found that there is an average of 1.8 sources of income per household. As for the types of income source, the top five are wage and salaries (43.4%), self-owned business (16.1%), remittances (6.9%), animal husbandry (9.1%) and charcoal burning (9.1%).

At the Payam level, the Payam where people earn the highest proportion from wage and salaries appears to be the Central Payam at 61.1%. In the Southern Payam is the highest proportion of those who earn income from self-owned business at 21.5% and remittances at 13.5%.

The Central Payam has a higher percentage of wage and salary earners, with the reason being attributed to the fact that the Central Payam is host to governmental institutions and non-governmental organizations (NGOs). According to SSRRC, there are roughly 100 international organisations and NGOs registered in Malakal Town that provide opportunities for

employment.

It is interesting that the percentages of residents who own a business or receive remittances are relatively high in the Southern Payam. Activities such as charcoal production and collection of firewood, and animal husbandry are practiced mainly outside Malakal Town.



Source: Town Profile Survey by JICA Project Team

**Figure 3.3-2 Main Source of Livelihood**

**Table 3.3-3 Source of Income by Boma**

(As at January 2013)

	Boma (Payam)	No. of Samples	Monthly Income (%)														
			Crop farming	Animal husbandry	Wages and salaries	Owned business enterprise	Property income	Remittances	Pension	Fishing	Brick making	Black smith	Charcoal burning	Fetching water for sale	Collection of fire wood	Aid	Others
1	Hai El Matar	55	21.8	14.5	56.4	10.9	10.9	3.6	12.7	0.0	1.8	1.8	14.5	5.5	7.3	1.8	0.0
2	Hai El Shatti	38	15.8	7.9	44.7	2.6	0.0	2.6	0.0	2.6	0.0	0.0	2.6	0.0	2.6	2.6	0.0
3	El Bethery	25	4.0	0.0	8.0	4.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
4	Hai Zande	25	0.0	0.0	76.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	8.0
5	Hai Shulluk	27	3.7	0.0	7.4	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0
6	Hai Nuba	25	4.0	12.0	32.0	8.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Hai Dinka	31	9.7	3.2	16.1	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Thorat Malakia	54	13.0	3.7	70.4	18.5	9.3	5.6	3.7	0.0	0.0	1.9	9.3	3.7	3.7	1.9	1.9
9	Thorat Luakat	33	6.1	0.0	78.8	54.5	6.1	0.0	0.0	0.0	0.0	0.0	9.1	3.0	3.0	3.0	27.3
Northern Payam Sub-total		313	8.7	4.6	43.3	16.0	2.9	1.3	2.3	0.7	0.2	0.4	4.4	1.4	1.8	1.4	4.6
10	Ray El Maseri	41	24.4	19.5	61.0	14.6	4.9	0.0	0.0	2.4	0.0	0.0	4.9	0.0	19.5	0.0	0.0
11	Jallaba	37	29.7	2.7	64.9	16.2	10.8	13.5	8.1	0.0	0.0	0.0	13.5	5.4	0.0	2.7	0.0
12	Muderia	54	16.7	20.4	57.4	9.3	1.9	9.3	7.4	0.0	0.0	0.0	7.4	0.0	7.4	3.7	0.0
Central Payam Sub-total		132	23.6	14.2	61.1	13.4	5.8	7.6	5.2	0.8	0.0	0.0	8.6	1.8	9.0	2.1	0.0
13	Assosa	55	32.7	14.5	38.2	27.3	7.3	20.0	0.0	0.0	14.5	0.0	7.3	7.3	7.3	3.6	0.0
14	Bum	35	8.6	20.0	37.1	20.0	8.6	14.3	20.0	0.0	5.7	0.0	20.0	0.0	17.1	0.0	0.0
15	Goni	25	20.0	20.0	56.0	16.0	0.0	4.0	0.0	16.0	0.0	0.0	0.0	0.0	4.0	0.0	4.0
16	Dangershufu	87	14.9	14.9	43.7	20.7	4.6	16.1	6.9	2.3	4.6	0.0	16.1	4.6	20.7	1.1	3.4
17	Terawa	38	13.2	0.0	23.7	23.7	10.5	13.2	23.7	2.6	0.0	0.0	7.9	0.0	7.9	0.0	0.0
Southern Payam Sub-total		240	17.9	13.9	39.7	21.5	6.2	13.5	10.1	4.2	5.0	0.0	10.3	2.4	11.4	1.0	1.5
18	Thorat Jallaba	29	17.2	3.4	27.6	10.3	0.0	0.0	0.0	0.0	0.0	0.0	6.9	0.0	6.9	0.0	0.0
19	Emtidad Jallaba	35	8.6	5.7	17.1	0.0	8.6	0.0	11.4	0.0	0.0	0.0	0.0	0.0	5.7	0.0	0.0
20	Biathin	25	8.0	0.0	64.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	12.0	4.0
21	Hai Saha	25	12.0	4.0	32.0	24.0	0.0	0.0	0.0	12.0	0.0	0.0	8.0	4.0	4.0	0.0	0.0
22	Hai Television	65	24.6	9.2	36.9	27.7	23.1	23.1	4.6	1.5	4.6	3.1	10.8	6.2	1.5	0.0	1.5
23	East of the Ring Road	25	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
Eastern Payam Sub-total		204	12.4	3.7	29.6	13.7	5.3	5.2	2.7	2.3	0.8	0.5	4.3	1.7	4.4	2.0	1.6
Total Average		889	15.6	9.1	43.4	16.1	5.1	6.9	5.1	2.0	1.5	0.2	6.9	1.8	6.6	1.6	1.9

Source: Town Profile Survey by JICA Project Team

When respondents were questioned about how their income is spent, the main expenditures were food (89.4%), education (80.3%), medical fees (82.7%), clothing (56.5%), utilities (44.1%), transportation (36.1%), personal care (25.6%), housing (17.0%), recreation (6.0%) and other (5.3%). When the same question was asked of the participants of the labour-based technology (LBT) road construction work, almost all the respondents said they used their wages to buy food. Some participants spend their wages on education and medical expenses for their children. It is clear that many Malakal residents are too economically constrained to buy sufficient daily food. Some residents interviewed who live in the East of the Ring Road said that they plant sorghum, maize and some vegetables to produce two to three months' supply of food, and collect sand and pebbles to earn some extra cash. It is essential to provide support to improve their living standards. Regarding the participants of the LBT road construction work, those in their twenties represented

40% and those in their thirties 30%. It is clear that there are many unemployed youth in Malakal Town. Concerning youth employment, 65.3% of households surveyed responded that, “although there is a young member in the family at an employable age, he (she) is not working”. Among this group, the reason for them not being employed was “would like to work but cannot find a job” (60.3%), “inadequate education level” (23.8%), “do not have any acquaintances” (22.6%), “have no experience” (13.9%), “cannot speak English” (14.3%), “have no skills” (8.1%), and “the salary is too low” (3.9%).

As for vocational training, 38.8% of those surveyed replied that they have undertaken vocational training. Computer training (34.8%) was at the top of the list, followed by carpentry (20.8%), brick making (16%), electrical (11.4%), auto-mechanical (11.4%), tailoring (3.9%), nursing (5.9%), catering (1.0%), and other (0.7%).

English is the official language of South Sudan, but the level of English after finishing primary school or junior high school in South Sudan and Sudan is not of a high enough standard to be able to communicate sufficiently. There is a risk that the younger generation may create instability within society if they are unable to find work. It is therefore necessary to create employment targeting the younger generation in order to minimise instability.

Women make up the majority of participants in the LBT road construction work. The educational background of most of the women questioned was around junior high school level and they had no work experience. These women would like to work but do not know what they can do due to their lack of skills, although some say they can only work on a fixed schedule because they have to look after their children. The survey also found that 22.8% of the population in Malakal Town is made up of single mothers.

During the interview with some returnees who have settled outside the Ring Road, a returnee woman from Khartoum claimed that she does not know how to work in the field because she has never worked in agriculture and asked for technical training.

It is important to give priority to the younger generation, the socially vulnerable and returnees when implementing the projects aimed at improving livelihoods, and to provide support to improve their skills and income.

When optimistic returnees are faced with no opportunities for employment, there is a risk that their disappointment may turn into a factor for instability. Since many returnees had jobs and acquired skills in Khartoum or in foreign countries, it is highly recommended that full use is made of the experiences and skills gained by these people and that they are employed for the development of Malakal Town. There is a case of an ex-refugee in the Southern Payam who is applying his agricultural skills to vegetable production, which he has learned while staying in a refugee camp in Kenya.

In order to implement community projects, it is desirable that the government works jointly with

communities in planning and implementation. To do so, certain conditions are required such as stability, good leadership and experience in community development.

As for the stability of communities, most of the people interviewed said that although no community groups are currently formed in the Boma, they could easily be formed. Most communities said they are willing to form a group if there is a project to participate in.

In order to implement community projects, good community leadership is required. In a survey about community leaders, 85.2% confirmed “there is a community leader in the respective community”, 77.2% said “the community leader is selected by the community”, and 64.3% said “the community leader is effective”. It is a positive factor that community leaders appeared to be relatively well accepted by community residents.

In Malakal Town, some of the Boma already have experience in community projects. For example, Assosa has worked with CARE (NGO) on a community project. In another case, the Boma chief of Hai Television worked to collect funds from the community to repair the community road. Since then, he has been trusted and selected to be a Boma chief for more than 20 years. These experiences are valuable and can be used to develop a good partnership for community projects.

In a longstanding community where the community has experience and the Boma chief has gained initiative and community confidence, projects are much easier to implement. The process of reaching an agreement is already established, which allows the project to simply follow the procedure. However, in cases where new residents live next to one another in a new community, the community structure may still be fragile and may be prone to social problems. It is possible that a system of cooperation among the residents has not yet been established. When implementing a project in such areas, it is necessary to first take steps to build a sense of community through organising a workshop among the inhabitants.

Last but not least, it is important to promote ethnic and tribal co-existence in Malakal Town. The survey has confirmed that all the ethnic and tribal groups live and co-exist together, and the situation appears to be stable. Therefore, it must be ensured that no single ethnic group becomes the sole beneficiary from a project. Projects should incorporate the positive factor of peaceful co-existence of Malakal residents.

**< PART II >**

**DEFINING CONCEPTS FOR  
THE COMPREHENSIVE PLAN**

## **CHAPTER 4 CONCEPTUAL FRAMEWORKS FOR FORMULATION OF THE COMPREHENSIVE PLAN**

In **Chapter 4**, conceptual frameworks of the Comprehensive Plan are presented.

After a review of the national, Upper Nile State (UNS) and Makal County development plans, a vision for the development for Malakal “Vision Malakal for 2022” was identified in a workshop with participants from concerned state ministries. Four Development Strategies to progress the vision were established: (i) Malakal Infrastructure Development, (ii) Region-wide Economic Development, (iii) Social Development, and (iv) Urban and Peacebuilding and Governance Strengthening.

Two recovery/rehabilitation scenarios were proposed and studied to confirm the basis of the Comprehensive Plan. A socio-economic framework, a spatial framework (projection of future land use) based on the socio-economic framework, and conflict prevention measures were referenced in formulating the Development Programmes.

### **4.1 PLANNING APPROACH FOR THE COMPREHENSIVE PLAN**

The Comprehensive Plan has been prepared following the nine steps below.

#### **(1) Part I: Collection and Analysis of Data and Information**

Step1: Analysis of the situation through (i) existing data/statistics, (ii) the Town Profile Survey, and (iii) the Peace building Need and Impact Assessment (PNA). The Town Profile Survey consisted of (a) the Household Survey, (b) the Boma Profile, (c) the Market Survey, (d) the Land Use Survey including the 1:2,500 Topographic Survey and (e) community consultations. See **Chapter 2** and **3**.

#### **(2) Part II: Defining Concepts for the Comprehensive Plan**

Step2-1: Review of existing development plans of the governments at different levels. The Millennium Development Goals (MDGs), and development plans of the Republic of South Sudan (ROSS), UNS, and Makal County were reviewed. See **Chapter 4**.

Step2-2: Formulation of a development vision for Malakal based on the above analysis and review, and through the following works: (i) the conceptual hierarchy among the development plans, (ii) a SWOT analysis, (iii) a problem structure analysis, and (iv) workshops co-held with the State Ministry of Physical Infrastructure and Rural Development, UNS (MoPI&RD). See **Chapter 4**.

Step3: Design of the Development Strategies for actualising “Vision Malakal for 2022” with reference to the National Development Plan. See **Chapter 4**.

Step 4: Preparation of a framework for the Comprehensive Plan. The following documents were

prepared: (i) Development Scenario, (ii) Socio-economic Framework, (iii) Spatial Framework, (iv) Conflict Prevention Measures, and (v) SEARNS (a Long-sighted Perspective for Urban Development Planning). See **Chapter 4**.

### **(3) Part III: Sector Analysis**

Step 5: Sector analysis consists of (i) present situation, (ii) issues and needs, and (iii) proposed projects addressing the issues and needs. Sectors are grouped into the above Development Strategies in the manner set out in the *South Sudan Development Plan (SSDP) 2011-13*. See **Chapter 5 to Chapter 16**.

Sectors are as follows: **1** Water Supply, **2** Water Transportation, **3** Road Transportation, **4** Energy, **5** Sewage and Sanitation, **6** Storm Water Drainage, **7** Solid Waste Management, **8** Education, **9** Health, **10** Capacity Development, **11** Economic Development and **12** Social Welfare. While sectors 1 to 10 were pre-agreed before the implementation of the Project, sectors 11 and 12 were added later in the course of the Project because the Project Team noticed there were issues and needs that the pre-agreed sectors were not able to respond to. Thus, the Economic Development and Social Welfare sectors were added.

Step 6: Assessment of the projects by (i) economic and financial analysis, and (ii) environmental and social consideration. See **Chapter 17 and 18** for results of the assessment.

### **(4) Part IV: Formulation of the Comprehensive Plan**

Step 7: Formulation of the Comprehensive Social Economic Infrastructure Plan (the Comprehensive Plan). The proposed projects were combined into programmes aligned with the Development Strategies. A total of 20 programmes were aggregated into the four Development Strategies. See **Chapter 19**.

Step 8: Arrangement of the programmes through (i) prioritisation, (ii) scheduling, and (iii) budgeting referring to the Budget Allocation Plan given to Malakal City by UNS.

Step 9: Selection of the Urgent Development Projects based on the selection criteria set by the Project.<sup>1</sup>

The above steps are presented in the following flow chart.

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<sup>1</sup> After the formulation of the Comprehensive Plan, the Urgent Development Projects were selected and implemented.



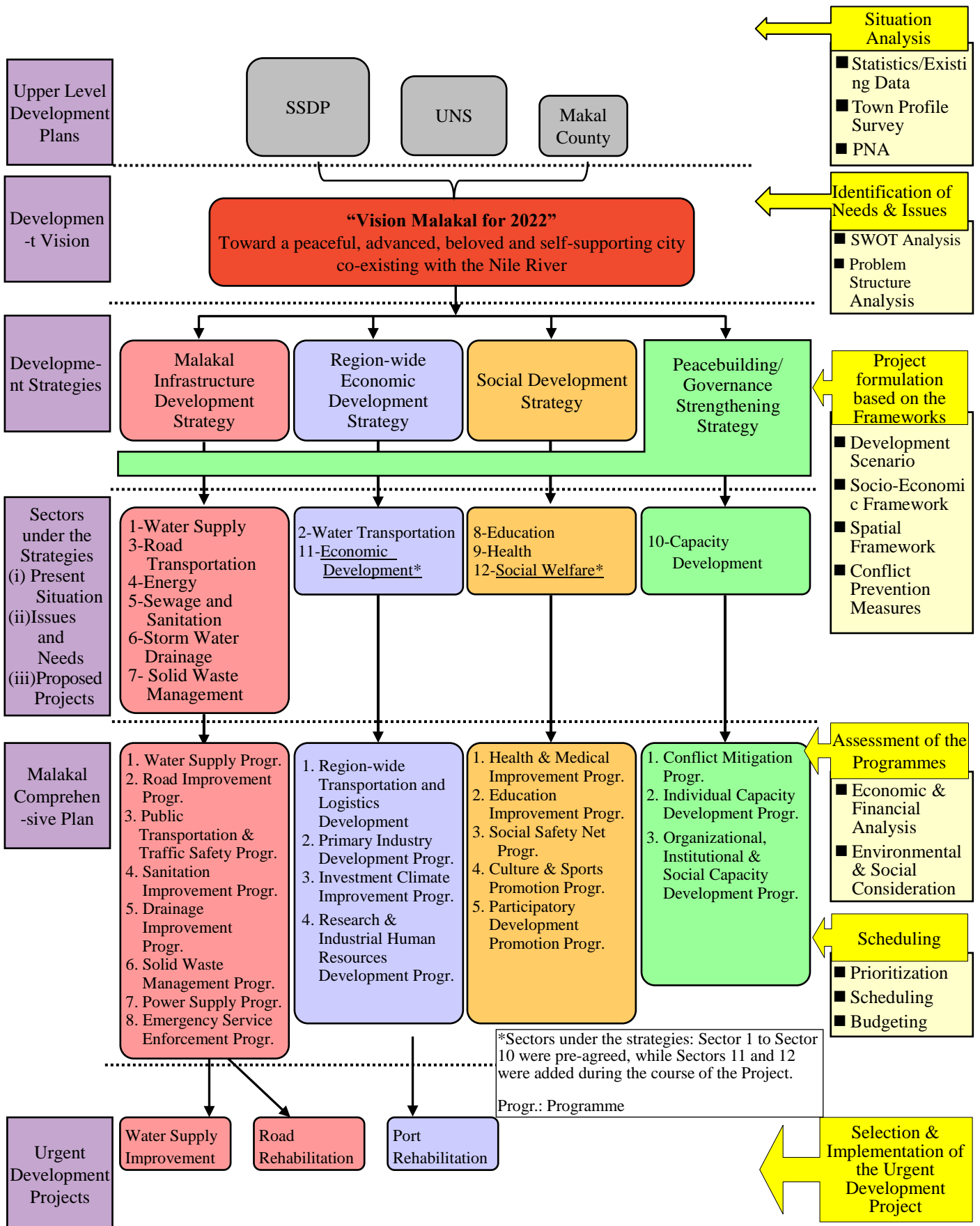


Figure 4.1-1 Flow of Comprehensive Plan Formulation

## 4.2 REVIEW OF EXISTING DEVELOPMENT PLANS

South Sudan adopted the MDGs prior to achieving independence. In addition to the MDGs, the ROSS, UNS and Makal County have formulated development plans with the aim of recovering from the conflict inherent respectively and enhancing the livelihood of the people. These existing development plans, including the MDGs, provide the foundation for the Comprehensive Social Economic Infrastructure Plan for Malakal, which the Project has formulated. The following sections present an outline of the development plans to clarify how the Comprehensive Plan aligns with upper level development plans and how it is responding to the needs of the people in Malakal.

The conceptual hierarchy of the national and state development plans and the Comprehensive Plan are shown in **Figure 4.2-1**.



Source: JICA Project Team

**Figure 4.2-1 Hierarchy of Plans**

### 4.2.1 The Millennium Development Goals

The MDGs were adopted in 2001 by the Sudan People's Liberation Movement (SPLM). Although SPLMS was not a member of the United Nations at that time, SPLM adopted the MDGs as an effective approach to addressing poverty in post-conflict South Sudan. The MDGs seek to combat poverty, hunger, disease, illiteracy, discrimination against women and environmental degradation by 2015, as listed below.

MDG 1: Eradicating extreme poverty and hunger

MDG 2: Achieving universal primary education

MDG 3: Promoting gender equality and empowering women

MDG 4: Reducing child mortality

MDG 5: Improving maternal health

MDG 6: Combating HIV/AIDS, malaria, and other diseases

MDG 7: Ensuring environmental sustainability

#### MDG 8: Developing a global partnership for development

Key development priorities were incorporated into the SSDP to attain the MDGs by the targeted year, with support from the United Nations Development Programme (UNDP). However, due to the conflict in the area (which ended five years after the adoption of the MDGs), implementation of the MDGs in South Sudan has been delayed. Realistically, UNDP acknowledges that most of the goals will not be met by 2015 unless an accelerated effort is made to address the challenges posed by the current state of conflict and fragility in South Sudan.

Having considered the significance of the MDGs in the development of South Sudan, the Project has referenced the MDGs along with other development plans and strategies to ensure the outputs of the Project contribute to meeting the goals.

#### **4.2.2 National Level Development Plan–*South Sudan Development Plan 2011-13***

This section presents the national *South Sudan Development Plan 2011-13* (SSDP) in detail to illustrate how and where the new nation is heading.

##### **(1) Outline of the SSDP**

The SSDP was formulated jointly by the government of ROSS (GOSS) with significant support from donors. Inputs from local governments were incorporated and the contents are comprehensive and well organised. Based on the theme “Realising freedom, equality, justice, peace and prosperity for all”, the SSDP 2011-13 describes the nation’s response to core development and state-building challenges during the first three years of independence. Key development priorities for the new nation are identified, and priority programmes for achieving these objectives are outlined. The priorities and related programmes were identified and prepared collaboratively by four groups of related ministries and agencies and cover (i) governance, (ii) economic development, (iii) social and human development and (iv) conflict prevention and security. The work of the four groups was complemented with inputs from the state and local governments.

The SSDP set the overall objective and long-term goal as shown below.

##### **SOUTH SUDAN’S VISION 2040**

By 2040, we aspire to build an exemplary nation: a nation that is educated and informed; prosperous, productive and innovative; compassionate and tolerant; free, just and peaceful; democratic and accountable; safe, secure and healthy; and united and proud.

##### **OVERALL SSDP OBJECTIVE**

To ensure that by 2014 South Sudan is a united peaceful new nation, building a strong foundation for good governance, economic prosperity and enhanced quality of life for all.

## **(2) Four Main Pillars of the SSDP and the National Priority Programme Areas**

### **(a) Key National Development Priorities**

The SSDP states the key national development priorities as follows.

- **Good governance:** To build a democratic, transparent, and accountable government, managed by a professional and committed public service, with an effective balance of power among the executive, legislative and judicial branches of government;
- **Increased prosperity:** To diversify private sector-led economic growth and sustainable development that improves livelihoods and reduces poverty;
- **Enhanced quality of life:** To promote the well-being and dignity of all the people of South Sudan by progressively accelerating universal access to basic social services;
- **Safety and security:** To defend the sovereignty and territorial integrity of South Sudan, prevent the resurgence of conflict, and uphold the constitution by providing equitable access to justice and maintaining law and order through institutions which are transparent, accountable and respect human rights and fundamental freedoms.

### **(b) Development Pillars and Sectors under the Pillars**

The national priorities are summarised as “pillars”, namely (i) governance, (ii) economic development, (iii) social and human development, and (iv) conflict prevention and security. Sectors related to the pillars are identified and shown in **Table 4.2-2**.

The following two sections, (3) and (4), present two of the four pillars, which are directly related to the Project’s purpose.

## **(3) Economic Development Pillar**

The Economic Development pillar consists of three sectors: (i) natural resources, (ii) infrastructure, and (iii) economic functions. This pillar is regarded as a fundamental requirement for South Sudan to prosper and lift large numbers of its population out of poverty. Five areas are identified for the GOSS to mobilise its resources, which include the following:

- Roads and road transport development to improve transport infrastructure
- Development of energy, mineral and mining sectors (including oil) to ensure good management of critical oil resources and increase electrical power supply
- Water resources management, development, utilisation and provision of sanitation services to improve access to safe water and improved sanitation

## **(4) Social and Human Development Pillar**

The Social and Human Development pillar consists of four sectors: (i) health, (ii) education, (iii) social protection, and (iv) sports and culture. This pillar is expected to help the nation to advance the physical, social, cultural and spiritual development of South Sudanese society simultaneously.

- Expansion of access to basic health by increasing basic health services and health promotion and other related interventions
- Expansion of the number and quality of teachers to enhance education quality
- Expansion of access to general education by increasing and improving efficiency of the education system

**Table 4.2-1 Outline of SSDP National Priorities**

South Sudan's Vision 2040	By 2040, we aspire to build an exemplary nation: a nation that is educated and informed; prosperous, productive and innovative; compassionate and tolerant; free, just and peaceful; democratic and accountable; safe, secure and healthy; and united and proud.			
Overall SSDP Objective	To ensure that by 2014 South Sudan is a united peaceful new nation, building a strong foundation for good governance, economic prosperity and enhanced quality of life for all.			
Key national development priorities	<b>Good governance</b>	<b>Increased prosperity</b>	<b>Enhanced quality of life</b>	<b>Safety and security</b>
Development pillars	<b>Governance</b>	<b>Economic development</b>	<b>Social and human development</b>	<b>Conflict prevention and security</b>
Sectors	- Public administration - Accountability	- Natural resources - Infrastructure - Economic functions	- Social protection - Health - Education and youth - Sports and culture	- Security - Rule of law
Priority Programme Areas  <b>Areas directly related to the Project are shown in bold</b>	<ul style="list-style-type: none"> <li>● Executive function of the Presidency</li> <li>● Development of institutional and human resource capacity</li> <li>● Promulgation of legislation and oversight of the Executive</li> <li>● Statistics</li> <li>● Economic management and resource mobilisation</li> </ul>	<ul style="list-style-type: none"> <li>● Increased agriculture production</li> <li>● <b>Improved and expanded road infrastructure</b></li> <li>● Good management of oil sector resources</li> <li>● Increased livestock production</li> <li>● <b>Expanded and improved water and sanitation infrastructure</b></li> </ul>	<ul style="list-style-type: none"> <li>● Introduction of a child benefit cash transfer</li> <li>● <b>Expanded access to basic health</b></li> <li>● <b>Expansion of number and quality of teachers.</b></li> <li>● <b>Expanded access to general education</b></li> <li>● Introduction of a Payam Youth Service</li> </ul>	<ul style="list-style-type: none"> <li>● National Disarmament, demobilization and reintegration(DDR) programme</li> <li>● National Security Architecture (NSA) and Security Sector Transformation (SST)</li> <li>● Legal framework</li> <li>● Community security</li> <li>● Criminal justice system</li> </ul>
Cross Cutting Issues	Capacity-building, Youth, Gender Equality Environment, Human Rights, HIV/AIDS, Corruption			

Source: Compiled by the JICA Project Team based on the *South Sudan Development Plan 2011-2013*, 2011, ROSS.

### (5) Allocation of Resources with Consideration to Decline of Oil Revenues

The National Priority Programme Areas are where government resources are focused. It is anticipated that donors would align their support with these national priorities. The allocation of public expenditure was supposed to reflect these development priorities. At the same time, the SSDP's fiscal sustainability is critical to achieving the Overall SSDP Objective and reaching South Sudan's Vision. However, since oil revenue will decline over the SSDP period and beyond (by 2020 oil revenues will be below the level predicted for the 2011 budget), this will not be possible.

Under these circumstances, the following expenditure allocations within the SSDP were prepared, referring to percentiles rather than actual amounts. The Governance pillar is expected to reduce its budget share from 25% to 22% in 2014 and Conflict Prevention and Security from 38% to 34%.

Social and Human Development will increase from 9% to 12% and Economic Development will increase from an expected 13% in 2011 to 18% in 2014 (**Table 4.2-2**).

**Table 4.2-2 SSSDP Expenditure Allocations (in %)**

Pillar	2011	2012	2013	2014
Governance	25	23	23	22
Economic Development	13	17	18	18
Social and Human Development	9	11	12	12
Conflict Prevention and Security	38	34	34	34
States	16	15	14	14
of which				
Infrastructure	7	10	11	11
Education	5	7	7	7
Health	2	3	3	4
Security	29	25	24	24

Source: *South Sudan Development Plan*, ROSS, 2011

Division of labour between GOSS and the states was defined at the same time. National policies, the development of regulatory frameworks and their oversight are the responsibility of GOSS ministries. Service delivery involving availability and quality of the services is the responsibility of the state, county and Payam governments.

#### 4.2.3 State Level–Upper Nile State Strategic Plan 2012/13-2014/15

Corresponding to the SSSDP, the UNS government formulated the *Upper Nile State Strategic Plan 2012/13-2014/15*. The outline of the *Strategic Plan* is presented as follows:

##### (1) Outline of the UNS Strategic Plan

<p><b>State Vision</b></p> <p>To be a beacon of peace, democracy, transparency, accountability, equity and prosperity in South Sudan.</p> <p><b>State Mission</b></p> <p>To provide security, promote sustainable development, justice, equity, and mainstream democracy in the Upper Nile State.</p>
---

Four pillars were established to contribute to the realisation of the vision and mission of the UNS. Each pillar aligns with the four pillars of the SSSDP, and the strategic goals are summarised below. In addition, gender, HIV/AIDS, environment, capacity development, and monitoring and evaluation are all emphasised as cross-cutting issues.

**Table 4.2-3 Pillars and State Strategic Goals**

<b>Pillar</b>	<b>State Strategic Goal</b>
Governance	Enhance good governance, accountability and transparency through an established legal framework, provide coordination between state institutions, capable civil service, improved public financial management and zero tolerance to corruption
Economic Development	Ensure sustainable economic development that improves the livelihood of the state population
Social and Human Development	Enhance access to basic social services so as to promote the well-being and dignity of the people of UNS
Conflict Prevention and Security	Reduce conflicts, maintain peace and provide equitable access to justice

Source: *Upper Nile State Strategic Plan 2012/13-2014/15*, UNS, 2012

## (2) Economic Development in the UNS Strategic Plan

The state Strategic Goals are further broken down into Strategic Objectives. Ten Strategic Objectives are identified for Economic Development, which include the following:

- Improve access to basic services and markets through construction of new and upgrading of existing roads
- Improve access to clean drinking water and improved sanitation
- Improve urban development through introducing development/master plans

## (3) Social and Human Development in the UNS Strategic Plan

Likewise, four Strategic Objectives are identified for Social and Human Development, which include the following:

- Increase access to and quality of primary and secondary education
- Increase access to basic health services
- Reduce social and economic inequality and exclusion

### 4.2.4 County Level–*Makal County Strategic Plan: 2012-2014*

The vision and development goals of Makal County are presented in the *Makal County Strategic Plan: 2012-2014*. The plan was formulated with support from the UNDP and the Canadian International Development Agency (CIDA) incorporating results of consultation meetings at Boma, Payam and county level, and problem analysis by sector.

#### (1) Outline of *Makal County Strategic Plan: 2012-2014*

##### **Vision**

A secure and developed county by 2012-2014

##### **Mission**

To ensure good governance, provision of security to the citizen – Extending basic infrastructure to all parts of the county

- Development Goals
  - i. Participation of people in decision making
  - ii. Strengthen of local government apparatus
  - iii. Networking of Payams together with tarmac roads
  - iv. Construction of number of police stations and provision of qualified personnel's
  
- The Objective of the Strategic Plan
  - i. Construction of 5 Payam Headquarters
  - ii. Extension of line ministries branches down to Payam level.
  - iii. Equipment of the Payams with the qualified cadres.
  - iv. Construction of tarmac roads.
  - v. Provision of clean water and electricity to all parts of the county.
  - vi. Construction of 3 police stations in Ogod and Lelo Payams
  - vii. Provision of mobilities to the police force.
  - viii. Arrangement for conduction of an election for local legislative council.
  - ix. Election of customary law council.

**(2) County SWOT Analysis**

As mentioned earlier, consultation meetings at Boma, Payam and county level and problem analysis by sector were carried out to formulate the Comprehensive Plan. The results of the meetings and analysis were summarised as the Overall County SWOT (strength, weaknesses, opportunities, threats) Analysis as presented in **Table 4.2-4**.

**Table 4.2-4 Overall County SWOT Analysis**

	<b>Positives</b>	<b>Challenges</b>
Internal	<b>Strengths:</b> - Population density - Revenues - Fertile land - Access to transport - Location of state capital within the county	<b>Weaknesses:</b> - Insecurity - Unpaved roads - Poor infrastructure - Shortage of health personnel
External	<b>Opportunities:</b> - River Nile - Geographical location - Existence of organisations in the county	<b>Threats:</b> - Flood - Unhealthy environment

Source: *Makal County Strategic Plan: 2012-2014*, Makal County, 2011

Issues listed under “Weaknesses” and “Threats” in the above table indicate the main concerns of people in the county. Mitigating these issues may contribute to further improving the strengths and opportunities of the county, which in the long run, will help the county mobilise its resources in more effective ways.

The above SWOT analysis was discussed in workshops held by the Project. The results of the Makal County SWOT analysis and the workshops were incorporated into the Comprehensive



Plan, particularly in the selection of the Urgent Support Projects.

The reason why the Makal County SWOT analysis was referred to in the plan for Malakal Town was that the *Makal County Strategic Plan* was formulated before the establishment of the Malakal Municipality. The majority of the people who contributed to the plan preparation (about 90% of the total Makal population) have become residents of Malakal Town. See the table below for the distribution of population between Malakal municipality and Makal County.

**Table 4.2-5 Payam under Malakal and Makal**

No	Payam	Population			% of the total population	Present Administration
		Female	Male	Total		
1	Central Payam	15677	19096	34773	27.47%	Malakal City
2	Northern Payam	16474	19426	35900	28.36%	
3	Southern Payam	21035	22923	43958	34.72%	
4	Lelo Payam	2737	3006	5743	4.54%	Makal County
5	Ogod Payam	2956	3256	6212	4.91%	
Total		58879	67707	126586	100.00%	

Source: Compiled by the JICA Project Team based on *Makal County Strategic Plan: 2012-2014*, Makal County, 2011

### 4.3 VISION FOR THE DEVELOPMENT OF MALAKAL

This section presents a series of participatory analytical works with counterpart personnel to formulate a development vision for Malakal.

#### 4.3.1 Conceptual Hierarchy of the Comprehensive Plan

As shown in the conceptual hierarchy presented in **Figure 4.2-1**, key development issues presented in the existing development plans were referred to when establishing a vision for the development of Malakal.

#### 4.3.2 SWOT Analysis for Malakal

With reference to the Overall County SWOT Analysis presented in the *Makal County Strategic Plan 2012-2014*, the Project conducted a SWOT analysis on Malakal incorporating discussions from the workshops.

**Table 4.3-1 SWOT Analysis on Malakal**

<p><u>Strengths</u></p> <ul style="list-style-type: none"> <li>• Densely inhabited population</li> <li>• Revenues</li> <li>• Fertile land</li> <li>• State capital</li> <li>• <b>Upper Nile University</b></li> </ul>	<p><u>Weaknesses</u></p> <ul style="list-style-type: none"> <li>• Sluggish industrial activities</li> <li>• Insecurity</li> <li>• Unpaved road</li> <li>• Poor infrastructure</li> <li>• Shortage of health personnel</li> </ul>
<p><u>Opportunities</u></p> <ul style="list-style-type: none"> <li>• Nile River</li> <li>• <b>Geographical location (access to the East African countries)</b></li> <li>• Existence of organisations in the county</li> <li>• <b>Existence of oilfield and mineral resources in the nearby area</b></li> <li>• Existence of solar energy</li> </ul>	<p><u>Threats</u></p> <ul style="list-style-type: none"> <li>• Floods</li> <li>• <b>Unreliable logistics</b></li> <li>• Unhealthy environment</li> </ul>

Source: JICA Project Team based on the *Makal County Strategic Plan 2012-2014*

The following items were added to the Malakal SWOT analysis as a result of the workshop discussions:

- Upper Nile University as the core of economic development (strength)
- Geographical location near East African countries with improved access (opportunity)
- Existence of natural resources such as oil, mineral resources and solar energy (opportunity)
- Unreliable logistics system leading to high prices, especially for Malakal, which is heavily dependent on imported goods (threat)

#### **4.3.3 Problem Structure Analysis**

A problem structure analysis was conducted to identify the problems, their mutual relationships and major issues. **Figure 4.3-2** presents the constructed problem structure.

The problems that people were suffering from were categorised overall as “low quality of life”. Various problems causing low quality of life could be grouped into three categories: “poor living conditions” (living environment), “poverty” (economic issue) and “insecurity of life and property” (law and order issues). Specific factors causing these problems were identified based on cause and effect relationships. In reading the table from right to left, the fundamental problems identified lead to the three main categories summarised above which in turn lead to the overall problem of a “low quality of life”.

Poor living conditions are caused by poor levels of service mainly due to the limitations of the government in its financial, technical and managerial capacities. The rapid increase in the population caused by an influx of returnees is also a contributing factor to poor living conditions as the required infrastructure is not in place. This negates the capacity of people to “help themselves”.

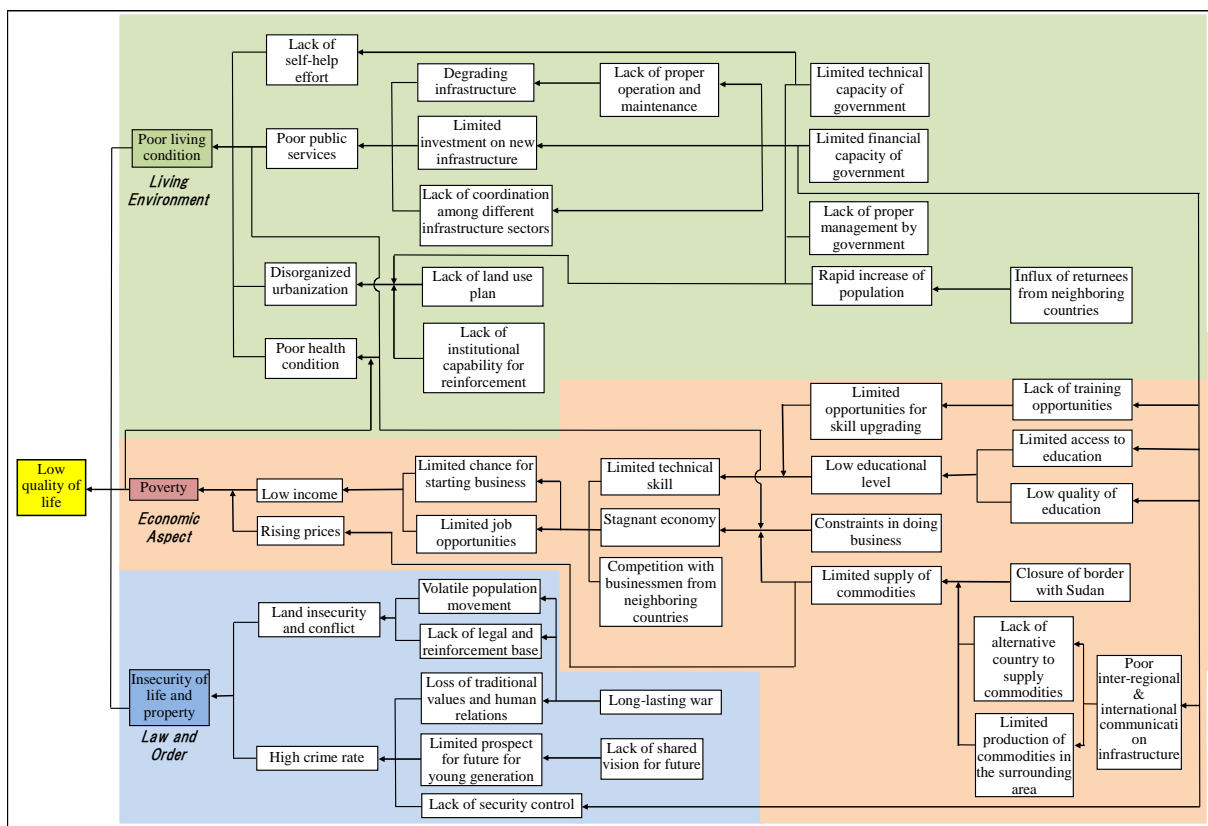
Poverty or economic problems are a result of low incomes and rising prices. Low educational levels and lack of skills coupled with a stagnant economy lead to low levels of employment and business initiative. The economy is stagnant because of constraints on doing business and the limited supply of commodities from areas surrounding Malakal and neighbouring countries. Poor road conditions limit commercial flows. Low financial capacity of the government results in limited provision of training and improvement in the quality of education.

The long-lasting war that caused rapid movement of people, coupled with a weak legal base and enforcement mechanism, is causing land issues in some areas. The long-lasting war also destroyed traditional values and ties between people, resulting in a high crime rate. A lack of future vision, which could prevent the younger generation from negative behaviour, and weak security control by the government are also contributing factors.

The following factors have been identified as those able to be tackled by South Sudan with support from international partners.

- Limited technical capacity of government

- Limited financial capacity of government
- Lack of proper management by government
- Lack of land use plan
- Lack of institutional capability for reinforcement of land use plan
- Lack of training opportunities for skill development
- Limited access to education
- Low quality of education
- Constraints in doing business
- Poor inter-regional and international communication infrastructure
- Lack of shared vision for future
- Lack of security control



Source: JICA Project Team

**Figure 4.3-1 Problem Structure of Malakal Town**

#### 4.3.4 Results from the Workshops

A workshop titled “Participatory Workshop on Vision and Challenges for Malakal Town Development” was conducted on 23 July 2012. The objective of the workshop was to provide opportunities for senior officers of the MoPI&RD to express their views on the future of Malakal and provide their input into how this could be achieved. The workshop proceeded in three steps. The first step aimed to develop the imagination of the participants by showing a set of photographs corresponding to each of the SEARNS concept (to be presented later).

The second step was conducted in a workshop style encouraging the participants to express their ideas on what kind of town they would like Malakal Town to be in the year 2022. Each participant wrote their ideas on a sticky card and posted them on a large sheet of paper on the wall. Each of them then explained their cards. The last step was to encourage each participant to think about what issues they and their organisations should work on in order to realise the vision they expressed.

**Figure 4.3-2** and **Figure 4.3-3** show the outputs of the workshop. The ideas expressed by each senior officer were categorised under “general vision”, “model”, “planning” and “services (city with good services)”. Ideas such as “to have a peaceful beloved city” and “to see Malakal Town as the most developed city in South Sudan” were grouped under the general vision. Similar ideas were expressed, and participants cited cities in other countries such as Kenya, the United States, the United Kingdom and Japan as examples of a model for Malakal.

Many ideas were discussed, and the general consensus was that there was a need for good services including electricity, roads, schools, water, markets and shopping centres, telephones, parks and open spaces with flowers, waste disposal, an international airport, health services, and tall buildings to house offices. The participants agreed that the provision of these services would result in a city that was beloved, peaceful and well developed, similar to developed cities in other countries. The participants agreed that to achieve this outcome depends on good planning and management such as labelling of roads, good design of buildings and the provision of a conducive environment for all citizens in all aspects of life.

The participants further considered what issues should be tackled to achieve these visions. A variety of opinions expressed were grouped under “good security”, “good capacity of staff”, “good management”, “good resources and funding”, “strategy”, “planning”, “operations and maintenance”, “monitoring and evaluation”, “community participation”, and “an increase in quality and quantity of public services”.



#### **4.3.5 Development Vision for Malakal “Vision Malakal for 2022”**

In the SWOT analysis, a high potential for economic development was identified while insufficiencies in human resources, infrastructure and socio-economical mechanisms were recognised.

The Problem Structure Analysis aimed to identify problems, their mutual relationships and major issues, including the following: poor living conditions, inadequate provision of public services, poor condition of infrastructure, limited government capacity, the rapid increase of population, influx of returnees, disorganised urbanisation, low incomes and price rises, the long-lasting war, a weak legal base and enforcement mechanisms, traditional values, negative behaviours, and weak security.

In the workshop, various ideas were expressed by the participants, which were summarised as follows:

- To have a peaceful beloved city
- To see Malakal Town as the most developed city in South Sudan

The following issues were recognised as those that need to be addressed: security, public services, capacity of staff, management, financial resources, strategy and planning, operations and maintenance, and community participation.

After the series of analytical workshops described above, a development vision for Malakal targeting the year 2022 was formed.

<b>Vision Malakal for 2022</b>
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“Toward a peaceful, advanced, beloved and self-supporting city co-existing with the Nile River”.
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#### **4.4 DEVELOPMENT STRATEGIES**

##### **4.4.1 Outline of the Development Strategies**

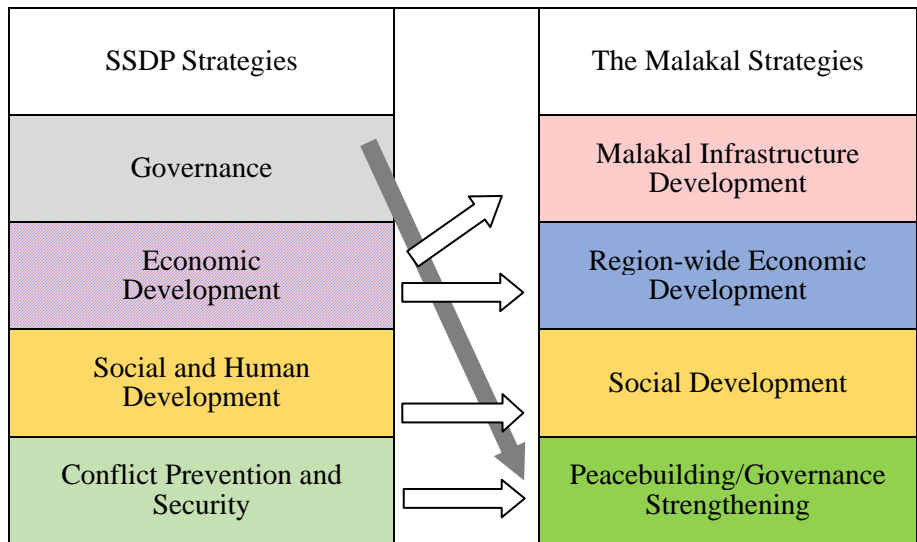
Development Strategies were designed in order to deliver “Vision Malakal for 2022”, and to provide a framework for formulating the Comprehensive Plan.

Findings from the analytical workshops on the current conditions in Malakal provided a basis for the Development Strategies. The analytical workshops included (i) analysis of existing statistics, (ii) the Town Profile Survey, and (iii) the PNA. The Town Profile Survey consisted of (a) the Household Survey, (b) the Boma Profile, (c) the Market Survey, (d) the Land Use Survey including 1:2,500 Topographic Survey, and (e) community consultations.

Eventually, four Development Strategies were established referencing the SSDP.

<b>Development Strategies for Malakal</b>
i. Malakal Infrastructure Development Strategy
ii. Region-wide Economic Development Strategy
iii. Social Development Strategy
iv. Peacebuilding and Governance Strengthening Strategy

The relationships between the Development Strategies and the SSDP’s core pillars are shown in **Figure 4.4-1**. The Malakal Development Strategies do not directly align with the SSDP. While SSDP’s “Governance” and “Conflict Prevention and Security” are merged in “Peacebuilding/Governance Strengthening” in the Malakal Development Strategies, the SSDP’s “Economic Development” is broken down into “Malakal Infrastructure Development” and “Region-wide Economic Development”. This arrangement suits the location of Malakal and its historical and geographical characteristics.



Source: JICA Project Team

**Figure 4.4-1 The SSDP’s Core Pillars and the Malakal Development Strategies**

#### 4.4.2 Background of Designing the Development Strategies and Programmes

##### (1) Development Alternatives

“Strategies” in this plan are principles to achieve the Development Programmes. Although the focus of the Comprehensive Social Economic Infrastructure Plan is recovery/reconstruction, two alternative restoration/reconstruction scenarios are formulated considering the following;

- The Comprehensive Plan consists mainly of recovery/rehabilitation projects.
- The Planning Horizon is 10 years, which is rather short for an ordinary master plan.
- Prompt formulation and implementation of comprehensive social economic infrastructure plans are required.

Two alternative restoration/reconstruction scenarios are as follows:

**(a) Recovery/reconstruction oriented type**

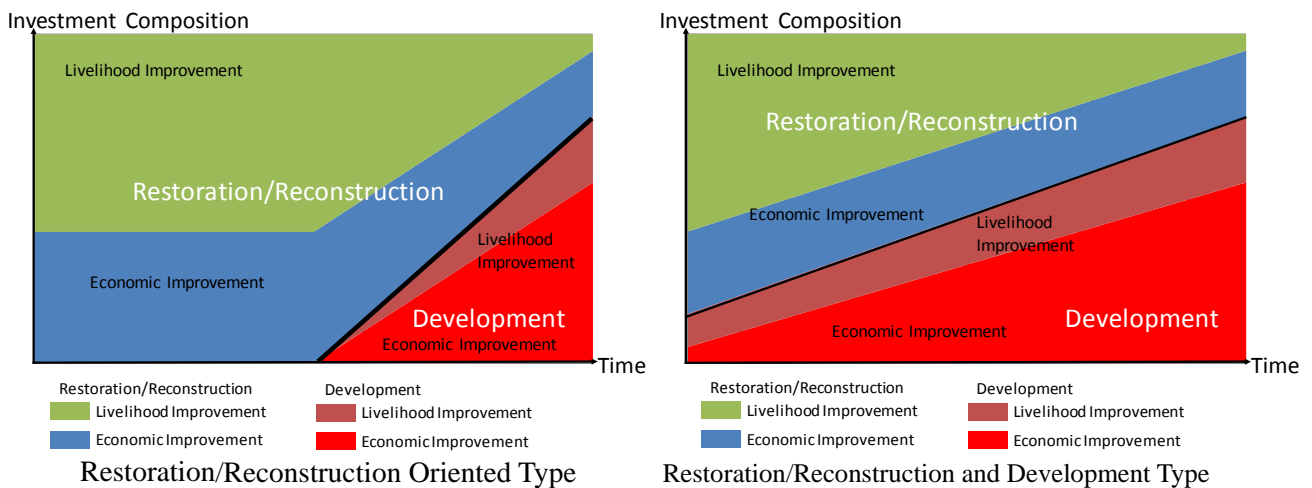
Social economic infrastructure projects for restoration/reconstruction are prioritised, and then development projects are implemented.

**(b) Restoration/reconstruction and development type**

Social economic infrastructure projects to meet BHN (Basic Human Needs) and development projects are both prioritised and implemented at an early stage.

**(2) Comparison of the Two Scenarios**

The following **Figure 4.4-2** shows the conceptual funding requirement for the two restoration/reconstruction scenarios.



**Figure 4.4-2 Conceptual Funding Requirement for Restoration/Reconstruction Scenarios**

In this project restoration/reconstruction comparison, the development type scenario was adopted in consideration of the considerable time required for the realisation of a self-supportive economy and the improvement of social stability to engender a better way of life for people through job creation.



**Table 4.4-1 Comparison of Alternative Restoration/Reconstruction Scenarios**

Scenario	A. Restoration/Reconstruction Oriented Type	B. Restoration/Reconstruction cum Development Type
Contents	Restoration/reconstruction needs of residents are wholly fulfilled. Development projects are implemented after restoration/reconstruction projects.	BHN projects such as water supply projects are prioritised. At the same time, development projects for Malakal Town are implemented.
Improvement of Residents' Life	Social economic infrastructure services for residents' lives are rehabilitated. It is necessary to implement operational and maintenance cost measures for social economic infrastructure such as the adoption of the "beneficiary-to-pay principle".	Social economic infrastructure services for BHN are rehabilitated. It is necessary to implement operational and maintenance cost measures for social economic infrastructure such as the adoption of the "beneficiary-to-pay principle".
Economic Development Perspective of Malakal Town	Currently no outstanding industry exists in Malakal Town. Malakal Town is a consumer city. Local industries shall be promoted to form a self-supportive city and lower the high dependency on public investment. Economic development projects need considerable preparation periods; consecutive stage changes to economic development are not easy.	Currently no outstanding industry exists in Malakal Town. Malakal Town is a consumer city. Local industries shall be promoted to form a self-supportive city and lower the high dependency on public investment. Economic development requires a preparation period and a relatively smooth stage change can be expected.
Conflict Prevention	Job opportunities are limited at the early stage. To sustain lives of returnees is not easy, and instability of the society is challenging to improve.	Instability of society is expected to improve due to job opportunity increases and a decline in unemployment rate.
Effective Fund Utilisation	Reduction of project costs is not easy.	Reduction of project costs is expected due to improvement of logistics system, and effective utilisation of funds is likely.
Evaluation	△	○

#### 4.4.3 Malakal Infrastructure Development Strategy

The improvement of the living environment and the production environment are major objectives of the present project. Infrastructure development by the government will constitute the main approach.

The following are the Malakal Infrastructure Development Strategies:

- i. The BHN of people are the highest priority and will be fulfilled based on an assessment of people's needs.
- ii. Urban infrastructure to support production activities will be developed at an appropriate time in accordance with the economic development strategy. The initial emphasis will be on the development of a region-wide transportation system to reduce transportation costs. Other economic infrastructure such as an industrial park could be developed later.
- iii. Housing development for returnees will be supported through land ownership and utilisation measures in consideration of Malakal's unique situation with a large number of returnees.
- iv. Development Programmes comprise components of the following: 1) Water Supply, 2) Road Improvements, 3) Public Transportation and Traffic Safety, 4) Sanitation Improvement, 5) Drainage Improvement, 6) Solid Waste Management, 7) Power Supply,

and 8) Emergency Services Reinforcement (for firefighting and medical services). See details in Chapter 19.

#### **4.4.4 Region-wide Economic Development Strategy**

Malakal is an area of strategic importance in the economic development of the Greater Upper Nile region. From this viewpoint, it is important to support infrastructure development in Malakal to promote regional economic activity, which will enhance economic development in Malakal Town.

However, the physical development will be achieved not only by the improvement of the living environment through better urban infrastructure, but also by a rise in income levels and an increased supply of goods and services in quantity and type. A rise in income levels will lead to enhancement of people's capacity to pay for social services, thus contributing to strengthening the sustainability of urban infrastructure.

The following are the region-wide economic development strategies for Malakal Town:

- i. The economic structure needs to be transformed from the existing one, which is heavily dependent on public expenditure, to an autonomous one based on a continuously expanding equilibrium of supply and demand.
- ii. Promotion of the economic development of Malakal needs to be planned and implemented in the wider regional context of the UNS or even in the larger context of the Upper Nile region comprising Jonglei State, Unity State and UNS. Malakal will reinforce its function as a hub by supplying goods and services to the surrounding areas including processing functions. In the meantime, the surrounding areas will promote primary industries such as agriculture, fishery and livestock, by receiving inputs and services from Malakal, which will enhance capacity for supplying raw materials to Malakal. A region-wide transportation network needs to be established to construct this kind of mutually supportive mechanism between Malakal and the surrounding area.
- iii. The logistics and trade hub function of Malakal should be strengthened so that goods and services are more efficiently transported to, from and through Malakal, and to and from neighbouring countries and regions.
- iv. Economic development needs to be pursued in stages and cannot be implemented all at once. In terms of development, the government needs to play a leading and major role in technical support and investment in the initial stage as the private sector in Malakal is still weak. As the private sector grows, the government can gradually begin to limit its role to one of supervision and guidance. An initial emphasis will be placed on importing goods such as food items and urban services taking into account Malakal's physical isolation from other areas. As the quality of locally made goods is improved, export of goods to other areas and neighbouring countries could be promoted. In terms of public investment in economic

infrastructure, an initial emphasis needs to be placed on those facilities that will help reduce transportation costs such as river transportation infrastructure and road links to Ethiopia. Other economic infrastructure could be constructed when the price of construction materials reduces as a result of the initial endeavours.

- v. Petroleum related industries should be promoted in Malakal taking advantage of the oil production in UNS.
- vi. An effort should be made to promote industrial collaboration, which would enhance competitiveness of goods and services produced in Malakal. This would combine different kinds of goods and services rather than promoting single goods or services in an isolated manner by promoting the collaboration between academia, research institutes, business and government.
- vii. Human resource development and education expansion should be promoted in order to upgrade the skill level of young people in Malakal so that economic growth and job creation can be realised, resulting in an income rise for the Malakal population.
- viii. In consideration of the above, Development Programmes to deliver the Region-wide Economic Development Strategies include the following components: 1) Region-wide Transportation and Logistics Development, 2) Primary Industry Development, 3) Investment Climate Improvement, 4) Research and Industrial Human Resources Development. See details in **Chapter 19**.

#### **4.4.5 Social Development Strategy**

Social development contributes to fulfilling physical and spiritual needs, both of which are required for ensuring a better quality of life. Social development implies provision of activities as well as a targeted approach to development.

The following are the social development strategies:

- i. The status of Malakal should be upgraded to become the regional centre of high quality medical and educational services in the Greater Upper Nile Region.
- ii. The quality and management of health and education services should be improved so that citizens can have better access to these services and enjoy a higher quality of these services.
- iii. Social development in Malakal should provide for community participation and ethnic harmonisation through sport and other cultural activities, which will provide a social safety net.
- iv. In consideration of the above, Development Programmes to deliver Social Development Strategies include the following components: 1) Health and Medical Improvement, 2) Education Improvement, 3) Social Safety Net, 4) Culture and Sports Promotion, and 5) Participatory Development Promotion. See details in **Chapter 19**.

#### **4.4.6 Peacebuilding and Governance Strengthening Strategy**

Governance including peacebuilding is a cross-cutting theme that is essential for effectively implementing the three strategies mentioned above, and improving the quality of life of the Malakal people. Strengthening of governance comprises the components of peacebuilding and capacity development at three levels: individual, organisational and social/institutional. The following are the peacebuilding/governance strengthening strategies:

- i. Peacebuilding and governance should be recognised as cross-cutting subjects related to all aspects of development.
- ii. Due attention should be paid to conflict mitigation and prevention and promotion of ethnic harmonisation in project planning and implementation through promotion of collaborative works aimed at common targets.
- iii. Individual capacity development of government officers and communities should be promoted.
- iv. Government organisations should be strengthened by providing project management skills (planning, implementation and operations).
- v. The legal system and social mechanisms such as community participation should be strengthened at the social and institutional level.
- vi. In consideration of the above, Development Programmes to deliver Peacebuilding and Governance Strengthening Strategies include the following components: 1) Conflict Mitigation, 2) Individual Capacity Development, and 3) Organisational, Institutional and Social Capacity Development. See details in Chapter 19.

#### **4.5 SOCIO-ECONOMIC FRAMEWORK**

The following two sections outline estimates and projections in the preparation of the Comprehensive Plan. It should be noted that statistical data was regrettably scarce, therefore some information collected through the Town Profile Survey and those of neighbouring countries was utilised on a supplementary basis. Because of these limitations, quantitative figures are effective for the Comprehensive Plan only.

##### **4.5.1 Population Framework for the Year 2022**

The population of Malakal Town in 2022 was projected for three scenarios: low, medium and high density, based on the following assumptions and the estimated population of 2012 as 153,000. (See 2.2.1 Population)

- i. The proportion of returnees who leave for other destinations is assumed to be 20% of all the returnees arriving in Malakal Town for the three scenarios.
- ii. The number of returnees arriving in Malakal Town from 2013 to 2015 is assumed to be 15,000 for the low scenario, 30,000 for the medium scenario and 60,000 for the high

scenario.

- iii. The rate of natural growth is assumed to be 2.2% per year for the three scenarios based on the United Nations Children’s Fund (UNICEF) statistics for Sudan in 2010.
- iv. The number of migrants into Malakal Town seeking jobs and service provisions is assumed to be zero for the low scenario, 1% of the population in the previous year for the medium scenario and 2% for the high scenario.

The population of Malakal Town is thus estimated at 204,000 for the low scenario, 241,000 for the medium scenario, and 298,000 for the high scenario. They are equivalent to average annual growth rates of 2.9%, 4.6% and 6.9% per year respectively. **Table 4.5-1** shows a summary.

**Table 4.5-1 Projected Population of Malakal Town in 2022**

Factors	Low growth scenario	Medium growth scenario (Most likely scenario)	High growth scenario	Remarks
Population in 2008	114,528	114,528	114,528	Statistical Yearbook 2010
Population in 2012	153,000	153,000	153,000	Estimate
Number of returnees in future	15,000	30,000	60,000	2013, 2014, 2015 assumed
Proportion of returnees leaving for other destinations	20%	20%	20%	-
Natural growth	2.20%/year	2.20%/year	2.20%/year	UNICEF Statistics for Sudan in 2010
Net migration by non-returnee factor	0%	1%	2%	% of population in the previous year
Population of Malakal in 2022	204,480	240,535	297,617	-
rounded	204,000	241,000	298,000	-
Annual average growth rate	2.9%/year	4.6%/year	6.9%/year	-

Source: JICA Project Team

The medium scenario would be the most likely to occur, therefore, it was adopted as the basis for the Comprehensive Plan. **Table 4.5-2**, **Table 4.5-3** and **Table 4.5-4** present the population projection process for the three scenarios.

**Table 4.5-2 Population Projection for Malakal Town for 2022: Low Growth Scenario (1/3)**

Item	Value		Remarks
<b>Population in 2012</b>	153,000	persons	
Assumed proportion of returnees leaving for other destinations:	20%		
2013			
Natural growth	3,366	persons	
Migration caused by return of returnees	8,000	persons	
Total number of returnees	10,000	persons	
Those to remain in Malakal	8,000	persons	
Those to leave Malakal	2,000	persons	
Migration caused by non-returnee factor	1,530		
Proportion	1%		<i>to population in the previous year</i>
Total	165,896	persons	
2014			
Natural growth	3,650	persons	
Migration caused by return of returnees	8,000	persons	
Total number of returnees	10,000	persons	
Those to remain in Malakal	8,000	persons	
Those to leave Malakal	2,000	persons	
Migration caused by non-returnee factor	1,659		
Proportion	1%		<i>to population in the previous year</i>
Total	179,205	persons	
2015			
Natural growth	3,943	persons	
Migration caused by return of returnees	8,000	persons	
Total number of returnees	10,000	persons	
Those to remain in Malakal	8,000	persons	
Those to leave Malakal	2,000	persons	
Migration caused by non-returnee factor	1,792		
Proportion	1%		<i>to population in the previous year</i>
Total	192,939	persons	
2016			
Natural growth	4,245	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	1,929		
Proportion	1%		<i>to population in the previous year</i>
Total	199,113	persons	
2017			
Natural growth	4,380	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	1,991		
Proportion	1%		<i>to population in the previous year</i>
Total	205,485	persons	
2018			
Natural growth	4,521	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	2,055		
Proportion	1%		<i>to population in the previous year</i>
Total	212,060	persons	
2019			
Natural growth	4,665	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	2,121		
Proportion	1%		<i>to population in the previous year</i>
Total	218,846	persons	
2020			
Natural growth	4,815	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	2,188		
Proportion	1%		<i>to population in the previous year</i>
Total	225,849	persons	
2021			
Natural growth	4,969	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	2,258		
Proportion	1%		<i>to population in the previous year</i>
Total	233,077	persons	
2022			
Natural growth	5,128	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	2,331		
Proportion	1%		<i>to population in the previous year</i>
Total	240,535	persons	
	<b>Rounded</b>	241,000	persons

Source: JICA Project Team

**Table 4.5-3 Population Projection for Malakal Town for 2022: Medium Growth Scenario (2/3)**

Item	Value		Remarks
<b>Population in 2012</b>	153,000	persons	
Assumed proportion of number of those leaving for other destinations:	20	%	
2013			
Natural growth	3,366	persons	
Migration caused by return of returnees	4,000	persons	<i>Migration by non-returnee factor is assumed at zero in net.</i>
Total number of returnees	5,000	persons	
Those to remain in Malakal	4,000	persons	<i>80% of returnees assumed</i>
Those to leave Malakal	1,000	persons	
Migration caused by non-returnee factor	0		
Proportion	0	%	<i>to population in the previous year</i>
Total	160,366	persons	
2014			
Natural growth	3,528	persons	
Migration caused by return of returnees	4,000	persons	<i>Migration by non-returnee factor is assumed at zero in net.</i>
Total number of returnees	5,000	persons	
Those to remain in Malakal	4,000	persons	<i>50% of returnees assumed</i>
Those to leave Malakal	1,000	persons	
Migration caused by non-returnee factor	0	%	
Proportion	0	%	<i>to population in the previous year</i>
Total	167,894	persons	
2015			
Natural growth	3,694	persons	
Migration caused by return of returnees	4,000	persons	<i>Migration by non-returnee factor is assumed at zero in net.</i>
Total number of returnees	5,000	persons	
Those to remain in Malakal	4,000	persons	<i>50% of returnees assumed</i>
Those to leave Malakal	1,000	persons	
Migration caused by non-returnee factor	0	%	
Proportion	0	%	
Total	175,588	persons	
2016			
Natural growth	3,863	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	0		
Proportion	0%		<i>to population in the previous year</i>
Total	179,451	persons	
2017			
Natural growth	3,948	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	0		
Proportion	0	%	
Total	183,399	persons	
2018			
Natural growth	4,035	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	0		
Proportion	0	%	
Total	187,433	persons	
2019			
Natural growth	4,124	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	0		
Proportion	0	%	
Total	191,557	persons	
2020			
Natural growth	4,214	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	0		
Proportion	0	%	
Total	195,771	persons	
2021			
Natural growth	4,307	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	0		
Proportion	0	%	
Total	200,078	persons	
2022			
Natural growth	4,402	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	0		
Proportion	0	%	
Total	204,480	persons	
<b>Rounded</b>	204,000	persons	

Source: JICA Project Team

**Table 4.5-4 Population Projection for Malakal Town for 2022: High Growth Scenario (3/3)**

Item	Value		Remarks
<b>Population in 2012</b>	153,000	persons	
Assumed proportion of number of those leaving for other destinations:	20	%	
2013			
Natural growth	3,366	persons	
Migration caused by return of returnees	16,000	persons	<i>Migration by non-returnee factor is assumed at zero in net.</i>
Total number of returnees	20,000	persons	
Those to remain in Malakal	16,000	persons	<i>80% of returnees assumed</i>
Those to leave Malakal	4,000	persons	
Migration caused by non-returnee factor	3,060		
Proportion	2%		<i>to population in the previous year</i>
Total	175,426	persons	
2014			
Natural growth	3,859	persons	
Migration caused by return of returnees	16,000	persons	<i>Migration by non-returnee factor is assumed at zero in net.</i>
Total number of returnees	20,000	persons	
Those to remain in Malakal	16,000	persons	<i>80% of returnees assumed</i>
Those to leave Malakal	4,000	persons	
Migration caused by non-returnee factor	3,509		
Proportion	2%		<i>to population in the previous year</i>
Total	198,794	persons	
2015			
Natural growth	4,373	persons	
Migration caused by return of returnees	16,000	persons	<i>Migration by non-returnee factor is assumed at zero in net.</i>
Total number of returnees	20,000	persons	
Those to remain in Malakal	16,000	persons	<i>80% of returnees assumed</i>
Those to leave Malakal	4,000	persons	
Migration caused by non-returnee factor	3,976	%	
Proportion	2%		
Total	223,143	persons	
2016			
Natural growth	4,909	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	4,463		
Proportion	2%		<i>to population in the previous year</i>
Total	232,515	persons	
2017			
Natural growth	5,115	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	4,650		
Proportion	2%		
Total	242,281	persons	
2018			
Natural growth	5,330	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	4,846		
Proportion	2%		
Total	252,457	persons	
2019			
Natural growth	5,554	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	5,049		
Proportion	2%		
Total	263,060	persons	
2020			
Natural growth	5,787	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	5,261		
Proportion	2%		
Total	274,108	persons	
2021			
Natural growth	6,030	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	5,482		
Proportion	2%		
Total	285,621	persons	
2022			
Natural growth	6,284	persons	
Migration caused by return of returnees	0	persons	<i>Returnee assumed at zero</i>
Migration caused by non-returnee factor	5,712		
Proportion	2%		
Total	297,617	persons	
<b>Rounded</b>	298,000	persons	

Source: JICA Project Team



#### 4.5.2 Economic Development Framework

The Economic Development framework was prepared from two aspects: (i) balance of labour force supply and demand, and (ii) gross regional domestic product (GRDP) for 2022. A possible range of economic growth was estimated by establishing three scenarios of low, medium and high growth. The medium growth scenario of the population presented in the previous section was applied as the basis for all three scenarios for the GRDP estimate. The procedures and the results of the economic development framework are presented below.

##### (1) Balance of Labour Force Supply and Demand for 2022

**Table 4.5-5** presents the results of the balance of labour force supply and demand in 2012 and 2022 under high, medium, and low scenarios. **Table 4.5-6~8** show detailed estimates of the balance of labour force demand and supply under high, medium, and low scenarios, respectively.

**Table 4.5-5 Labour Force Supply and Demand Balance in 2012 and 2022 (Estimation)**

Item	2012	2022		
		High	Medium	Low
Population	153,000	241,000		
Work force	64,000	101,000		
Job opportunities (employed/working)	38,000	102,000	82,000	60,400
Unemployed	26,000	0	20,000	41,000
	40%	0%	20%	40%

Source: JICA Project Team

The present number of people in the workforce was estimated based on the estimated population of Malakal Town in 2012, work age population and the number of those with no intention of working including students. The number of job opportunities or those engaged in jobs/works was estimated based on the work force and the rate of current unemployment, which was assumed to be 40% based on the result of the Household Survey conducted as part of the Town Profile Survey.

Job opportunities in the future were estimated in such a way as to reduce the unemployment rate to zero by the year 2022 for the high growth scenario, 20% for the medium growth scenario and 40% for the low growth scenario. These unemployment rates can be regarded as a policy target for job creation. The number of job opportunities in 2022, is thus assumed to be equal to the number in the work force in 2022 in the high growth scenario, whereas it will rise to the level at which the unemployment rate declines to 20% for the medium scenario and 0% for the low scenario. The rate of growth for job opportunities to achieve no unemployment by 2022 is estimated at 10.3% per year under the high growth scenario, whereas for the medium growth scenario to attain a 20% unemployment rate, it is estimated at 7.9% per year. Even under the low growth scenario with the unemployment rate remaining at the current level of 40%, job opportunities must grow at 4.7% per year because the workforce will continue to expand as a result of population growth.

Subsequently, value added by sector was estimated until 2022 based on a number of assumptions such as distribution of labour force by sector and value added per worker. The proportion of the secondary sector labour was assumed to grow by stages: 5% between 2012 and 2014, 8% between 2015 and 2018, and 12% between 2019 and 2022. On the contrary, the proportion of the primary sector would decline from 5% to 4% and further to 3% during the same periods.

**Table 4.5-6 Labour Force Demand and Supply Balance (High Growth Scenario)**

Year	Labor Force Demand						d. Work Force	e. Job Opportunities Created (Supply)	f. Labor Force Balance	g. Unemployment Rate (%)
	a. Population	b. Working Age Population	c. Non-work force			c-4 Total				
			c-1 Malakal Vocational Training Center Students	c-2 UNU Students	c-3 Women With No Intention to Work					
2012	153,000	78,948	0	2,000	0	2,000	76,948	46,169	-30,779	40.0
2013	165,896	85,602	0	2,000	0	2,000	83,602	50,924	-32,678	39.1
2014	179,205	92,470	0	2,000	0	2,000	90,470	56,169	-34,300	37.9
2015	192,939	99,557	0	2,000	0	2,000	97,557	61,955	-35,602	36.5
2016	199,113	102,742	0	2,000	0	2,000	100,742	68,336	-32,406	32.2
2017	205,485	106,030	0	2,000	0	2,000	104,030	75,375	-28,655	27.5
2018	212,060	109,423	0	2,000	0	2,000	107,423	83,138	-24,285	22.6
2019	218,846	112,925	0	2,000	0	2,000	110,925	91,702	-19,223	17.3
2020	225,849	116,538	0	2,000	0	2,000	114,538	101,147	-13,391	11.7
2021	233,077	120,268	0	2,000	0	2,000	118,268	111,565	-6,702	5.7
2022	240,535	124,116	0	2,000	0	2,000	122,116	123,056	940	-0.8

a. Population projected as presented in Section 4.5.1

b. Ratio of working age population 51.6% of the population. Proportion of population between age of 15 and 59 based on 2010 Statistical Yearbook of South Sudan

c. Non-work force: those people in the work-age population, but who have no intention to work.

c-1 Number of students at Malakal Vocational Training Center 289 Based on the information by interview

c-2 Number of students of Upper Nile University 2,000

c-3 Female is assumed at 50% of the population

c-3 Ratio of women with no intention to work 33% of women

c-4 Total of c-1, c-2 and c-3

d. Workforce as the difference between working age population and non-workforce (b. minus c.)

e. Job opportunities created (estimated as below)

e-1 Population in Malakal in 2012: 153,000

e-2 Working age population in 2012 78,948 (same assumption as b.)

e-3 Non-workforce in 2012 2,000 (as shown in the table)

e-4 Workforce in 2012 76,948 (as shown in the table)

e-5 Unemployed in 2012 40% (referring to the result of Town Profiling Survey)

30,779

e-6 Employed/working in 2012 46,169 (e-4 minus e-5)

The figures for the following years were derived by applying an annual growth rate at such a level as the labor force balance turning positive in the year 2022.

Rate of growth of job opportunities: 10.3% per year

f. Labor Force Balance: e. minus d.

g. Unemployment Rate in 2022 0.0 %

Source: JICA Project Team

**Table 4.5-7 Labour Force Demand and Supply Balance (Medium Growth Scenario)**

Year	Labor Force Demand						e. Job Opportunities Created (Supply)	f. Labor Force Balance	g. Unemployment Rate (%)	
	a. Population	b. Working Age Population	c. Non-work force			d. Work force				
			c-1 Malakal Vocational Training Center Students	c-2 UNU Students	c-3 Women With No Intention to Work					c-4 Total
2012	153,000	78,948	0	2,000	0	2,000	76,948	46,169	-30,779	40.0
2013	165,896	85,602	0	2,000	0	2,000	83,602	49,816	-33,786	40.4
2014	179,205	92,470	0	2,000	0	2,000	90,470	53,752	-36,718	40.6
2015	192,939	99,557	0	2,000	0	2,000	97,557	57,998	-39,559	40.5
2016	199,113	102,742	0	2,000	0	2,000	100,742	62,580	-38,163	37.9
2017	205,485	106,030	0	2,000	0	2,000	104,030	67,524	-36,507	35.1
2018	212,060	109,423	0	2,000	0	2,000	107,423	72,858	-34,565	32.2
2019	218,846	112,925	0	2,000	0	2,000	110,925	78,614	-32,311	29.1
2020	225,849	116,538	0	2,000	0	2,000	114,538	84,824	-29,714	25.9
2021	233,077	120,268	0	2,000	0	2,000	118,268	91,525	-26,742	22.6
2022	240,535	124,116	0	2,000	0	2,000	122,116	98,756	-23,360	19.1

a. Population projected as presented in Section 4.5.1

b. Ratio of working age population 51.6% of the population. Proportion of population between age of 15 and 59 based on 2010 Statistical Yearbook of South Sudan

c. Non-work force: those people in the work-age population, but who have no intention to work.

c-1 Number of students at Malakal Vocational Training Center, 289 Based on the information by interview

c-2 Number of students of Upper Nile University. 2,000

c-3 Female is assumed at 50% of the population

c-3 Ratio of women with no intention to work 33% of women

c-4 Total of c-1, c-2 and c-3

d. Workforce as the difference between working age population and non-workforce (b. minus c.)

e. Job opportunities created (estimated as below)

e-1 Population in Malakal in 2012: 153,000

e-2 Working age population in 2012 78,948 (same assumption as b.)

e-3 Non-workforce in 2012 2,000 (as shown in the table)

e-4 Workforce in 2012 76,948 (as shown in the table)

e-5 Unemployed in 2012 40% (referring to the result of Town Profiling Survey)  
30,779

e-6 Employed/working in 2012 46,169 (e-4 minus e-5)

The figures for the following years were derived by applying an annual growth rate at such a level as the labor force balance turning positive in the year 2022.

Rate of growth of job opportunities: 7.9% per year

f. Labor Force Balance: e. minus d. -23,360

g. Unemployment Rate in 2022 19.1 %

Source: JICA Project Team

**Table 4.5-8 Labour Force Demand and Supply Balance (Low Growth Scenario)**

Year	Labor Force Demand						e. Job Opportunities Created (Supply)	f. Labor Force Balance	g. Unemployment Rate (%)	
	a. Population	b. Working Age Population	c. Non-Work Force			d. Work Force				
			c-1 Malakal Vocational Training Center Students	c-2 UNU Students	c-3 Women with No Intention to Work					c-4 Total
2012	153,000	78,948	0	2,000	13,026	15,026	63,922	38,353	-25,569	40.0
2013	165,896	85,602	0	2,000	14,124	16,124	69,478	40,156	-29,323	42.2
2014	179,205	92,470	0	2,000	15,257	17,257	75,213	42,043	-33,169	44.1
2015	192,939	99,557	0	2,000	16,427	18,427	81,130	44,019	-37,110	45.7
2016	199,113	102,742	0	2,000	16,953	18,953	83,789	46,088	-37,701	45.0
2017	205,485	106,030	0	2,000	17,495	19,495	86,535	48,254	-38,281	44.2
2018	212,060	109,423	0	2,000	18,055	20,055	89,368	50,522	-38,846	43.5
2019	218,846	112,925	0	2,000	18,633	20,633	92,292	52,897	-39,395	42.7
2020	225,849	116,538	0	2,000	19,229	21,229	95,309	55,383	-39,926	41.9
2021	233,077	120,268	0	2,000	19,844	21,844	98,424	57,986	-40,438	41.1
2022	240,535	124,116	0	2,000	20,479	22,479	101,637	60,711	-40,926	40.3

a. Population projected as presented in Section 4.5.1

b. Ratio of working age population 51.6% Proportion of population between age of 15 and 59 based on 2010 Statistical Yearbook of South Sudan

c. Non-work force: those people in the work-age population, but who have no intention to work.

c-1 Number of students at Malakal Vocational Training Center, 289 Based on the information by interview

c-2 Number of students of Upper Nile University 2000

c-3 Female is assumed at 50% of the population

c-3 Ratio of women with no intention to work 33% of women

c-4 Total of c-1, c-2 and c-3

d. Workforce as the difference between working age population and non-workforce (b. minus c.)

e. Job opportunities created (estimated as below)

e-1 Population in Malakal in 2012: 153,000

e-2 Working age population in 2012 78,948 (same assumption as b.)

e-3 Non-workforce in 2012 15,026 (as shown in the table)

e-4 Workforce in 2012 63,922 (as shown in the table)

e-5 Unemployed in 2012 40% (referring to the result of Town Profiling Survey)

25,569

e-6 Employed/working in 2012 38,353 (e-4 minus e-5)

The figures for the following years were derived by applying an annual growth rate at such a level as the labor force balance turning positive in the year 2022.

Rate of growth of job opportunities: 4.7% per year

f. Labor Force Balance: e. minus d.

g. Unemployment Rate in 2022 40.0 %

Source: JICA Project Team

## (2) Gross Regional Domestic Product for 2022

**Table 4.5-9** summarises the estimated GRDP under a high growth scenario, a medium growth scenario and a low growth scenario. GRDP per capita is estimated to grow by 6.6% per annum and reach US\$ 1,988 in 2022 (almost doubling in 10 years) under the high scenario. The GRDP per capita growth under the medium scenario and low scenario would be 4.3% and 1.2% per year respectively.

The medium growth scenario is adopted for the planning of Malakal Town. Measures for promoting the economic growth of Malakal Town need to be prepared with this estimate as a reference target.

**Table 4.5-9 Gross Regional Domestic Product of Malakal in 2012 and 2022**

Item	Unit	2012	GRDP in 2022			2012-2022 Growth Rate (%/year)		
			High	Medium	Low	High	Medium	Low
Gross Regional Domestic Product (GRDP)	10 <sup>3</sup> SSP	473,426	1,410,422	1,131,901	837,647	11.5	9.1	5.9
GRDP per capita	SSP	3,094	5,864	4,706	3,482	6.6	4.3	1.2
	US\$*	1,049	1,988	1,595	1,180			

\*SSP: South Sudan Pounds, Applying SSP 2.95 per US\$

Source: JICA Project Team

**Table 4.5-10**, **Table 4.5-11** and **Table 4.5-12** present the process of GRDP projection under high, medium and low growth scenarios, respectively. Considering the current situation, no condition is anticipated for the lead time required for infrastructure development that would result in economic growth later. The values estimated for 2022 show a range of possible economic growth at the point of 2022 after going through different patterns of annual fluctuations.

**Table 4.5-10 Value Added Generated in Malakal Town (High Growth Scenario)**

Year	a. Labor Force Distribution				b. Labor Force				Value Added (Thousand SSP)			
	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total
2012	5%	5%	90%	100%	2,308	2,308	41,552	46,169	4,617	69,253	498,623	572,493
2013	5%	5%	90%	100%	2,546	2,546	45,832	50,924	5,092	76,386	549,981	631,460
2014	5%	5%	90%	100%	2,808	2,808	50,552	56,169	5,617	84,254	606,629	696,500
2015	4%	8%	88%	100%	2,478	4,956	54,520	61,955	4,956	148,692	654,243	807,891
2016	4%	8%	88%	100%	2,733	5,467	60,136	68,336	5,467	164,007	721,630	891,104
2017	4%	8%	88%	100%	3,015	6,030	66,330	75,375	6,030	180,900	795,958	982,887
2018	3%	12%	85%	100%	2,494	9,977	70,668	83,138	4,988	299,298	848,012	1,152,298
2019	3%	12%	85%	100%	2,751	11,004	77,946	91,702	5,502	330,126	935,357	1,270,985
2020	3%	12%	85%	100%	3,034	12,138	85,975	101,147	6,069	364,129	1,031,699	1,401,896
2021	3%	12%	85%	100%	3,347	13,388	94,830	111,565	6,694	401,634	1,137,964	1,546,292
2022	3%	12%	85%	100%	3,692	14,767	104,598	123,056	7,383	443,003	1,255,174	1,705,560

**Assumptions**

a. Labor force distribution

a-1 Primary sector

2012-2014 5% assumed

2015-2018 4% assumed

2019-2022 3% assumed

a-2 Secondary sector

2012-2014 5% Assumed referring to Town Profile Survey result (Restoration Period)

2015-2018 8% Assumed to increase (Consolidation Period)

2019-2022 12% Assumed to further increase (Expansion Period)

a-3 Tertiary sector a-1 minus a-2

b. Labor force estimated by distributing the total labor force estimated (job created) by the distribution proportions.

c. Value added was estimated by multiplying the number of labor force and value added per worker by sector as follows.

Primary 2,000 SSP per person per year

Secondary 30,000 SSP per person per year

Tertiary 12,000 SSP per person per year

(estimated based on the example of Uganda for which data were available. No data were available either for South Sudan or Sudan)

**GRDP Estimated**

2012 GRDP 572,493 thousand SSP

2022 GRDP 1,705,560 thousand SSP

Level of growth 3.0 times

11.5 % per year between 2012 and 2022

GRDP per capita 2012 3,742 SSP per person

1,268 US\$ per person

2022 7,091 SSP per person

2,404 US\$ pr person

2.95 SSP/US\$ assumed

Source: JICA Project Team

**Table 4.5-11 Value Added Generated in Malakal Town (Medium Growth Scenario)**

Year	a. Labor Force Distribution				b. Labor Force				Value Added (Thousand SSP)			
	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total
2012	5%	5%	90%	100%	2,308	2,308	41,552	46,169	4,617	69,253	498,623	572,493
2013	5%	5%	90%	100%	2,491	2,491	44,835	49,816	4,982	74,724	538,014	617,720
2014	5%	5%	90%	100%	2,688	2,688	48,376	53,752	5,375	80,627	580,517	666,520
2015	4%	8%	88%	100%	2,320	4,640	51,038	57,998	4,640	139,195	612,459	756,294
2016	4%	8%	88%	100%	2,503	5,006	55,070	62,580	5,006	150,192	660,843	816,041
2017	4%	8%	88%	100%	2,701	5,402	59,421	67,524	5,402	162,057	713,050	880,508
2018	3%	12%	85%	100%	2,186	8,743	61,929	72,858	4,371	262,289	743,152	1,009,812
2019	3%	12%	85%	100%	2,358	9,434	66,822	78,614	4,717	283,010	801,861	1,089,587
2020	3%	12%	85%	100%	2,545	10,179	72,101	84,824	5,089	305,367	865,208	1,175,664
2021	3%	12%	85%	100%	2,746	10,983	77,797	91,525	5,492	329,491	933,559	1,268,542
2022	3%	12%	85%	100%	2,963	11,851	83,943	98,756	5,925	355,521	1,007,310	1,368,757

**Assumptions:**

a. Labor force distribution

a-1 Primary sector

2012-2014: 5% assumed  
 2015-2017: 4% assumed  
 2018-2022: 3% assumed

a-2 Secondary sector

2012-2014 5% Assumed referring to Town Profile Survey result (Restoration Period)  
 2015-2018 8% Assumed to increase (Consolidation Period)  
 2019-2022 12% Assumed to further increase (Expansion Period)

a-3 Tertiary sector

a-1 minus a-2

b. Labor force estimated by distributing the total labor force estimated (job created) by the distribution proportions.

c. Value added was estimated by multiplying the number of labor force and value added per worker by sector as follows.

Primary 2,000 SSP per person per year  
 Secondary 30,000 SSP per person per year  
 Tertiary 12,000 SSP per person per year

(estimated based on the example of Uganda for which data were available. No data were available either for South Sudan or Sudan)

**GRDP estimated**

2012 GRDP 572,493 thousand SSP

2022 GRDP 1,368,757 thousand SSP

Level of growth 2.4 times  
 9.1 % per year between 2012 and 2022

GRDP per capita 2012 3,742 SSP per person  
 1,268 US\$ per person  
 2022 5,690 SSP per person  
 1,929 US\$ pr person  
 2.95 SSP/US\$ assumed

Source: JICA Project Team

**Table 4.5-12 Value Added Generated in Malakal Town (Low Growth Scenario)**

Year	a. Labor Force Distribution				b. Labor Force				Value Added (Thousand SSP)			
	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total	Primary	Secondary	Tertiary	Total
2012	5%	5%	90%	100%	1,918	1,918	34,518	38,353	3,835	57,530	414,215	475,580
2013	5%	5%	90%	100%	2,008	2,008	36,140	40,156	4,016	60,234	433,683	497,932
2014	5%	5%	90%	100%	2,102	2,102	37,839	42,043	4,204	63,065	454,066	521,335
2015	4%	8%	88%	100%	1,761	3,522	38,737	44,019	3,522	105,646	464,842	574,010
2016	4%	8%	88%	100%	1,844	3,687	40,557	46,088	3,687	110,611	486,690	600,988
2017	4%	8%	88%	100%	1,930	3,860	42,464	48,254	3,860	115,810	509,564	629,235
2018	3%	12%	85%	100%	1,516	6,063	42,944	50,522	3,031	181,880	515,326	700,237
2019	3%	12%	85%	100%	1,587	6,348	44,962	52,897	3,174	190,428	539,546	733,148
2020	3%	12%	85%	100%	1,661	6,646	47,075	55,383	3,323	199,378	564,905	767,606
2021	3%	12%	85%	100%	1,740	6,958	49,288	57,986	3,479	208,749	591,455	803,683
2022	3%	12%	85%	100%	1,821	7,285	51,604	60,711	3,643	218,560	619,254	841,456

**Assumptions:**

a. Labor force distribution

a-1 Primary sector

2012-2014: 5% assumed

2015-2017: 4% assumed

2018-2022: 3% assumed

a-2 Secondary sector

2012-2014 5% Assumed referring to Town Profile Survey result (Restoration Period)

2015-2018 8% Assumed to increase (Consolidation Period)

2019-2022 12% Assumed to further increase (Expansion Period)

a-3 Tertiary sector a-1 minus a-2

b. Labor force estimated by distributing the total labor force estimated (job created) by the distribution proportions.

c. Value added was estimated by multiplying the number of labor force and value added per worker by sector as follows.

Primary 2,000 SSP per person per year

Secondary 30,000 SSP per person per year

Tertiary 12,000 SSP per person per year

(estimated based on the example of Uganda for which data were available. No data were available either for South Sudan or Sudan)

**GRDP estimated**

2012 GRDP 475,580 thousand SSP

2022 GRDP 841,456 thousand SSP

Level of growth 1.8 times

5.9 % per year between 2012 and 2022

GRDP per capita 2012 3,108 SSP per person

1,054 US\$ per person

2022 3,498 SSP per person

1,186 US\$ pr person

2.95 SSP/US\$ assumed

Source: JICA Project Team



## 4.6 SPATIAL DEVELOPMENT FRAMEWORK

### 4.6.1 Future Urban Structure and Allocation of Functions

#### (1) Principles of Development and Conservation

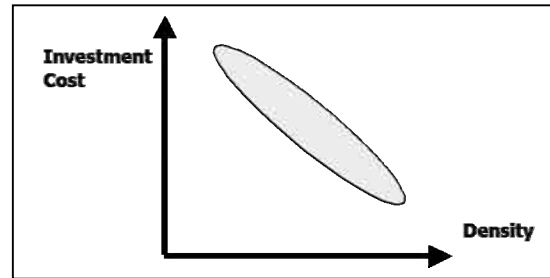
The following principles were adopted for spatial development and conservation in consideration of the urban structure of Malakal Town.

##### Conservation of Precious Natural Resources

The conservation of natural resources including land and the Nile River is respected. The Nile River is utilised for cargo and passenger transport, water supply, fishing, irrigation and tourism.

##### Intensive Development

Intensive development is currently pursued to avoid the negative impacts caused by low density development, which necessitates large government expenditure on the construction of urban infrastructure and public service facilities.



Source: JICA Project Team

**Figure 4.6-1 High Density Development**

##### Distinction between Conservation/Reservation Areas and Urban Areas

Classification of Malakal Town into green zone preservation area and urban functional area are necessary to avoid urban sprawl. The green zone preservation areas, including lands for suburban intensive farming, is a precious natural resource and should be retained for future urban development.

#### (2) Utilisation of Urban Development Potential

Improving the existing regional transport infrastructure and providing agricultural and commercial opportunities for the available workforce will increase the development potential within the Malakal Town area.

**Table 4.6-1 Utilisation of Urban Development Potential**

Type	Potential	Utilisation Direction
Population		
Residential Population	Malakal Town is densely inhabited. The population density is estimated at 58 persons/ha in 2012.	Labour intensive industry development within the commuting range
Transport		
Port	The port length is 150 m and water depth is 4-6 m. The port capacity, however, is limited by the docking space and manpower for loading and unloading.	Development and fostering of both domestic and export industries in the areas adjacent to the port taking advantage of river transport
Malakal Airport	Malakal Airport has a 2,000 m runway and serves as a four-season gateway. It is located at the northern periphery of Malakal Town.	Formation of secondary and tertiary industrial corridor between Malakal Town and airport.
International transport corridors	Malakal Town is located at a crossroads of potential east-west and north-south international corridors.	Development of transit trade related industries
Industry		
Agriculture	Although its potential has not been tapped yet, agriculture activities utilising Nile River water and cattle breeding are promising.	Development of irrigated farming, fishing and cattle breeding
Commerce	Large market burgeoning at transport nodal points.	Development of commercial cores utilising potential

Source: JICA Project Team

### (3) Urban Structure Patterns

The present urban structure of Malakal Town is characterised by the following:

- i. An accumulation of industries has developed in the areas behind Malakal Port.
- ii. The road network is a typical grid pattern.
- iii. The major urban functions are located along the Nile River.
- iv. New urbanisation is burgeoning beyond the Ring Road to the east of Malakal Town.
- v. There is new land development underway between the Ring Road and the Outer Ring Road.

As stated above, the grid pattern will continue to underpin the basic structure of Malakal Town in the future. Variations to the urban structure can occur only in areas regarding distribution of urban functions and the regional transport network development. Current infrastructure will need to be taken into account in the planning process of distributing urban functions, including locations of regional transport facilities. Among those regional transport facilities, reinforcement of the existing port is currently the only project underway. A new port development is proposed and discussed.

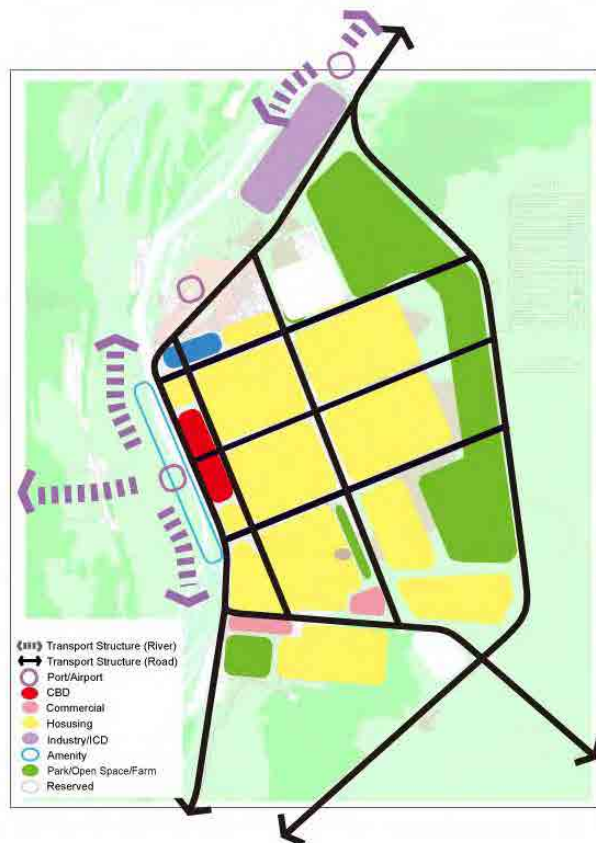
Two alternative structures based on the present urban pattern of Malakal Town and port development were formulated and examined as shown in **Table 4.6-2**.

**Table 4.6-2 Urban Structure Patterns**

Item	Urban Function Pattern	
	a) Concentric Pattern (similar to present pattern )	b) Dispersed Pattern
Transport network	• Malakal Port is located inside of Malakal Town	• New Malakal Port is located outside of Malakal Town
	• Regional transport facilities are concentrated, making transport more economical in terms of total trip length.	• Regional transport network can be more systematically formed by separating intra- and inter-regional traffic, and flows of commodities and passengers.
	• Traffic congestion is likely to occur in the central area of Malakal Town due to the agglomeration of functions.	• Traffic congestion in the central area of Malakal Town could be avoided .
Urban area development	• Investment amount will be lowered because of compact urban area development.	• Investment amount will be expanded because of expanded urban area development.
	• Urban area expansion will be restrained.	• Urban area expansion can be more flexible.
Environmental protection	• Encroachment of urban functions to the Nile River bank is confined.	• Encroachment of urban functions to the Nile River bank is promoted.
Role of administration	• Administrative interference in land use activities will be necessary.	• Administrative interference in land use activities will be necessary. Close consultation with Shilluk people will also be indispensable.

Source: JICA Project Team

As the existing port proved to be the decisive factor for the formation of the present town in terms of its layout and placement of commercial and business zones, the future urban structure of Malakal Town will therefore depend on the location of the new port. The current urban structure follows a linear configuration in which major urban functions are arranged along the Nile River in a north-south direction. This pattern was proposed in consideration of minimising investment costs for urban infrastructure by avoiding development far from the Nile River. Conversely, large tracts of land have now become available for economic development between the present Malakal Town and the proposed new Malakal port outside of Malakal Town. **Figure 4.6-2** shows a conceptual urban structure of a dispersed urban function pattern.



Source: JICA Project Team

**Figure 4.6-2 Future Urban Function Distribution Patterns**

## 4.6.2 Future Land Use Plan

### (1) Land Use Demand

Land use demand was estimated in the following ways.

- i. Estimate of required urbanised area in 2022 by gross population density
- ii. Estimate of required land area by land use type

#### (a) Estimation of required urbanised area in 2022 by gross population density

Based on the population and working population by sector (described in the previous section) and results from the existing Land Use Survey, the required future urbanised area is estimated. The required urbanised area in 2022 excluding security forces areas, agricultural land and open spaces is estimated at about 4,020 ha, of which the existing urbanised area is 2,442 ha. The additional new urban area required is about 730 ha as shown in **Table 4.6-3**.

**Table 4.6-3 Urbanised Area Required by 2022**

Item	
Population in 2012 (Persons) (est.)	153,000
Population in 2022 (Persons) (est.)	241,000
Population Increase between 2012 and 2022 (persons) (rounded)	88,000
Existing Urbanized Area Malakal Town (Excluding Security Forces Area, Agricultural Land, and Open Spaces) (ha)	2,442
Gross Population Density in Existing Urbanized Area Malakal Town 2012 (persons/ha)	63
Existing Gross Habitable Area in Malakal Town (ha)	3,290
Assumed Population Density in Malakal Town 2022 (persons/ha)	60
Future Population Absorbed in the Present Malakal Town Area (persons)	197,400
Population Required in the New Development Area (persons)	43,600
Gross Population Density in New Development Area (persons/ha)	60
Additional New Urban Development Required (ha)	730
Total Urbanized Area (Excluding Security Focus Area, Agricultural Land, and Open Spaces) (ha)	4,020

Source: JICA Project Team

In the following estimate, land class sizes, population density by housing type, and standard land use composition are evaluated.

**Table 4.6-4 Land Class in Malakal Town`**

	Class 1	Class 2	Class 3/4
Gross Population density (person/ha)	100	120	150
Minimum parcel size	20x30m	20x25m	20x20m
Purchase Price per plot (SSP)	1,000	700	500

Source: MoPI&RD, UNS

**Table 4.6-5 Population Density by Housing Type**

House Type	Plot Size (sq.m)	House Size (sq.m)	Maximum Plot Ratio	No.of Plots/ Houses per ha (plots/houses ha)	Ave. Household Size (persons/H.H.)	Gross Pop. Density (persons/ha)	Net Pop. Density (persons/ha)
Detached House Type (1-2 Stories)	600 (20x30)			10.8	6	65	100
	500 (20x25)			13.0	6	78	120
	300 (20x20)			21.7	6	130	150
Terrace House Type (1-2 Stories)		100	0.5	38.3	6	230	450
		100	0.8	61.2	6	367	720
Condominium House Type (3-4 Stories)		100	0.8	108.0	6	648	1,440
		100	1.0	135.0	6	810	1,800

Source: JICA Project Team based on information from the MoPI&RD

**Table 4.6-6 Standard Land Use Composition**

House Type		Housing	Other Building	Green Area	Transport	Total
Detached House Type	(1-2 Stories)	60-75	4-7	4-10	17-22	100
Terrace House Type	(1-2 Stories)	45-55	10-11	13-16	23-25	100
Condominium House Type	(3-4 Stories)	40-50	12-15	15-19	24-27	100

Source: JICA Project Team

**(b) Estimation of required land areas by land use type**

Based on information on the new land development plan from the MoPI&RD, the approved development areas for the future are listed in **Table 4.6-7**. As stated earlier, some plots in the new development areas have already been sold to returnees, Internally Displaced Persons (IDPs) and residents within and near Malakal Town.

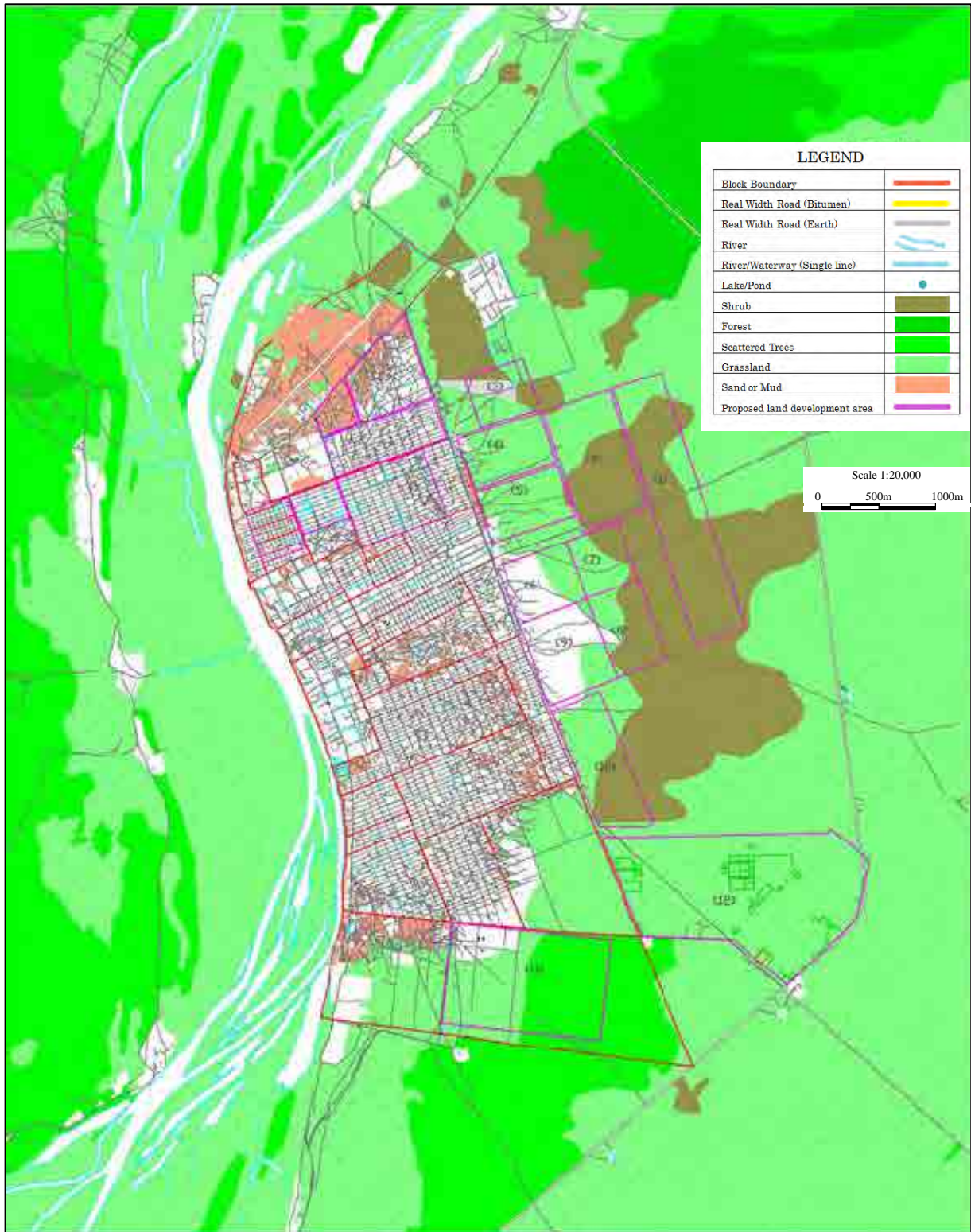
**Table 4.6-7 New Land Development In and Outside of Malakal Town**

No	Name	Area (ha)	Planned Year	Planning Agency	No. of plots		Number of Plots Sold	Land Price Annual Fee (SSP/USD)	Planned Pop (pers.)
					Class	No. of Plots			
1	Naivasha Town Phase I Class 1	255.95	2007	Survey Dep. MPI&RD	Class 1	1,684	540 plots sold	1,000	10,104
2	Naivasha Town Phase I Class 2	160.76	2007	Survey Dep. MPI&RD	Class 2	1,700	700 plots sold	700	10,200
3	Naivasha Town Northern Zone Class 3 Area BK I	59.84	2007	Survey Dep. MPI&RD	Class 3/4	710	1,760 plots sold	500	4,260
4	Naivasha Town Phase I Northern Zone Class 3 Area BK II	84.24	2007	Survey Dep. MPI&RD	Class 3/4	790		500	4,740
5	Naivasha Town Phase I Northern Zone Class 3 Area BK III	84.24	2007	Survey Dep. MPI&RD	Class 3/4	790		500	4,740
6	Naivasha Phase Two Block 4/A	80.36	2012	Town Planning Dep., MPI&RD	Class 3	777	Not Sold		4,662
7	Naivasha Phase Two Block 4B	60.68	2012	Town Planning Dep., MPI&RD	Class 3	790	Not Sold		4,740
8	Naivasha Phase Two Block 5A	83.94	2012	Town Planning Dep., MPI&RD	Class 3	1,349	Not Sold		8,094
9	Naivasha Phase Two Block 5/B	114.85	2012	Town Planning Dep., MPI&RD	Class 3	1,254	Not Sold		7,524
10	Windows/Disabled Persons	127.72	2011	Survey Dep. MPI&RD	Class 3	1,660	100% Sold		9,960
11	Academia	292.67	2009	Survey Dep. MPI&RD	Class 3	3,666	2,266 plots sold	500	21,996
12	UNDP (Proposed)	429.00	2011	UNDP	1st	932	Not Sold		5,592
					2nd	1,014	Not Sold		6,084
					3rd	2,014	Not Sold		12,084
					Total	3,960	Not Sold		23,760
Total		1,830	-	-	-	-	-	-	114,780

Source: MoPI&RD

Note: UNDP planned for some areas to be provided for IDPs.

1,830 ha of land area is currently under development. This will meet the future housing area requirement of 730 ha. Therefore, a restriction on selling plots is required to avoid the excessive expansion of infrastructure investment in these areas. The location of the twelve new development areas listed above is shown in **Figure 4.6-3**.



Note: The areas numbered 1 to 12 are proposed for new land development.

Source: Physical and Urban Planning Department, MoPI&RD

**Figure 4.6-3 Future Land Development Plan in Malakal Town**

## (2) Future Land Required by Land Use

### (a) Residential Area

It is estimated that the number of housing plots in 2012 was about 20,400 and the total residential area was about 1,454 ha. An average plot size in 2012 was calculated on the basis of residential area and population. As a result, the estimated present unit plot size calculated is about 713 m<sup>2</sup>. This means that an average plot size is almost equal to the second class residential area. According to the new land development plan, the average plot size is assumed to be 450 m<sup>2</sup>, which will result in a higher density than present conditions. It is therefore estimated that future net residential areas in Malakal Town would be about 527 ha as shown in **Table 4.6-8**.

**Table 4.6-8 Residential Area Required**

Item	2012	2022	2012/2022	Remarks
Population Malakal and Surrounding Area	153,000	241,000	1.58	
Number of Family	20,400	32,100	1.57	
Number of Housing Plots	20,400	32,100	1.57	
Net Residential Area Required (ha)	1,454	1,981	1.36	
Net New Residential Area Required (ha)	-	527	-	
Average Plot Size (m <sup>2</sup> /plot)	713	713-400	-	Average Plot size in the New Land Development is Assumed 450 sq.m

Source: JICA Project Team

### (b) Business/Commercial Area

Presently, the most prolific activities of the business sector in Malakal Town are government-related businesses. However, private business activities are expected to increase gradually by the year 2022.

The future business area is estimated on the basis of the number of businesses in the business sector and the land area per business. The land area was an outcome of the Land Use Survey conducted in the Town Profile Survey in this Project. The future business/commercial area is forecast to increase from 327 ha in 2012 to 711 ha in 2022 as shown in **Table 4.6-9**.

**Table 4.6-9 Business/Commercial Area (Required)**

Item	2012	2022	2012/2022
Employment in Sector (pers.)	34,362	86,498	2.52
Business/ Commercial (pers.)	15,497	53,100	3.43
Public administration and defence, compulsory social security (pers.)	14,823	23,300	1.57
Education health and social work (pers.)	4,043	10,100	2.50
Net Business/Commercial Area Required (ha)	327	711	2.17
Business/ Commercial (ha)	107	295	2.76
Public administration and defence, compulsory social security (ha)	145	228	1.57
Education health and social work (ha)	75	188	2.50
Average Area per Worker (m <sup>2</sup> /pers.)	95	-	-
Business/ Commercial (m <sup>2</sup> /pers.)	69	69-50	-
Public administration and defence, compulsory social security (m <sup>2</sup> /pers.)	98	98	1.00
Education health and social work (m <sup>2</sup> /pers.)	186	186	1.00

Source: JICA Project Team



Presently, the number of employees in the tertiary sector is estimated at about 34,000 persons. The composition of the tertiary sector was estimated based on data from the “5<sup>th</sup> Population and Housing Census, 2008”.

**Table 4.6-10 Composition of Tertiary Sector Population**

Business/ Commercial	Public Administration and Defence, Compulsory Social Security	Education Health and Social Work	Total
45%	43%	12%	100%

Source: 5<sup>th</sup> Sudan Population and Housing Census, 2008

**(c) Industrial Area**

Currently, the industrial sector’s activities in Malakal Town are very small. It was estimated that the average land area (including storage) for businesses is about 42 m<sup>2</sup>/person.

The future industrial area is estimated on the basis of the number of businesses in the industrial sector and the land area per business. The future industrial area is expected to increase from 8 ha in 2012 to 51 ha in 2022 as shown in **Table 4.6-11**.

**Table 4.6-11 Industrial Area Required**

Item	2012	2022	2012/2022
Employment in Industrial Sector	1,910	12,210	6.39
Industrial Area Required (ha)	8	51	6.40
Average Industrial Area per Employment	42	42	1.00

Source: JICA Project Team

**(d) Other Land Areas**

Other land uses such as institutional, educational, religious and public facilities are expected to increase, principally in proportion to the population increase. Therefore, these land uses are estimated on the basis of the existing land use areas multiplied by the increased rate of the population.

**(e) Overall Land Use Demand**

The housing area requirement was estimated based on the gross population density, which contains educational areas and nearby commercial areas, etc. **Table 4.6-12** shows the future land use demand obtained from the results of the future land use demand projection, after minor adjustment.



**Table 4.6-12 Future Land Use Demand in 2022**

Land Use		2012		2022	
		ha	%	ha	%
1	Residential	1,454	43.2	1,981	39.0
2	Business/Commercial	107	3.2	295	5.8
3	Public Administrations and Defense, Compulsory Social Security	145	4.3	228	4.5
4	Education	75	2.2	188	3.7
5	Industry & Storage	8	0.2	51	1.0
6	Religion & Custom	42	1.2	65	1.3
7	Recreation & Leisure	30	0.9	481	9.5
8	Transport	309	9.2	311	6.1
9	Road	349	10.4	962	18.9
10	Agricultural Land	27	0.8	272	5.4
11	Open Space	820	24.4	250	4.9
Total		3,366	100.0	5,085	100.0

Source: JICA Project Team

### (3) Land Use Zoning and Land Use Plan

The following are the principles applied to land use zoning.

- i. Land use zoning was designed to distribute land effectively for urban functions and enhancement of the urban environment.
- ii. Mixed land use areas were not excluded in the zoning system with consideration for rationalisation and conversion of some land for future use.
- iii. Land use zoning in this study complies with the distribution of urban functions based on the land value and characteristics of the land.
- iv. Present land use and urbanisation were reflected in the zoning system.
- v. Land use conversion was designed taking account of economic land value and the capacity of urban functions.
- vi. The zoning system mirrors that stipulated in the “Upper Nile State Physical Planning and Development Regulation”.
- vii. An exclusive industrial zone was proposed in this Study for strategic land use to restrict private activities.

It should be noted that the zoning system shown above is an essential condition but not the only condition for realisation of the land use plan. Other legislation controlling development and construction would be necessary, such as detailed land use zoning for conservation of historic areas or the best agricultural land. Also a scheme for urban development and redevelopment would be necessary along with the zoning system for the improvement of infrastructure and realisation of future land use plans. For instance, the seemingly decrepit road network between Malakal Town and the new land development beyond the Ring Road should be upgraded by the new project implementation scheme.

Based on the above principles the following directions for land use conversion were established.

- i. The land use conversion was based on the assumption that the land use conversion pattern is

- determined by the land value and its capacity or productivity for the urban function (land use conversion pattern by solvency).
- ii. Land designated for a specific future use that cannot be secured from the land market due to low functional solvency or productivity, such as a park, should be resumed by the public sector.
  - iii. Public land should be resumed where public land is illegally occupied, as well as idle lands in the urban area.

**Table 4.6-13 Land Use Conversion Pattern in the Urbanised Area  
(Land Use Conversion Pattern by Functional Solvency/Productivity)**

From \ To	CBD	Commercial	Light industry	Heavy industry	Low density residential	Public use
CBD*	○					
Commercial	○	○				
Light industry	○	○	○		○	
Heavy industry				○	○	
Low density residential		○			○	
Public use						○

CBD: Central Business District  
Source: JICA Project Team

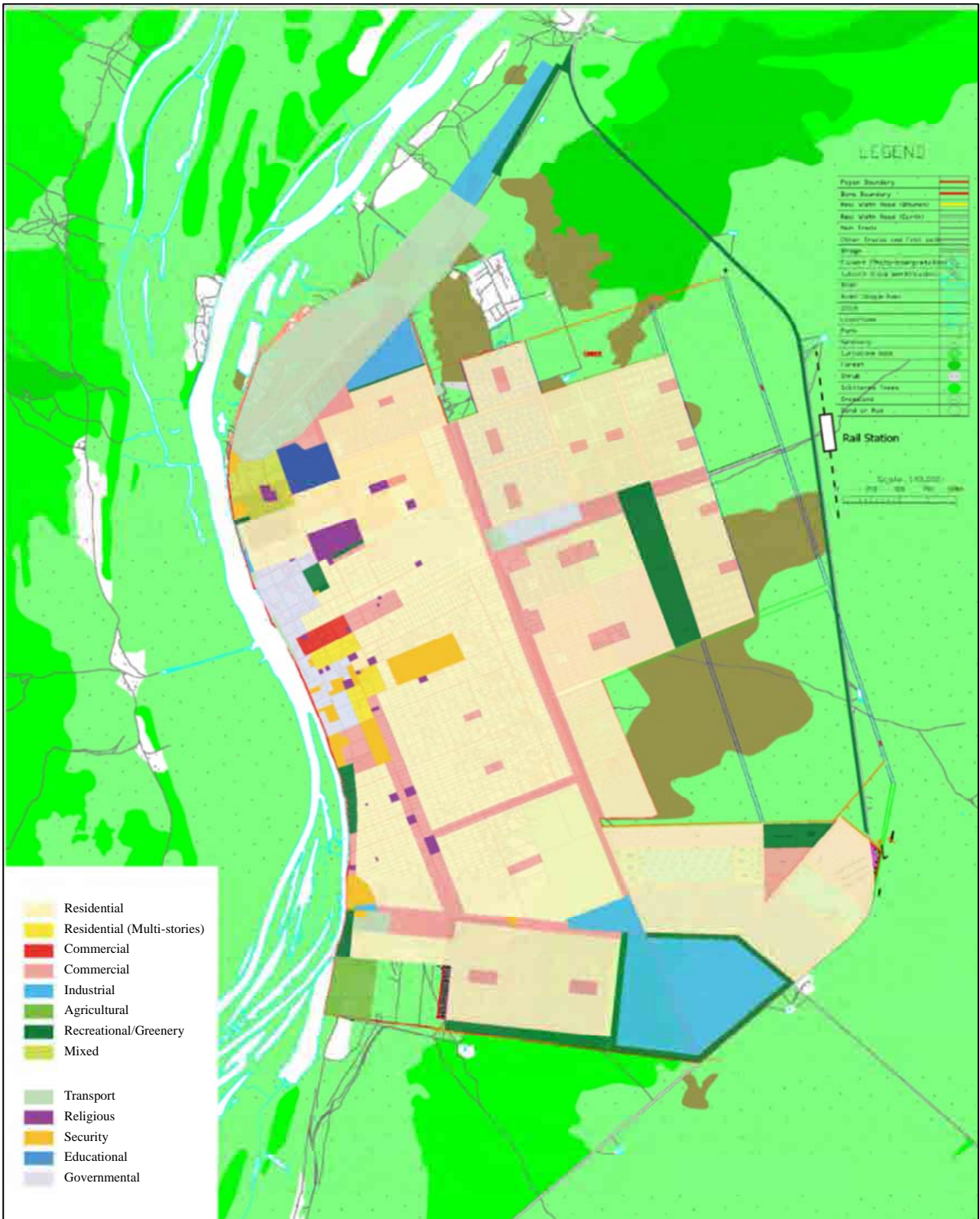
In accordance with the “Upper Nile State Physical Planning and Development Regulation”, MoPI&RD, 2012, the following zoning system is proposed. In this Project, the proposed zoning system provides a general scheme. Detailed zoning for industry and commercial use should be further examined.

**Table 4.6-14 Zoning in This Project**

Zoning in this Project	Zoning in Zoning Act
1) Housing area	H1 Zone: Low density housing area H2 Zone: Medium density housing area
2) Commercial and business	B1 Zone: High density commerce, general business, and commodities retail area B2 Zone: Low density commerce, general business, and commodities retails area
3) Industrial	I1 Zone: Light industry area I2 Zone: Exclusive industrial
4) Agricultural	A1 Zone: Agricultural area
5) Recreational	R1 Zone: Recreational area
6) Institutional	G1: Governmental building area
7) Mixed use	M1 District: Commerce and light manufacturing processing area
8) Other	O1: Other than above

Source: Proposed by the JICA Project Team based on the “Upper Nile State Physical Planning and Development Regulation”, MoPI&RD, 2012

**Figure 4.6-4** presents the proposed land use zoning of Malakal Town in 2022.



Source: JICA Project Team with assistance from the MoPI&RD

**Figure 4.6-4 Proposed Land Use Zoning in 2022**

## **4.7 CONFLICT PREVENTION MEASURES**

The Comprehensive Plan and the Urgent Support Projects have to be implemented and managed by applying the Peacebuilding Needs and Impact Assessment (PNA) principles by identifying peace promotion and potential conflict factors in the still unstable situation of South Sudan. Thus conflict prevention measures are drawn from findings of the PNA and the Town Profile Survey as follows:

### **4.7.1 Conflict Prevention Measure for Malakal Infrastructure Development**

- **Prioritisation of basic human needs in urban infrastructure development**

The Comprehensive Plan should give priority to BHN in urban infrastructure development. Unfulfilled BHN in the daily lives of returnees who have returned to their motherland full of hope may risk becoming a source of discontent towards the government.

### **4.7.2 Conflict Prevention Measures for Region-wide Economic Development**

- **Response to uneven infrastructure development**

Compared to the old part of Malakal Town, basic infrastructure and services hardly exist in the newly expanded areas, particularly in the Eastern Payam and Southern Payam where a higher ratio of returnees and immigrants from rural areas have settled. Projects and measures for areas with poor social economic infrastructure are necessary.

- **Importance of consideration for livelihood enhancement (improvement of skills and income) in project implementation**

It is important to give priority to the younger generation, socially vulnerable people and returnees when implementing projects aimed at improving livelihoods and providing support to improve skills and income.

### **4.7.3 Conflict Prevention Measure for Social Development**

- **Joint work with communities**

Community projects are useful for helping consolidate the co-existence of local people, but on the larger scale. Therefore, it is desirable that the government work jointly with communities to plan and implement community projects. It is also encouraged to promote cultural activities and organise mass sporting events to promote the peaceful co-existence of different ethnic and tribal groups. Community development requires certain conditions such as stability, good leadership and experience.

### **4.7.4 Conflict Prevention Measures for Governance**

Since land issues are the major cause of disputes, measures for dealing with land issues are

required. They are:

- **Introduction of statutory law for land management**
- **Streamlining of land ownership and land management of public land**
- **A national procedure for land distribution**
- **Clarification between urban planning and land expropriation for implementation of the project**
- **Establishment of land use restrictions for urban planning**

#### **4.8 SEARNS—a Long-sighted Perspective for Urban Development Planning**

##### **(1) Background of SEARNS**

Projects presented in the previous sections in this chapter incorporate the concept of SEARNS, which is a long-sighted perspective for urban development planning extracted from lessons learned from cases in developed countries. Introduction of a long-sighted perspective into a post-conflict situation may be seen as premature. However, massive reconstruction works carried out in Juba are affecting natural living environments. Learning from Juba’s case, the Project introduced a long-sighted perspective at the recovery phase in order to ensure rehabilitation works can be developed smoothly and effectively.

##### **(2) Outline of SEARNS**

SEARNS is a concept to describe the future state of Malakal supplementing the vision and is more directly concerned with project formulation. It should be noted that such elements are mutually interrelated.

The acronym SEARNS is explained below—examples are provided.

S: symbiotic system (co-existence of culture and people with nature)

E: ecological system (preservation of ecology)

A: amenity oriented (integrating amenity into urban planning)

R: recycling system (recycling of resources)

N: network system (networking with other areas/people in various ways)

S: self-supportive system (strong and stable economic and social base)

##### Symbiotic system

A “symbiotic System” involves all people of varying social strata and groups living together, recognising each other’s needs and their unique cultural values and making an effort to establish equal relationships as members of the community. “Symbiotic System” also means co-existence with nature—for instance, co-existence with the Nile River.

##### Ecological System

An “ecological system” involves creating various systems from the viewpoint of protection of the

natural environment from human activities, such as through the use of solar power utilisation systems, rainfall utilisation systems, permeable pavements, etc. Some examples follow.

Solar power is a type of renewable energy that can be used for water heating or generating hot wind.

Rainwater can be harvested and used for domestic purposes such as washing, showering and so on. The storm water drainage problem can also be reduced by storing an increased amount of water, thus reducing discharge.

Permeable pavements allow rainwater to infiltrate into the earth, contributing to the prevention of flooding and improving muddy road conditions. The pavement is also effective in alleviating the accumulation of solar heat in the road.

#### Amenity Oriented

An “amenity oriented” city would maximise amenities for the comfort of the people by creating a comfortable urban environment taking into account location, climate, nature and the social environment by employing good planning principles.

Note: No green areas or parks are observed in other capital cities in South Sudan due to an insufficient legal framework for restriction and inducement of land use.

#### Recycling System

A “recycling system” encourages reutilisation of consumed final products as a resource for other materials or products. They can be reused for different types of goods and are not limited to the same product.

#### Network System

A “network system” intensifies social bond, and prevents a city from becoming isolated from other areas. It enhances mobility of people, freight, and information through face-to-face human networks, communication networks, and transport networks.

For instance, development of alternative transport routes contributes to the stabilisation of the supply of goods. Enhancement of administrative bodies would enable intensification of human networks.

#### Self-supportive System

A “self-supportive system” means a city that is able to support the regional economy by earning money from outside of the area to add value internally. Fundamental industries are essential to bringing this about.

### **(3) Application of SEARNS to Malakal**

Insufficiency or interruption of commodity transport to Malakal caused by the geographical isolation endangers the existence of Malakal. Therefore a self-supportive system (S) for Malakal would go a long way to overcome this risk. Improvement of self-supportiveness can be attained

by improving access to energy and food, and development of the economy.

Introduction of an ecological system (E) and recycling system (R) is desirable for effective utilisation of locally available resources such as oil, solar energy, water and water power of the Nile River.

At the same time, network improvement (N) for smooth and low cost transportation of cargo, passengers and information should be pursued to overcome the geographical remoteness. Reinforcement of the Nile River as a means of transport is included in the network reinforcement.

The self-supportive improvement of Malakal can also be attained through reinforcement of urban functions such as health, education, and administration. Where the needs for high-end urban functions can be satisfied within Malakal, the people will be less likely to approach Juba or foreign countries for their needs.

The peculiar characteristics of Malakal as a regional centre in the Greater Upper Nile Region should be reinforced by way of network improvements for cargo and passenger transportation and information exchange. Reinforcement of urban functions in Malakal will also have a positive ripple effect on the towns and villages in the Greater Upper Nile Region.

Providing a peaceful city doesn't mean that Malakal will automatically be socially stabilised. However, it should help to engender tribal harmonisation, care of socially vulnerable people and rehabilitation of juvenile delinquents and criminals, providing a symbiotic system (S). Such a symbiotic system should provide more opportunities for job creation, which in turn will improve economic development.

“Advanced and beloved city” describes a city where economic activities and living conditions are enhanced through improvement of social services through better social economic infrastructure together with effective organisations and institutions in a structured way.

Considering the indigenous characteristics of Malakal and the technical level of the local people, development of advanced but manageable social economic infrastructure involving local people in the development process should be promoted. Attention should also be paid to urban amenity (A) along with cost efficiency as fundamental values in urban planning and environmental administration for the long term. Urban planning is composed of projects and control of private construction activities, however, in South Sudan the control aspect is quite weak. In this regard, control of private construction activities should be implemented in Malakal through the improvement of the local administration by referencing advanced examples in other countries.

#### **4.9 CONCLUSION**

In this chapter, planning stages of the Comprehensive Plan were presented. *The SSDP, UNS Strategic Plan 2012/13–2014/15*, and *Makal County Strategic Plan* were reviewed as references to establish a vision for the development of Malakal. *The SSDP 2011-13* is a national plan that

sets out a medium-term agenda for development. The key national development pillars that encapsulated the development priorities are as follows: Governance, Economic Development, Social and Human Development, and Conflict Prevention and Security. The same pillars were established in the *UNS Strategic Plan 2012/13–2014/15* to contribute to the realisation of the state vision and mission.

Taking into consideration the above development plans and the results of the SWOT analysis and Problem Structure Analysis, “Vision Malakal for 2022” and the Comprehensive Plan were established as follows: “Toward a peaceful, self-supportive, advanced and beloved city co-existing with the Nile River”.

To deliver the above vision, the following Development Strategies of the Comprehensive Plan were designed: 1) Malakal Infrastructure Development Strategy, 2) Region-wide Economic Development Strategy, 3) Social Development Strategy, and 4) Peacebuilding/Governance Strengthening Strategy. These strategies follow the four pillars of the SSDP. However, the pillars of “Governance” and “Conflict Prevention and Security” in the SSDP are merged with the “Peacebuilding/Governance Strengthening Strategy” in the Comprehensive Plan. Conversely, the “Economic Development” pillar in the SSDP is broken into the “Malakal Infrastructure Development Strategy” and “Region-wide Economic Development Strategy”.

The Development Programmes under each strategy are as follows:

Malakal Infrastructure Development Strategy and Programmes

- Water Supply Programme
- Road Improvement Programme
- Public Transportation and Traffic Safety Programme
- Sanitation Improvement Programme
- Drainage Improvement Programme
- Solid Waste Management Programme
- Power Supply Programme
- Emergency Services Reinforcement Programme

Region-wide Economic Development Strategy and Programmes

- Region-wide Transportation and Logistics Development Programme
- Primary Industry Development Programme
- Investment Climate Improvement Programme
- Research and Industrial Human Resources Development Programme

Social Development Strategy and Programmes

- Health and Medical Improvement Programme
- Education Improvement Programme
- Social Safety Net Programme
- Culture and Sports Promotion Programme



- Participatory Development Promotion Program
- Peacebuilding/Governance Strengthening Strategy and Programmes
- Conflict Mitigation Programme
- Individual Capacity Development Programme
- Organisational, Institutional, and Social Capacity Development Programme

Three scenarios of high, medium, and low growth were examined under the Socio-Economic Framework, which consists of the population framework and the economic development framework. In the Comprehensive Plan, the medium growth scenario was adopted, shown in **Table 4.9-1**.

**Table 4.9-1 Socio-Economic Framework of Medium Growth Scenario Targeted 2022**

Item	Unit	2012	2022 (Medium Growth Scenario)
Population	Thousand	153	240
Population Average Increase (2012-2022)	%/year	4.6	
GRDP	Million SSP	473	1,131
GRDP Average Increase (2012-2022)	%/year	9.1	
GRDP Per Capita	SSP	3,094	4,706
	US\$*	1,049	1,595
GRDP per Capita Average Increase (2012-2022)	%/year	2.1	
Unemployment	%	40	20

\*\*US\$=2.95 SSP

Note: GDP per capita of South Sudan was 1,546 US\$ in 2011.

Source: JICA Project Team

As for the spatial development framework, two alternative structures—a concentric pattern and a disperse pattern—based on the present urban pattern of Malakal Town (with the determining factor of port development) were formulated and examined. The dispersed urban pattern was adopted.

**Table 4.9-2 Urban Structure Patterns (Dispersed Pattern)**

Item	Urban Function Pattern
	Dispersed Pattern
Transport network	• New Malakal Port is located outside of Malakal Town.
	• Regional transport network can be more systematically formed by separating intra- and inter-regional traffic, and flows of commodities and passengers.
	• Traffic congestion in the central area of Malakal Town could be avoided.
Urban area development	• Investment amount will be expanded because of expanded urban area development.
	• Urban area expansion can be more flexible.
Environmental protection	• Encroachment of urban functions to the Nile River bank is promoted.
Role of administration	• Administrative interference in land use activities will be necessary. Close consultation with Shilluk people will also be indispensable.

Source: JICA Project Team

Recommendations from the viewpoint of conflict prevention were prepared under each strategy of the Comprehensive Plan as shown in **Table 4.9-3**.

**Table 4.9-3 Recommendations on Conflict Prevention by Strategy of the Comprehensive Plan**

	Strategy	Recommendation
1	Malakal Infrastructure Development	<ul style="list-style-type: none"> <li>• Prioritisation of BHN in infrastructure development</li> </ul>
2	Region-wide Economic Development	<ul style="list-style-type: none"> <li>• Response to uneven infrastructural development</li> <li>• Importance of consideration for enhancement of livelihood (improvement of skills and income) in project implementation</li> </ul>
3	Social Development	<ul style="list-style-type: none"> <li>• Joint work with communities</li> </ul>
4	Peacebuilding/Governance Strengthening	<ul style="list-style-type: none"> <li>• Introduction of statutory law for land management</li> <li>• Streamlining of land ownership and land management of public land</li> <li>• National procedure for land distribution</li> <li>• Clarification between urban planning and land expropriation for implementation of the project</li> <li>• Establishment of land use restrictions for urban planning</li> </ul>

Source: JICA Project Team

The concept of SEARNS as a long-sighted perspective for urban planning extracted from the lessons learned from cases in South Sudan and other developing countries was presented for the formulation of the Comprehensive Plan. It could be thought that the introduction of SEARNS into a post-conflict situation is premature, however, the magnitude of reconstruction work in Juba and its outcomes indicate that having a long-sighted perspective at the reconstruction phase is necessary for a smooth and effective transition from reconstruction to development.

**< PART III >**

**SECTOR ANALYSIS**

## **CHAPTER 5 WATER SUPPLY**

In this chapter, the following perspectives regarding the Water Supply Sector are presented and analysed; 1) Institutional Framework, 2) Policies and Strategies, 3) Financial Resources, 4) Operation and Maintenance System, 5) Facilities and Staffing, 6) Findings from Relevant Survey(s), 7) Programmes and Projects, and 8) Needs and Issues. And then, 1) development plans are formulated based on the present situation, needs and issues, and 2) projects are proposed from technical point of view.

### **5.1 INSTITUTIONAL FRAMEWORK**

#### **5.1.1 Ministry of Water Resources and Irrigation (MOWRI), Republic of South Sudan (ROSS)**

The Ministry of Water Resources and Irrigation (MOWRI), Republic of South Sudan (ROSS) has the following responsibilities for the development of water resources in South Sudan: drafting and overseeing the implementation of policies, guidelines, Master Plans and regulations for water resources development, conservation, management, and scientific research. In addition, according to MOWRI, MOWRI supervises the operation of the South Sudan Urban Water Corporation (SSUWC).

#### **5.1.2 The South Sudan Urban Water Corporation (SSUWC)**

The SSUWC was established in 2007 with responsibility for provision of water services in urban areas. It is to operate urban water facilities, to improve their sustainability and to expand the service coverage. The headquarters of the SSUWC is located in Juba.

Water supply in Malakal Town has been served by SSUWC-Malakal, a branch office of the SSUWC, since 2007.

### **5.2 POLICIES AND STRATEGIES**

In order to develop water resources, the preparation of a Water Policy started in January 2005, after the historic signing of the Comprehensive Peace Agreement (CPA), and was completed in November 2007.

The overall goal of the Water Policy is to support social development and economic growth through promotion of an efficient, equitable and sustainable water supply development. The purpose of the Water Policy is to outline the vision of the water supply sector of ROSS and to establish basic principle and objectives so as to guide future water supply development. The Water Policy consists of the future policies for water development required for domestic, agriculture, forestry, livestock, fisheries, industry, hydropower, waterways and transportation environment.

As per the Water Policy, the key issues for the water sector in ROSS are as follows:

- (i) Inadequate institutional arrangement

- (ii) Low level of access to stable supply of safe water
- (iii) Underdevelopment of water resources
- (iv) Limited participation by water users in development process
- (v) Lack of sustainability of water supply facilities
- (vi) Pollution of water resources
- (vii) Water disaster and drought
- (viii) Water use conflict
- (ix) Water source conflict in trans-boundary area
- (x) Lack of organization capacity for water supply
- (xi) Lack of clear financing strategy

In addition, for the purpose of the promotion of decentralization in the water supply sector, ROSS prepared a draft Water Bill 2013, which set out the policy and strategy of decentralization of the water supply sector. This Bill has not been authorized yet.

During the Project period, the SSUWC has not commenced the Sector Development Plan (2011 – 2013) for urban water supply. However, water service coverage in urban areas were targeted to increase from 34% in 2010 to 35%, 38% and 45% in 2011, 2012 and 2013 respectively in the South Sudan Development Plan. There is no mid-long term plan for the water supply sector beyond year 2013.

**Table 5.2-1** shows the projects for the year 2011 – 2013 planned for an achievement of the targeted service coverage. The project for urban water infrastructure development in Malakal Town is not included in the plan.

**Table 5.2-1 Projects Carried Out between 2011 and 2013**

(As of August 2011)

On-going or Budgeted Activities	Cost South Sudan Pounds (SSP) ('000s)		
	2011	2012	2013
<b>On-going or Budgeted Activities</b>			
- Rehabilitation and extension of urban water supply systems in Wau (USAID) and piloting in Yei (GIZ)	15,000	4,000	4,000
- Operating costs SSUWC HQ and areas	2,250	4,500	4,500
- Salaries for SSUWC HQ and areas	6,000	12,000	12,000
- Construction and equipping of SSUWC offices	1,600	1,600	1,600
- Capacity development for urban water carders (USAID, JICA, GIZ)	2,500	4,000	2,100
- Feasibility studies, designs for water supply systems in Torit, Rumbek, Kuajok, Aweil, Bentiu, Yambio, Bor (MDTF*) and Yei (KfW)	4,000	7,000	-
<b>Additional Activities</b>			
- Operation and maintenance: <ul style="list-style-type: none"> <li>• metering system (incl. supply of equipment) towards improvement of billing and customer service, etc.;</li> <li>• repair and extension of distribution networks and consumer connections;</li> <li>• establishment and equipment of urban water maintenance teams</li> </ul>	-	7,500	10,000
- Construction of new water supply systems in Juba (JICA), state capitals, Yei (KfW), and other major towns	-	150,000	250,000
- Upgrading and absorption of pre-urban small water systems under urban water supply management	-	2,000	4,000
- Improve and sustain the supply chain for water treatment chemicals	-	5,000	8,000
- Skills and knowledge development and training for urban water personnel	-	600	1,000

\* Multi Donor Trust Fund

Source: South Sudan Development Plan 2011-2013 (August 2011)

### 5.3 FINANCIAL RESOURCES

The entire water tariff collected from beneficiaries is sent to Ministry of Finance (MOF) of ROSS from the SSUWC of each area. Central government allocates annual budget to SSUWC for the salaries of staff and cost of fuel and chemical until 2011. According to the preliminary study report of JICA in 2011, the annual budget of SSUWC is approximately South Sudan Pounds (SSP)19 millions (for the year 2011). However, the allocated annual budget was reduced to SSP17 millions in the fiscal year of 2012 because of austerity as oil production was suspended. Eventually, approximately SSP1.0 million was actually allocated to SSUWC-Malakal from July 2012 to June 2013. Therefore, since the budget required for operation and maintenance of water supply system may not be fully allocated from the central government, the budget of SSUWC must in future be self-supporting and rely on water tariff revenues rather than government subsidies (so called “ring-fence operation”).

### 5.4 OPERATION AND MAINTENANCE SYSTEM

#### 5.4.1 Water Use

Water use is categorized into the following four variations as described in detail in **Table 5.5-1**.

- (i) Supplied by SSUWC through water pipes

- (ii) Supplied by a non-Governmental organization (NGO) at its treatment plant
- (iii) Sold by vendors either purified or non-purified
- (iv) Taken directly Nile River without treatment

Water sold by private vendors is much higher in price than water supplied by SSUWC-Malakal. As mentioned afterward, at least 87% (about 140,000 in 2013) of total population in Malakal Town has been forced to receive water at a high cost which is about 60 times the flat rate of SSUWC-Malakal water and makes up about 60% of the monthly average income in Malakal Town.

#### 5.4.2 Water Supply Service in Malakal Town

Water pressure condition in the following areas in Malakal Town is shown in **Figure 5.4-1**.

- (i) Central Zone: Area with a focus on Jallaba
- (ii) North Zone: Area with a focus on Thorat Luakat and Thorat Malakia
- (iii) East Zone: Area with a focus on Biathin and Hai Television Area
- (iv) South Zone: Area with a focus on Dengershufu, Assossa and Terawa

Water supply service of SSUWC-Malakal is summarized in **Table 5.4-1**.

**Table 5.4-1 Summary of Water Supply Service of SSUWC-Malakal, UNS**

(As of August 2013)

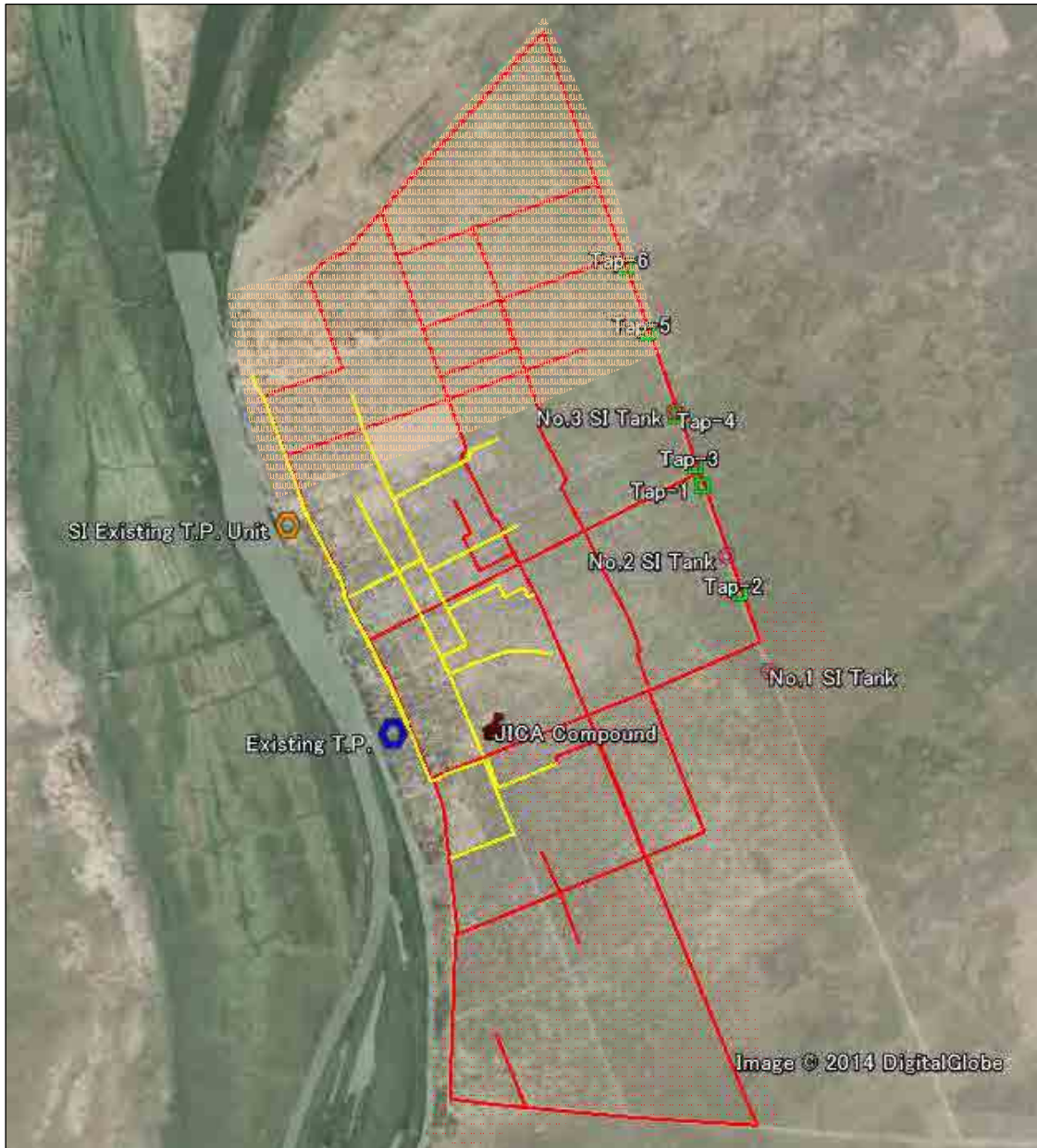
No.	Item	Unit	Data	Remarks (Information Source)
1	Population (2012)		153,000	Town profile of this study
2	Service Population (2013)		20,505	Assumed based on number of service connections obtained by field survey
3	Water Service Ratio	%	13.4	
4	Number of Service Connection		2,663	
5	Number of Installed Water Meters	meters	0	Data of SSUWC-Malakal
6	Water Production	m <sup>3</sup> /d	1,500	Assumed based on actual performance of pump
7	Revenue Water	m <sup>3</sup> /d	300	Calculation Condition: Residence: 20 litre per capita per day Commercial: 4-30m <sup>3</sup> /day
8	Revenue Water Ratio	%	20	
9	Non-Revenue Water Ratio	%	80	

Source: JICA Project Team and SSUWC-Malakal

Water consumption is not measured through water meters. SSUWC imposes a water tariff at a flat rate multiplied by the diameter of service pipes for domestic users and that of metered rate for business for commercial users. In addition, there still exist the pipes deteriorated and damaged by road construction which may be leading to large scale water leakage. Consequently, revenue water accounts for approximately 20% of the total water production.

**Table 5.4-1** shows raw data of a financial statement between 2009 and 2012 obtained from SSUWC-Malakal. Salaries, overtimes, incentives and bonuses are paid for by central government and not considered as expenses by SSUWC Malakal. There is a surplus between 2009 and 2011 but not in 2012. Conventionally, the cost of fuel and chemical use of each SSUWC branch was borne

by central government. However, SSUWC-Malakal did not receive funds from central government and had to bear these cost (SSP427,356 in 2012). This is the main reason for a deficit situation regarding SSUWC-Malakal in 2012.



Legend	
	Treatment Plant
	Unit Type Treatment Plant of Solidarity International (SI)
	Existing Elevated Tank
	Tap: Public Tap of SSUWC
	Replaced Pipelines
	Not Replaced Pipelines
	Service Area with acceptable Water Pressure
	Service Area with Low Water Pressure
	Service Area with Lower Water Pressure
	Service Area in Serious Water Scarcity

Source: JICA Project Team

**Figure 5.4-1 Current Condition of Water Supply Service**



**Table 5.4-2 Financial Status of SSUWC-Malakal**

(Unit: South Sudan Pounds (SSP), As of August 2013)

Item	2009	2010	2011	2012
<b>Revenue</b>				
Water tariff	129,000	223,403	399,600	361,712
Connection fee	3,200	10,300	5,600	4,500
Subsidy	0	20,000	50,000	0
<b>Total</b>	<b>129,008</b>	<b>223,403</b>	<b>399,600</b>	<b>366,212</b>
<b>Expenditure</b>				
Salaries	(490,502)	(634,734)	(1,123,464)*	(718,236)
Overtime	(139,091)	(115,218)	(54,469)	(301,560)
Incentive	(27,051)	(43,839)	(4,164)	(88,080)
Bonus	0	(39,250)	(196,378)	(2,400)
Duty allowance	14,887	2,953	73,038	0
Acting allowance	0	5,953	0	26,676
Daily workers	0	12,644	0	21,000
Fuel	36,331	75,118	64,072	427,356
Maintenance	19,843	10,501	19,373	158,434
Office expenses	9,273	9,302	8,842	4,448
Airtime allowance	9,273	14,805	0	0
Stationary	8,380	15,823	70,109	25,200
Advertisement	0	900	0	43,080
<b>Total</b>	<b>83,100</b>	<b>145,046</b>	<b>162,396</b>	<b>706,194</b>
<b>Balance</b>	<b>49,108</b>	<b>108,657</b>	<b>292,804</b>	<b>-339,982</b>

Note:

- Basically, fuel and chemical are provided from SSUWC headquarters. However, in case of shortage of fuel provided from SSUWC headquarters, SSUWC-Malakal bears cost of fuel.
- Borne by the central government, the expenses bracket off was not counted as expenditure for balance.
- \* Personnel cost in 2011 is exceptionally higher to compare with that in other years. SSUWC-Malakal explained that employment of staff members has sharply increased in this year. However, this explanation shall be clarified more in detail since personal cost in 2012 has decreased again.

Source: SSUWC-Malakal

### 5.4.3 Current Situation for Operation and Maintenance by SSUWC-Malakal

The budget of SSUWC-Malakal is allocated from SSUWC headquarters. Fuel and chemicals required for operation of the water supply system should be directly supplied to each SSUWC once a year. However, SSUWC-Malakal spent some amounts of O&M expenses to purchase fuel, etc. due to insufficient supply from SSUWC headquarters. Especially, SSUWC-Malakal had to bear high expenses to purchase fuel in 2012, which resulted in deficit finance situation. Since 2012, SSUWC-Malakal has been forced to operate the treatment plant for four hours a day.

There are about 90 staff members in SSUWC-Malakal as of 2013. Of the 90 staff members, even though 39 persons are in charge of O&M of the treatment plant, the existing treatment plant has not been operated and maintained sufficiently well by SSUWC-Malakal. This is because of a lack of skilled engineers and technicians as well as the deteriorated condition of the treatment plant.

In the existing treatment plant, raw water is treated by sand filtration in three systems and then

ultra-filtration. From the result of a treated water quality analysis, the quality of water mixed in clean water reservoir did not meet the World Health Organization (WHO) guideline standard. Water is not being treated properly, because of a failure of dosing control and defective flocculation basin, amongst other reasons.

For example, the results of water quality analysis for the treatment plant when checked by JICA Project Team on the morning of 3<sup>rd</sup> July, 2012 are shown in **Table 5.4-3**.

**Table 5.4-3 Water Quality Data of Treatment Plant**

(As of July 2013)

	Item	Sampling Site	Raw Water of SSUWC	1st Sedimentated Water of SSUWC	1st Sand Filtrated Water of SSUWC	2nd Sedimentated Water of SSUWC	2nd Sand Filtrated Water of SSUWC
		Date	2012/7/3	2012/7/3	2012/7/3	2012/7/3	2012/7/3
1	pH	-	6.5	6.7	6.7	3.9	4.2
2	Turbidity	NTU	95	90	93	9	11
3	Water Temperature	°C	28.8	28.8	28.8	28.8	28.8
4	Color	-	Light Brown	Light Brown	Light Brown	No color	No color
5	Electro Conductivity	mS/m	15.7	15.6	15.3	21.0	21.0
6	E.Coli	Cell/mL	27	16	14	1	0

Note: Data was collected by JICA project Team in the field.

Source: JICA project Team

The following are to be improved, judging from **Table 5.4-3**.

- (i) Coagulation dosing control
- (ii) Installation of mixing tank for coagulation
- (iii) Augmentation of sedimentation tank and sand filtration unit
- (iv) Design of sand filtration structure

Currently, the actual quantity of water production is not being measured because a water flow meter is not available. In addition, since water meters have not been installed in the house connection, actual consumption is not clear. Hence, a water audit cannot be undertaken under this situation on O&M work.

In terms of pipeline system, pipes are not repaired at the points where water is leaking due to limited budget. Lack of drawings, information of pipeline system and procurement of spare parts make it more difficult for SSUWC-Malakal to conduct repair works. Consequently, regular maintenance work is not conducted at all.

## 5.5 FACILITIES AND STAFFING

### 5.5.1 Water Supply Facility of SSUWC-Malakal

**Table 5.5-1** shows outlines of the existing water supply facilities managed by SSUWC-Malakal. Water production is 30% of design capacity due to a shortage of capacity in the purified water reservoir, lack of transmission pump capacity, failure of sand filtration, and other reasons. About 50km of existing pipes were laid in 1937 and are now in an advanced state of dilapidation. The location of existing pipes is shown in **Figure 5.4-1**. In 2013, only 1,500m<sup>3</sup>/day (10% of the

design capacity) is produced because of a shortage of fuel.

**Table 5.5-1 Current Condition of Water Use**

(As of August 2013)

No.	Variation in Water Use	Organization	Water Tariff	Information Source
1	Piped water through SSUWC's water supply system	SSUWC-Malakal, UNS	Residential: Flat rate <ul style="list-style-type: none"> <li>• SSP26 for 25mm</li> <li>• SSP15 for 19mm (supposed that monthly water consumption of a household is 12m<sup>3</sup>, SSP1.25/m<sup>3</sup>)</li> <li>• SSP12 for 13mm</li> </ul> Commercial: Metered rate <ul style="list-style-type: none"> <li>• 4-30m<sup>3</sup> x SSP61 for hotel</li> <li>• 4-20 m<sup>3</sup> x SSP45 for general commercial</li> <li>• 4-10 m<sup>3</sup> x SSP61 for public office</li> </ul>	SSUWC-Malakal
2	Point supply through the unit type treatment plant which was installed by Solidarities International (NGO)	UNS and local residents of O&M work	Residential: Free of charge Commercial (jerry can): SSP3 for 20lx 4cans Commercial (drum can): SSP4 for 200lx 1can	Local residents of O&M work
3	Purchasing purified or non-purified water from water vendors with donkey and or trucks	Private	SSP15 for drum can (200 litre) (SSP75/m <sup>3</sup> )	JICA Project Team
4	Nile River without any treatment	-	Free of charge	-

Source: SSUWC-Malakal SSP1=about JP¥24 (at the middle of February 2012)

**Table 5.5-2 Water Supply Facility of SSUWC-Malakal**

(As of August 2013)

Items	Specification	Basis
Design Capacity	14,800m <sup>3</sup> /day (24hrs) <ul style="list-style-type: none"> <li>• Chemical clarification &amp; filtration: 10,800m<sup>3</sup>/day</li> <li>• Ultra-filtration: 4,000m<sup>3</sup>/day</li> </ul>	Interview with SSUWC
Water Production	About 1,500m <sup>3</sup> /day (3hrs-operation) (About 10% of design capacity)	Based on pump capacity and operation hours: 100m <sup>3</sup> /hr. x 2pumps x 3-4hrs=700m <sup>3</sup> /day 250m <sup>3</sup> /hr. x 1pump x 3-4hrs=850m <sup>3</sup> /day
Purified Water Reservoir	2 reservoirs (Of two, one tank capacity is 256m <sup>3</sup> )	Interview with SSUWC
Transmission System	4 system lines	
Main Pipelines (Diameter: at least 100mm)	Deteriorated pipes: 52km	Interview with SSUWC
	Replaced pipes: (2009): 92km	Interview with SSUWC 300mm: 3.5km 200mm: 8.5km 150mm: 30km 100mm: 50km
Elevated Tank	About 25m <sup>3</sup> x 3tanks	
Water Points (Public Taps)	6points x 11faucets (only along Ring Road)	

Source: SSUWC-Malakal

Consumers were not satisfied with water supply service due to the failure of stable water supply service and vandalized pipes, resulting in suspension of operation part of water supply facilities.

Moreover, pipes damaged by road construction have further aggravated water outages. Approximately 3,500 consumers have not currently received water supply service from SSUWC-Malakal.

SSUWC-Malakal acknowledges responsibility for the pipes damaged by the road construction as SSUWC-Malakal could not provide the road contractor with the necessary information such as drawings and an inventory of the existing pipelines. Hence, SSUWC-Malakal could not ask the road contractor for compensation for the damaged pipes. However, it is too difficult for SSUWC-Malakal to bear the repair costs of the damaged pipes (about US\$400,000) because of budget constraints.

A schematic flow-diagram of intake to transmission facilities is shown in **Figure 5.5-1**.

### **(1) Water Treatment Plant (WTP)**

The first WTP was constructed in 1937 during the colonial administration of the United Kingdom. Afterward, the WTP was expanded and rehabilitated by the Government of Sudan (GOS) in 1964, by the United Nations Children's Fund UNICEF in 2003, and by GOSS and UNS in 2009. In 2009, two floating intake facilities, flocculation basin and membrane facilities were constructed by GOSS. In 2012, the chemical dosing facilities, and three elevated tanks reserving the purified water from the 1<sup>st</sup> station were constructed by United States Agency for International Development (USAID).

### **(2) Intake Facilities**

Total capacity of intake facilities is approximately 13,000m<sup>3</sup>/day, which consist of an intake well of approximately 10,000m<sup>3</sup>/day and floating intake of approximately 3,000m<sup>3</sup>/day. Half the number of total pumps or more were broken down during the times of survey.

### **(3) Water Transmission Facilities**

The total capacity of the water transmission facilities is approximately 17,000m<sup>3</sup>/day, and consists of two systems. The first system has two pumps to lift water from Line 1 and Line 2 up to three elevated tanks, the total capacity of which is approximately 5,000m<sup>3</sup>/day. The second system has two pumps to supply water from Line 3 and Line 4 to distribution, the capacity of which is approximately 12,000m<sup>3</sup>/day.

## **5.5.2 Water Supply Facility of NGO (Solidarities International: SI)**

In order to protect refugees from water-borne diseases, a unit type treatment plant (150m<sup>3</sup>/day) was installed by SI, a French NGO, in Malakal Town in 2007. Operation time is 12 hours a day (7:00-19:00) and water production is 75m<sup>3</sup>/day. According to local operators, 3,500 to 4,000 local people receive water at the site of the treatment plant. Addresses of these people are not readily

known. One household, with household size of five persons, consumes five jerry-cans (20 litres per can) of water a day, hence, it can be assumed that the people may consume 20 litres of water per capita per day. Outlines of the unit type treatment plant are shown in **Table 5.5-3**.

**Table 5.5-3 Outlines of Unit Type Treatment Plant**

(As of May 2012)

Item	Detailed Items	Contents
1. Unit Type Treatment Plant	Manufactures	Véolia Water Force, France
	Design Capacity	150m <sup>3</sup> /day
	Water Production	75m <sup>3</sup> /day
	Treatment Process	Clarification -Filtration- Soda-ash- Disinfection
	Composition of the Treatment Plant	<ul style="list-style-type: none"> <li>• Engine pump</li> <li>• Generator</li> <li>• Purification Module</li> <li>• Purified Water Tank of 75m<sup>3</sup> x 2 tanks</li> <li>• Suction pipes</li> <li>• Transmission pipes in the compound</li> </ul>
	Cost in 2007 (including transportation)	About EUR180,000 (About JP¥18,900,000)
2. Period of Procurement		About two months
3. Period of Installation		About two weeks
4. Number of Staff required for Installation		<ul style="list-style-type: none"> <li>• Engineer from manufacture: one person</li> <li>• Assistant engineer from manufacture: one person</li> <li>• Labours: 10 persons</li> </ul>
5. Monthly Cost of Operation and Maintenance based on Assumption of Manufactures	Cost composition of O&M	<ul style="list-style-type: none"> <li>• Personnel</li> <li>• Petroleum</li> <li>• Oil</li> <li>• Aluminium sulphate</li> <li>• Calcium hypo-chloride</li> <li>• Miscellaneous</li> </ul>
	Planned cost in 2007 Actual cost in 2012	About SSP7,600 (about US\$2,576) About SSP18,000 (about US\$6,102), Monthly fuel: SSP9,000 Monthly personnel: SSP9,000

Source: Solidarity International (NGO) and local operation and maintenance staff

SI operated the plant until 2010. Afterward, the treatment plant was turned over to the UNS and six local residents took over facility for operation and maintenance. The six local residents were composed of two tariff collectors and four technicians including a maintenance leader.

As shown in the above table, monthly operation cost of SSP7,600 was estimated by manufacturer who delivered the unit type treatment plant, but SSP18,000 was actually spent due to oil price inflation with an inflation rate of 12% to 36% per annum during 2007 – 2010.

### 5.5.3 Water Quality Laboratory of SSUWC-Malakal

The current condition of the water quality laboratory in SSUWC-Malakal is summarized below;

[Personnel]

- There are two persons in charge of analysis for water quality.
- Staff members have never used jar tester funded by SI because of shortage of power supply.

[Equipment]

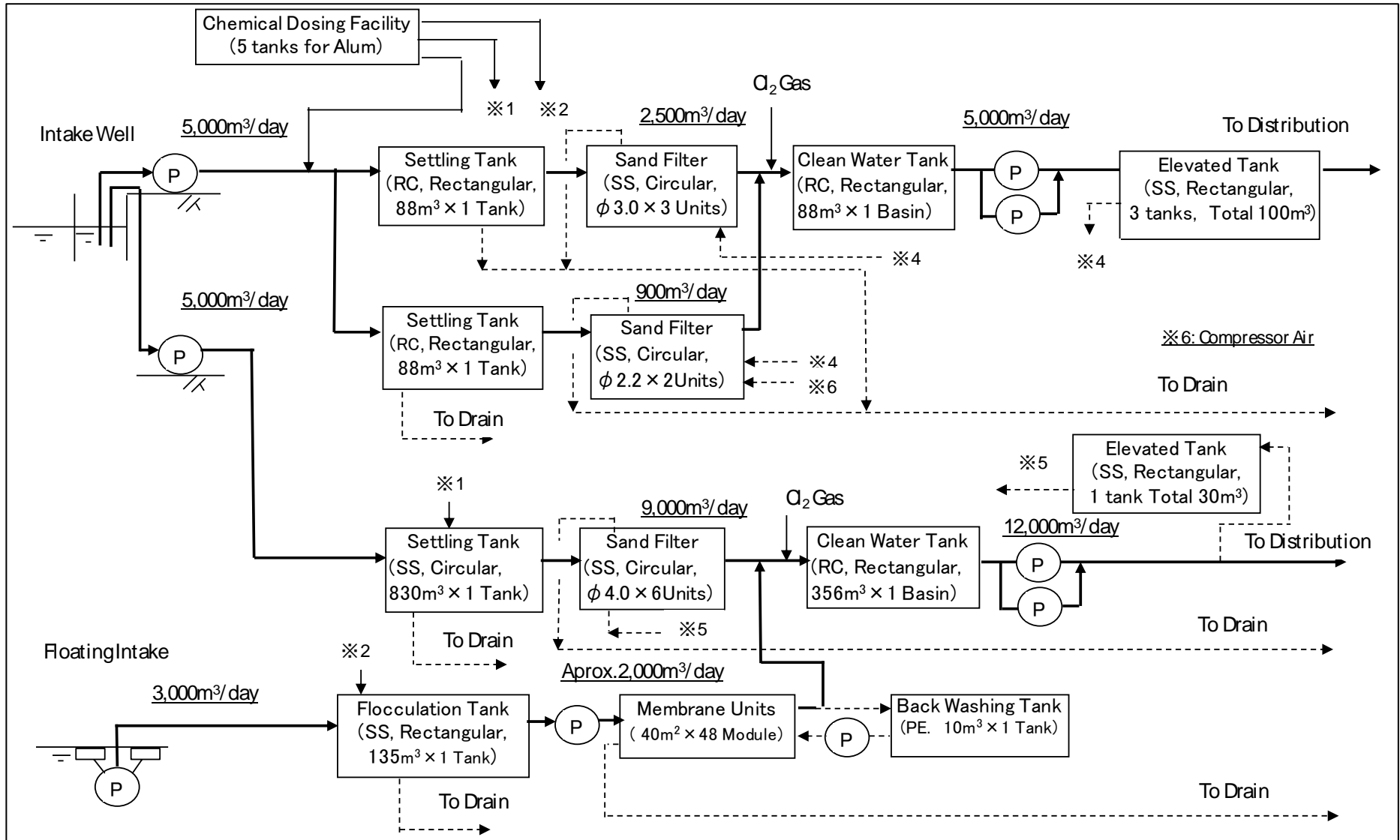
- There are turbidity meter, electro conductivity (EC) meter, pH meter, jar tester, incubator and electrical balance tec. in the laboratory. EC meter is not used because of shortage of battery. Confirmation was made that jar tester and electrical balance were functional.
- It was found that the values measured by the turbidity meter and the pH meter in the laboratory were inaccurate when compared with those carried out by the JICA Project Team.

[Chemical]

- There are no chemicals for adjusting pH equipment etc. because of budget constraints.
- Most of the facilities and chemicals are funded by developing partners such as SI or UNICEF. SSUWC have never bought any chemicals and have never repaired the analysis facilities, despite staff members in the laboratory requesting their boss or the headquarters of SSUWC in Juba to buy or repair them.

[Method]

- Only the turbidity of raw water and treated water are measured every day at present because of power shortage, defective equipment, etc.



Source: JICA Project Team

Figure 5.5-1 Existing Water Treatment Plant in SSUWC-Malakal

#### **5.5.4 Ex-Water Supply Facility of Rural Water Department of MoPI&RD**

This was an ex-treatment plant, consisting of a bladder as a storage tank and public taps, 2.5km south from the existing treatment plant of SSUWC-Malakal. This water supply system was managed by the Rural Water Department, who was responsible for rural water service and was one of the departments in State Ministry of Physical Planning and Rural Development, UNS (MoPI&RD),.

The ex-treatment plant employs a very simple treatment process. During operation of the system, residents took water without any payment. Therefore, aluminium sulphate as coagulant and hypo-chloride calcium for disinfection were granted by SSUWC-Malakal and UNICEF. However, SSUWC and UNICEF suspended supplying chemicals and it has not been used as a public water supply system since. Currently, private water vendors operate the facility intermittently for their private purpose.

### **5.6 FINDINGS FROM RELEVANT SURVEY(S)**

#### **5.6.1 Possibility of Groundwater Development**

United Nations Mission in South Sudan (UNMISS) explored the groundwater potential in their compound previously. A summary of the result is excerpted as follows:

- (i) Exploration Site: Jallaba (Former compound of UNMISS)
- (ii) Test wells: Two
- (iii) Average depth of two test wells: About 90m
- (iv) Optimum pumping yield: About 2,000l/hours (2,000 beneficiaries in case of 20 litre per capita per day)
- (v) Water quality: High saline water (8,220µS/cm)

Conventionally, the use of groundwater as potable water is uncertain, and there are no data for water quality or quantity of groundwater. If surface water is changed into groundwater for future potable water, it is important that an exploration of the groundwater potential be carried out. Since Malakal Town is close to the Nile River, it is not difficult to use it for water supply. In order to develop groundwater for the future, use of groundwater should be justified through the examination of O&M system and O&M cost in comparison with that of surface water.

#### **5.6.2 Result of Water Quality Analysis**

##### **(1) Purpose of Water Quality Survey**

The JICA Project Team conducted a water quality survey on the Nile River, and treated water of the SSUWC-Malakal's treatment plant and the unit type treatment plant funded by SI in Malakal Town to examine the various items described below:

- (i) Suitability as a water source: whether the water quality of the Nile River around Malakal



Town meets the required level as a source for potable drinking water.

- (ii) Current pollution levels in the Nile River water around Malakal Town
- (iii) The current quality of the treated water coming from the existing treatment plant UWC-Malakal
- (iv) The current quality of the treated water in the existing unit type treatment plant funded by SI

## **(2) Method of Water Quality Survey**

For conducting the water analysis, a simple method conducted on the site by JICA Project Team and the official method conducted by the Japanese laboratory were adopted. 10 parameters such as pH, turbidity, water temperature, colour, dissolved oxygen (DO), electro-conductivity, nitrate-nitrogen, ammonium-nitrogen and E-coli were analysed by a simple method and 34 parameters by laboratory analysis method.

## **(3) Results of Water Quality Survey**

The results of the water quality survey, the samples of which were taken from water treatment plant of SSUWC and SI from February 22 to February 23, are shown in **Appendix A-4**

As a result of the water quality survey, it is concluded that turbidity and bacteria are the main concerns in the water treatment processes. It is assumed that the appropriate water treatment process would be composed of coagulation, sedimentation, filtration and disinfection. If colour cannot be removed by coagulation and sedimentation, which can be checked by a jar test easily, installation of active carbon may one of the possible solutions. The key to raw water treatment is coagulation. Coagulation is the best process to reduce the alkalinity and turbidity of raw water. The result of the coagulation process is dependent on regular effort in improving the performance of filtration. The cost for the operation of water treatment is also dependent on the performance of the coagulation step.

It is recommended that the jar test be conducted regularly through the year, including the dry season and rainy season, to maintain the operation of the appropriate water treatment process by monitoring the condition of coagulation, pH and amount of soda ash etc.

## **(4) Summary of Water Quality Survey**

SSUWC-Malakal analysed raw water in the Nile River and treated water for the treatment plant of SSUWC and unit type treatment plant of SI in collaboration with the JICA Project Team. Methods of analysis were composed of field and laboratory analysis. The result of the analysis is shown in **Appendix A-4**. Concentration of aluminium in the raw water passed the standard of WHO guideline but, concentration of aluminium sulphate of the treated water exceeded the standard a little. This increase in the concentration of aluminium after treatment may be effect of coagulant (aluminium sulphate).

Turbidity and E. Coli in treated water of the treatment plant must meet WHO guideline.

## **5.7 PROGRAMMES AND PROJECTS**

### **5.7.1 Rehabilitation of the Water Supply Facilities**

Rehabilitation of the water supply facilities in SSUWC-Malakal consists of two projects as follows:

#### **(1) Rehabilitation of Distribution Pipe Network**

This project was to replace the distribution pipelines of approximately 92km in Malakal Town. The rehabilitation was carried out in 2009. However, some of the pipelines were damaged by recent road construction because the location of underground pipes was not readily identified due to a lack of information and drawings of the existing pipelines. The SSUWC-Malakal could not supervise construction work appropriately by providing information of the existing pipeline networks.

#### **(2) South Sudan Infrastructure Service Program**

The SSUWC-Malakal implemented rehabilitation of the elevated tanks located in the UNS government office and installed chemical (aluminium sulphate and soda ash) dosing system by the fund of USAID. The work of the rehabilitation and installation was completed in May 2012. However, water production has reached only 30% of a design capacity in 2012, then further reduced to 10% in 2013, because of lack of a power supply and fuel for generators.

### **5.7.2 Capacity Building for SSUWC**

The capacity development is supposed to be carried out with the assistance of USAID to SSUWC headquarters and will be expanded to Juba, Wau and Malakal. According to SSUWC-Malakal, the specific contents of the capacity development plan are not notified by SSUWC headquarters yet. SSUWC-Malakal still has no information on the scope of the program and time schedule.

## **5.8 NEEDS AND ISSUES**

### **5.8.1 General Issue**

The service coverage for the public water supply system of SSUWC-Malakal is about 13% in the year 2013, according to the number of contracted customers. People who have not received the piped water supply service, have been forced to use raw water taken from the Nile River. Promotion of service coverage (promotion of safe and stable water supply) is the highest priority issue in Malakal Town for water supply development. Besides, SSUWC has various issues; capacity of water supply service for treatment, transmission/distribution, and financial management system. For the financial management system, the Central Government has not

subsidized since 2012. Therefore, the annual budget for O&M should be ensured by SSUWC Malakal utilizing the water tariff collected. Thus, comprehensive improvements are necessary to upgrade the water service. The following challenges were observed.

- (i) Supply safe and stable water
- (ii) Eliminate areas in water scarcity
- (iii) Eliminate areas in low water pressure
- (iv) Raise the water revenue ratio
- (v) Realize a ring-fenced account (self-finance system)

### **5.8.2 Urgent Issue**

The service coverage is low at 13% (about 20,000 persons) as aforementioned. However, it is observed that the number of actual water beneficiaries is less even than that. It is because some parts of pipelines, about 52km, have been damaged due to the road construction works and other deteriorations. Moreover, the performance of the existing purification plant has been insufficient for demands. Therefore, in order to raise the water supply coverage ratio in Malakal, recovery works such as improvement of treatment pipelines, are urgently required. It will lead to reductions of non-service areas.

### **5.8.3 Considerations for the Comprehensive Plan**

#### **(1) Relation to the Social Economic Infrastructure Comprehensive Plan**

Stable and safe water supply is one of the major targets for infrastructure development. Water supply facilities should be developed along the future urban development areas of Malakal Town.

As a result of the urban planning of Malakal Town, the particular areas towards the east beyond the Ring-Road will be covered with water supply for by the year 2022.

#### **(2) Cooperation Work with Other Sectors**

A lot of infrastructure developments are required in Malakal Town. Road and water supply are especially indispensable. Since water supply pipelines are laid under the trunk and community roads, relevant organizations such as SSUWC-Malakal and a road department of UNS should cooperate to achieve a rationalization of construction works, so that construction costs are reduced. In addition, in order to maintain the facilities appropriately, technical data and information must be shared among the relevant organizations.

#### **(3) Application to the Comprehensive Plan**

Domestic, commercial and institutional waters depend on the Nile River. Groundwater has not been utilized because of inappropriateness in water quality, in particular, the excessive salinity. This is verified by recent surveys of UNMISS. Accordingly, it is essential that the surface water

should be developed as the water source for future water demand. In terms of use of the Nile River, a Water Act covering water rights for the Nile River has not been enacted.

To sustain the water supply facilities, O&M should be carried out regularly and appropriately. It is rational that the necessary budget for the O&M be covered by the collected water tariff. Thus, the current finance system should be reformed to become a ring-fenced system or equivalent one, which is independent from other sectors/areas for incomes/expenditures of SSUWC-Malakal. This is one of key points to promote the sustainability of water supply service.

#### **(4) Capacity Development (CD) of Water Supply**

The most important individual capacity development (CD) areas are Operation and Management (O&M) and “Water Tariff Collection”. The Comprehensive Plan outlines the rehabilitation and reconstruction of the distribution networks (pipelines) and treatment plants, and O&M training needs to be conducted for the rehabilitated facilities. SSUWC has some problems in terms of water tariff collection; namely high non-revenue water rate and low user price of pipelines. Firstly the system of water tariff collection has to be changed, and then water tariff collectors will be trained along with the new system. The new system will include the project to enhance users’ awareness about sustainable safety water supply and the equivalent water tariff.

As to organizational CD needs, the following areas are identified: Water Supply Sub-Sector: the division of water audit, the division of water tariff collection and a “water users’ committee”.

## **5.9 WATER SUPPLY SECTOR DEVELOPMENT PLAN**

### **5.9.1 Objectives of Water Supply Sector**

A safe and stable water supply is necessary to satisfy Basic Human Needs. SSUWC-Malakal should be responsible for the provision of water according to developing/increasing water demand that comes along with the population growth.

In order to improve the water supply service in urban areas, the Government of South Sudan targets the water service coverage at 45% in 2013 against 34% in 2010. In this context, the water service coverage should be much improved for Malakal Town. Because the groundwater is not appropriate for drinking in Malakal Town, the water supply coverage should be 100%. Accordingly, a 100% of service coverage is recommended as the target of this comprehensive plan.

According to the population growth, the water demand will increase in Malakal Town. In order to eliminate/reduce a water scarcity in Malakal Town, the capacity of the water treatment plant as well as the capacity of the transmission and distribution pipelines should be rehabilitated and expanded.

## 5.9.2 Sector Strategy

Development priorities for water supply facilities are as follows:

- (i) Priority will be given to rehabilitating the existing treatment plant.
- (ii) Replacement of the deteriorated distribution pipelines, which were laid in the 1930s, and ones damaged by road construction and other traffic accidents.
- (iii) Pipeline networks should be expanded in Malakal Town.

Regarding the pipeline networks expansion, item 3 above, the distribution measures of water are principally categorized into three types; house connections, public taps and vendors including water trucks. These measures should be selected in the light of the existing pipelines, current situation of road access, population density, cost effectiveness, equable distribution of water and so on. In order to prevent water disease, water vendors who have been taking water for sale must take water from the urban water supply system of SSUWC-Malakal.

As for financial management, the ring-fenced finance system (self-finance system) should be practiced, so that the collected tariff is saved by SSUWC-Malakal for a financial source of O&M.

## 5.9.3 Water Demand Projection

### (1) Design Criteria

The criteria for estimating water demand are shown in **Table 5.9-1**. Water service coverage is currently 13%. Since there are no functional public taps, the 13% is the service coverage for house connections. To secure equable or appropriate distribution of water, the number of house connections should be reduced and limited to special customers. Instead, the public tap system should be widely spread.

**Table 5.9-1 Design Criteria of Future Plan**

(As of October 2013)

Items		2012	2014	2016	2018	2020	2022	Remarks
Population (Person)		153,000	180,000	200,000	213,000	227,000	241,000	Source: Examination by JICA Study Team
Water Coverage of Domestic Water by Water Source (%)	Others*	87	87	87	95	95	95	Source: Field survey and examination by JICA study team
	House Connection	13	13	13	5	5	5	
Daily Water Consumption Rate (Liter/Capita/day)	Others*	20	20	20	30	30	30	Source: Town profile survey and examination by SSUWC-Malakal & JICA study team
	House connection	50	50	50	70	70	70	
Water Consumption Factor of Non-Domestic Water		9% of Residential Consumption						Source: Ministry of Labor and JICA Study Team
Non-Revenue Water for Others (%)		0	0	0	15	15	15	Source: Current situation of water service in Malakal, and examination by SSUWC-Malakal and JICA Study Team
Non-Revenue Water for House Connections (%)		80	80	80	15	15	15	Source: Current situation of water service in Malakal, and examination by SSUWC-Malakal and JICA Study Team
Daily Max. Water Demand (m <sup>3</sup> /day)		120% of Water Demand						Source: Water Supply Grant Aid Project of Juba

\* "Others" means all other people other than the beneficiaries of house connections. It includes users of public taps, vendors' water, etc.??

Source: JICA Project Team

In terms of water demand, SSUWC-Malakal does not have historical water data for volume of supply/consumption because it has not installed water meters for customers. According to the

household interview survey, the unit water consumptions for public tap users and house connection users are estimated at 20 litres and 50 litres per capita per day respectively. Expecting a life style up-grade after improvement of the water supply, SSUWC-Malakal has targets at 30 litres for public taps and 70 litres for house connections per capita per day for this comprehensive plan.

The volume of commercial water used has similarly not been metered. Currently, commercial consumption is estimated to be 9% of total domestic consumption. This ratio, which is 9%, will be utilized to estimate the commercial water demand for this comprehensive plan.

It is supposed that much volume of water leaks out from damaged pipeline. It causes much physical loss of water and Non-Revenue Water (NRW). It is currently estimated at 80%. Accordingly, it is recommended that all the existing pipelines be replaced with new ones. The design ratio of NRW could be, therefore, an ideal figure for the replaced pipeline networks. The comprehensive plan recommends 15% loss after replacement of pipelines.

In order to design water supply facilities, a daily maximum requirement factor has to be examined in the light of seasonal fluctuation of water demand. However, there is no historical data in SSUWC-Malakal. 1.0-1.2 is a common figure as daily maximum factor. The temperature in dry season of Malakal Town and Juba is much higher than that of the urban areas in surrounding countries such as the cities of Addis Ababa, Nairobi and Kampala. The daily maximum factor of 1.2 shall be, therefore, applied for estimating daily maximum water demand. It is the same figure, which was applied in Japan's Grant Aid Project in Juba.

Definitions of Special Terms for Categories of Water are as follows:

#### Domestic Water

A general term for residential water for daily life such as drinking, toilets, laundry and cleaning. Domestic water consumption increases along with population growth and improved living standards. Service population multiplied by water consumption rates (daily per-capita water consumption) will be the volume of domestic water consumption.

#### Non-Domestic Water

A general term for institutional and commercial waters. It is the water used for civil functions, such as governmental and private offices, hotels, commercial facilities, hospitals and schools. Institutional and commercial water consumptions increase along with development of urban areas and human activities.

#### Industrial Water

The water used for various purposes in industrial activities, including machinery cooling, product treatment, washing, and as a raw material of products. The industrial water increases along with socio-economic development. Since the large development of industry is not foreseen in Malakal Town for near future until 2022, the industrial water demand is not necessary to be accounted

specifically for this comprehensive plan.

### Non-Revenue Water (NRW)

NRW is a general term for overflow from service reservoirs, water leakage on pipelines and service connections, and illegal connections. It is defined as the balance between production and sold waters. In Malakal Town, the leakage is observed as the largest cause for the NRW.

## (2) Result of Projection

Based on the aforementioned design criteria, future water demand in Malakal Town is estimated to be 11,869m<sup>3</sup>/day in 2022 as shown in **Table 5.9-2**. It has been calculated according to the following conditions:

- (i) The existing system will be rehabilitated by 2018.
- (ii) The pipelines will be replaced by 2018. Consequently, NRW ratio will be improved to 15% from 80%.
- (iii) Coverage of house connections will be reduced in percentage. Public taps, however, will cover fully Malakal Town from 2018.

**Table 5.9-2 Water Demand Projection**

(As of October 2013)

Items	Description	2012	2014	2016	2018	2020	2022	
Population (Person)	[1]	153,000	180,000	200,000	213,000	227,000	241,000	
Water Coverage of Domestic Water by Water Source (%)	Others	87	87	87	95	95	95	
	House connection	13	13	13	5	5	5	
Service Coverage (%)	[4]	13	13	13	100	100	100	
Water Consumption Rate (Liter/Capita/day)	Others	20	20	20	30	30	30	
	House connection	50	50	50	70	70	70	
Water Consumption (m <sup>3</sup> /day)	Others	[7]=[1] x [2] / 100 x [5] / 1000	2,662	3,132	3,480	6,071	6,470	6,869
	Non-Domestic Water for others (9% of Residential Consumption)	[8]=[7] x 9%	240	282	313	546	582	618
	Sub-total	[9]=[7]+[8]	2,902	3,414	3,793	6,617	7,052	7,487
	House connection	[10]=[1] x [3] / 100 x [6] / 1000	995	1,170	1,300	746	795	844
	Non-Domestic Water for House Connections (9% of Residential Consumption)	[11]=[10] x 9%	90	105	117	67	72	76
	Sub-total	[12]=[10]+[11]	1,085	1,275	1,417	813	867	920
Total	[13]=[9] + [12]	3,987	4,689	5,210	7,430	7,919	8,407	
Non-Revenue Water for Others (%)*	[14]	0	0	0	15	15	15	
Water Demand for Others (m <sup>3</sup> /day)	[15]=[9]/(1-[14]/100)	2,902	3,414	3,793	7,785	8,296	8,808	
Non-Revenue Water for House Connections (%)**	[16]	80	80	80	15	15	15	
Water Demand for House Connection (m <sup>3</sup> /day)	[17]=[12] / (1-[16] / 100)	5,425	6,375	7,085	956	1,020	1,082	
Total Water Demand (m <sup>3</sup> /day)	[18]=[15]+[17]	8,327	9,789	10,878	8,741	9,316	9,890	
Daily Max. Water Demand (m <sup>3</sup> /day)	120% of Water Demand	[19]=[18] x 120%	9,992	11,747	13,054	10,489	11,179	11,868

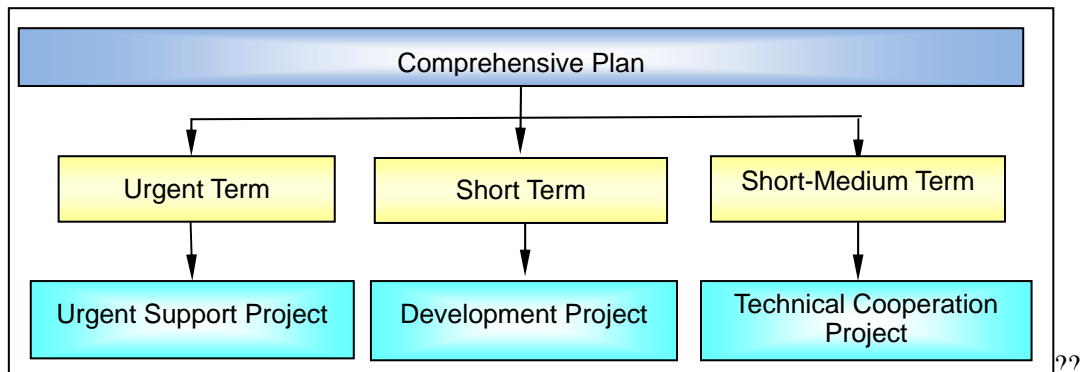
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Source: JICA Project Team and SSUWC-Malakal

## 5.9.4 Proposed Water Supply Plan

In order to improve the water supply service for Malakal Town, a Comprehensive Plan for the

water sector has been formulated. The Comprehensive Plan is composed of three stages such as Urgent Term, Short Term, and Short-Medium Term. A conceptual image of the Comprehensive Plan is shown in **Figure 5.9-1**.



Source: JICA Project Team

**Figure 5.9-1 Conceptual Image of the Comprehensive Plan on Water Sector**

#### Urgent Development Project

The Urgent Development Project, which is being conducted by JICA as a pilot project, will contribute to improvement of water supply for the areas facing water scarcity. 150m<sup>3</sup>/day will be added to current water production in 2014, through the above mentioned Urgent Development Project.

#### Development Project

The additional capacity for 11,000m<sup>3</sup>/day or more is necessary for Malakal Town to secure a safe and stable water supply in 2020 or later. The existing water treatment plant should be rehabilitated to secure 11,000m<sup>3</sup>/day at least. In parallel with the rehabilitation of the water treatment plant, replacements of pipelines are required to reduce the NRW. In 2013, the Government of Japan has commenced a preparatory study on the additional capacity of water supply for 11,000m<sup>3</sup>/day. It is categorized as a short term development project. It will be scheduled to commence the service in 2018 for the target in 2020.

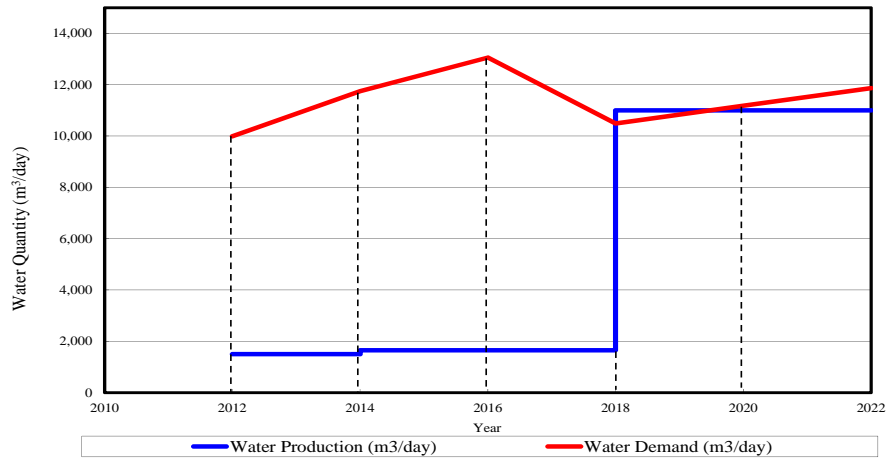
#### Technical Cooperation Project

Once the facilities rehabilitation finishes, capacity development programs should be conducted for O&M and water supply business. It includes the review/modification of comprehensive plan toward 2022 and far future.

#### Water Balance

To verify the aforementioned mentioned additional capacity, the water demand is figured out based on the forecasted population as shown in **Figure 5.9-2**. If the mentioned rehabilitations are realized, the water production will exceed the demand in 2018 and it will be a little less than that for 2022. The necessity of further additional capacity after 2020 should be studied in the technical cooperation project.





Water Quantity	2012	2014	2016	2018	2020	2022
Water Production (m <sup>3</sup> /day)	1,500	1,650	1,650	11,000	11,000	11,000
Water Demand (m <sup>3</sup> /day)	9,992	11,747	13,054	10,489	11,179	11,868
Water Balance (m <sup>3</sup> /day)	-8,492	-10,097	-11,404	511	-179	-868

Source: JICA Project Team

**Figure 5.9-2 Trend of Water Production and Water Demand**

## 5.10 WATER SUPPLY SECTOR PROJECT

The following Projects meet a policy of SSUWC headquarters and SSUWC-Malakal.

### (1) Small Scale Water Supply Development Project (Urgent Support Project: WS-1)

The Urgent Support Project will be carried out as a pilot project in order to supply water to areas which have been facing water scarcity in Malakal Town. During an operation of the water supply system, O&M which is conducted by SSUWC-Malakal, water user committees to be established, and or other private sectors instead of the committees will be monitored. The result of the monitoring will be reflected so as to improve the management system of SSUWC-Malakal, including the water tariff collection system. The following will be provided by this WS-1:

- (i) Water treatment plant for the capacity of 150m<sup>3</sup>/day
- (ii) Distribution pipelines and elevated tanks for public taps
- (iii) Public taps at 22 locations
- (iv) Three water tank trucks

### (2) Rehabilitation Project of the Treatment Plant, Transmission & Distribution Facilities (Development Project: WS-2)

The existing water supply facilities were constructed in 1937. Rehabilitation of these facilities, the treatment plant and the distribution networks, is one of the most urgent issues in Malakal Town. Even if the treatment plant was rehabilitated partially, full-recovery of the design capacity would not be expected. Although about 90km of pipelines out of 144km were replaced in 2009, some of replaced ones have already been damaged by road construction works. The damaged

ones have not been repaired yet. Moreover, the exiting pipelines which were laid in 1937 remain un-replaced for a length of 50km. It is observed that the damaged and/or deteriorated pipelines cause the current leakage of water.

The components shown in **Table 5.10-1** should be conducted as a Rehabilitation Project, to overcome the aforementioned problems.

**Table 5.10-1 Components of Development Project WS-2**

<b>Component/Facility</b>	<b>Capacity/Content</b>
Rehabilitation of Treatment Plant	11,000m <sup>3</sup> /day with chemical clarifier, flocculation basin, rapid sand filter, pump, generator and so on.
Replacement of Pipelines	Approximately 140km, diameter 100 - 300mm, Polyethylene, PN10.
Construction of elevated tanks	Several tanks of 200 - 250m <sup>3</sup>
Public Taps	73 locations (provisional)

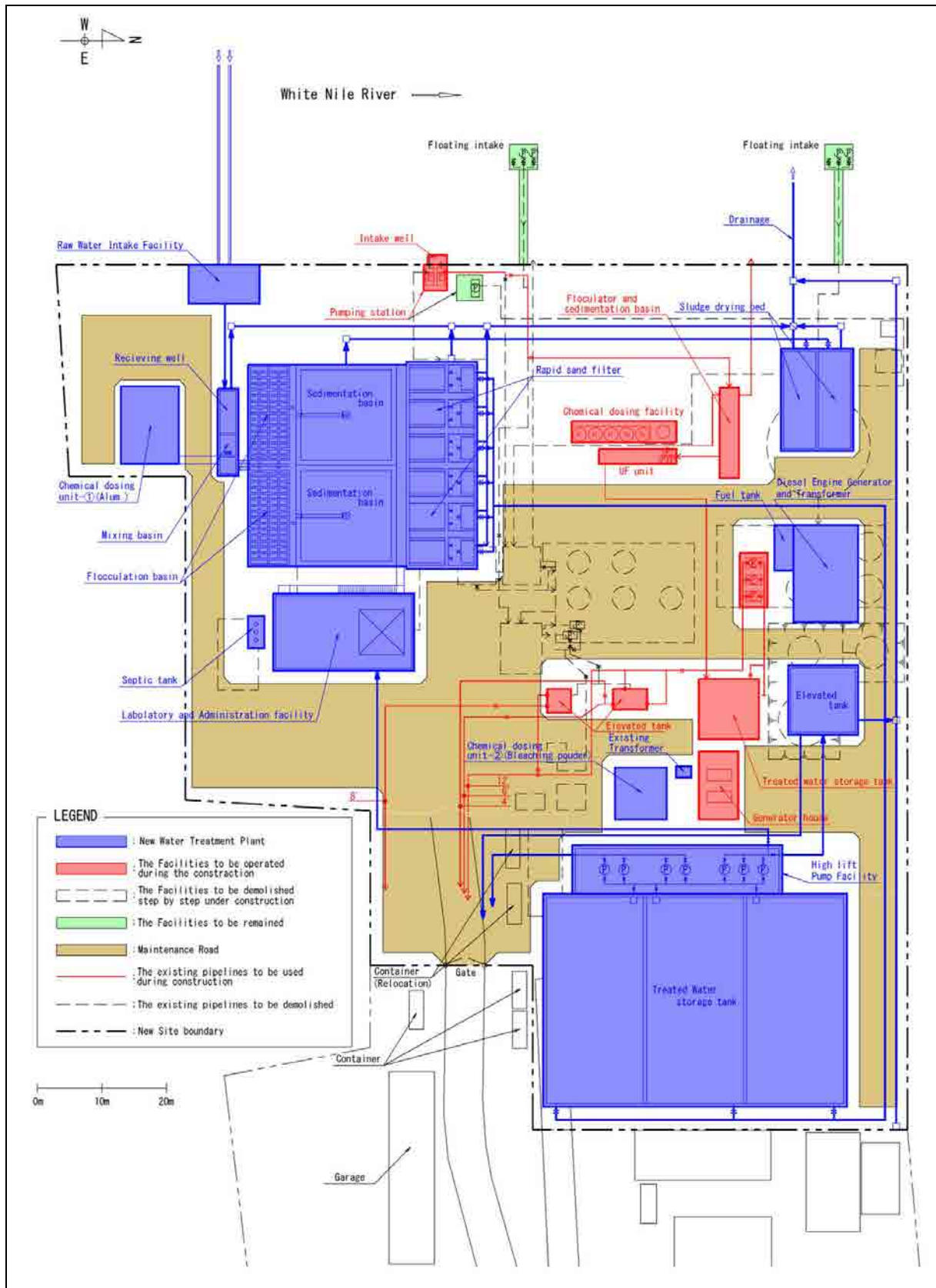
Source: JICA Project Team

Regarding water treatment process, three filtration options, i.e. slow sand, rapid sand or membrane, have been examined for appropriateness as shown in **Table 5.10-2**. The process selected is the rapid sand filtration system. A conceptual layout plan of the treatment facilities has been illustrated and is shown **Figure 5.10-1**. This rehabilitation project was requested in 2013 by SSUWC for a Japan's Grant Aid Project. JICA has commenced studying the possibilities of the grant aid.

**Table 5.10-2 Comparison of the Treatment Process for Restoration**

Evaluation Criteria	Slow Sand Filtration		Rapid Sand Filtration		Membrane Filtration	
Advantage	General Evaluation	<ul style="list-style-type: none"> <li>O&amp;M expense is low after formation of filtration membrane.</li> <li>Relatively operation is easy.</li> <li>Relatively organic matter can be removed properly.</li> </ul>	<ul style="list-style-type: none"> <li>Possible to treat greater quantity of water</li> </ul>	<ul style="list-style-type: none"> <li>Enable to treat water in high fluctuation</li> <li>Enable to remove bacteria reliably</li> <li>Possible to operate automatically</li> </ul>		
Disadvantage		<ul style="list-style-type: none"> <li>Large land is required.</li> <li>Impossible to treat water with turbidity of at least 30NTU</li> </ul>	<ul style="list-style-type: none"> <li>High skilled engineer for O&amp;M is required.</li> <li>Carry-over is likely to occur in high water temperature fluctuation of flocculator.</li> <li>Rapid sand filtration process is required to combine other treatment process in case of parameters except turbidity, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Chemical washing of membrane is required regularly.</li> <li>Replacement of membrane is required by 5-8 years.</li> <li>Membrane process is required to combine other treatment process in case of parameters except turbidity, E-Coli, etc.</li> </ul>		
Land Space (30%)	Current land where the existing treatment of SSUWC-Malakal is located is insufficient for slow sand filtration. Therefore, it is impossible to acquire the land at the current compound.		The existing treatment plant must be operated during construction. A capacity of 15,000m <sup>3</sup> /day is rehabilitated in two phases. Therefore, the existing warehouse, etc. will be demolished (see <b>Figure 5.3-1</b> ).		Easily, unit of membrane filtration will be replaced without large-scale demolition of structure. Because the land required for this process is one-third of a rapid sand filtration process.	
	1	0.30	2	0.60	3	0.90
O&M Cost (25%)	Special equipment and chemicals are not required for O&M. Therefore, O&M cost is low.		Fuel for chemical dosing system is required.		Depreciation of membrane filter is required as well as fuel of chemical dosing system. This makes O&M cost high.	
	3	0.75	2	0.50	1	0.25
Maintenance (20%)	In general, operation and maintenance of this process are easy. However, SSUWC-Malakal has not experienced to operate the slow sand filtration. Especially, training for slow sand filtration is required for SSUWC-Malakal.		Operation and maintenance of this process are more difficult than that of slow sand filtration process. But, SSUWC-Malakal has experienced to operate the rapid sand filtration for long time and is familiar with it.		Operation and maintenance of this process are easier than that of rapid sand filtration process. SSUWC-Malakal installed the Ultra-Filtration system with their fund in 2009. However, Ultra-Filtration has not been operated properly.	
	1	0.20	3	0.60	2	0.40
Initial Cost (15%)	Depreciation cost will definitely be influenced by initial cost. Low initial cost of this process can reduce a depreciation cost of the treatment plant.		Depreciation cost will definitely be influenced by initial cost. Initial cost of this process will increase a depreciation cost of the treatment plant.		Depreciation cost will definitely be influenced by initial cost. Initial cost of this process will highly increase a depreciation cost of the treatment plant compared with that of the rapid and slow sand filtration process.	
	3	0.45	2	0.30	1	0.15
Construction Period (10%)	At least 2.5 years is required.		At least 2.0 years is required.		At least 1.5 years is required.	
	1	0.10	2	0.20	3	0.30
<b>Total</b>		<b>1.80</b>		<b>2.20</b>		<b>2.00</b>

Source: JICA Project Team, Note: - Good: 3, fair: 2, Bad: 1, - evaluation criteria is weighted as it is important, - Relative evaluation



Source: JICA Project Team

**Figure 5.10-1 Layout of the Proposed Treatment Plant**

**(3) Technical Cooperation Project on Improvement of the Water Supply Service (Technical Cooperation Project: WS-3)**

SSUWC-Malakal has been facing serious problems with NRW, such as leakage, gaps between actual water consumption and billed water consumption at a flat rate. In addition, inventories of the existing pipelines are not well prepared either in drawings and/or data. This may be one of the most critical causes of damage to pipelines by road construction works.

SSUWC-Malakal has not been operating the existing treatment plant appropriately for many years because it has not been able to prepare enough skilled engineers or operators as well as creating an appropriate manual for operational procedures.

In those circumstances, capacity development programs should be undertaken by SSUWC-Malakal for the following components:

**(a) Analysis of Current Situation**

- (i) Learn/confirm current situation of water supply services in Malakal Town.
- (ii) Learn/confirm registered water consumption and production.
- (iii) Learn/confirm organization and regulation of SSUWC-Malakal.
- (iv) Learn/confirm revenue and expenditure of SSUWC-Malakal and allocated budget by headquarters.
- (v) Verify locations and specifications of the existing pipelines through site reconnaissance.
- (vi) Organize staff members for capacity development programs and pilot projects

**(b) Activities of the Technical Cooperation**

- (i) NRW Reduction
  1. Select contents and areas for pilot projects.
  2. Digitize pipelines for the pilot project areas using Geographic Information System (GIS) and AutoCAD software.
  3. Site reconnaissance for the existing pipelines.
  4. Check the minimum water flow at night in pilot project areas.
  5. Implement water leakage detection in pilot project areas.
  6. Repair leaks in pilot project areas.
  7. Check the minimum water flow at night in pilot project areas after repair of leaks.
  8. Improve water tariff collection system.
  9. Evaluate efficiency for water and activities.
  10. Disseminate learnt technologies in SSUWC-Malakal.
- (ii) Proper Operation of the Treatment Plant.
  1. Control water flow and pressure.
  2. Analyse and monitor water quality.

3. Operate intake and rising pump facilities.
  4. Control chemical dosing.
  5. Prepare appropriate procedures for O&M.
- (iii) Review of Comprehensive Plan and Design of Further Expansion
1. Verify water demand and water efficiency of facilities
  2. Forecast growth of service population and water demand
  3. Revise the comprehensive plan and design further expansion if necessary

#### **(4) Expansion of the Treatment Plant and the Distribution Pipe Network Project (WS-4)**

According to the population projection in the medium scenario, a population of approximately 241,000 persons is predicted for the year 2022. In this scenario the population will grow on the Southern and Eastern side of Malakal Town. In this case, by 2022 about 20,000m<sup>3</sup>/day of water will be demanded. If future population growth follows the medium scenario, the treatment plant should be expanded by at least 5,000m<sup>3</sup>/day. However, the land where the treatment plant currently is, in the compound of UNS, is too small to expand by an additional plant.

Therefore, after a discussion with SSUWC-Malakal, the site based on the Malakal City Physical Development Plan that was identified for the future expansion of the treatment plant was selected.

The key scope of the Development Project is summarized as follows:

- Expansion of Treatment Plant (5,000m<sup>3</sup>/day x 1 plant, Chemical Clarifier, flocculator, Rapid Sand Filtration, Rising Pumps, Generator)
- Development of pipes (Approximately 50km x  $\phi$ 100mm- 150mm, Polyethylene, PN10)
- Construction of elevated tank (1,000m<sup>3</sup> x 1 tank, Reinforced Concrete made)

### **5.11 OPERATION AND MAINTENANCE PLAN**

#### **5.11.1 Responsibility for Operation and Maintenance**

In the planning period for this comprehensive plan, the house connections will not be spread widely in Malakal Town for water supply contracts with customers. Most of the people will obtain the treated water through public taps which will be installed at 95 locations by 2020. Establishment of management system for the public taps is, therefore, a key for sustainability.

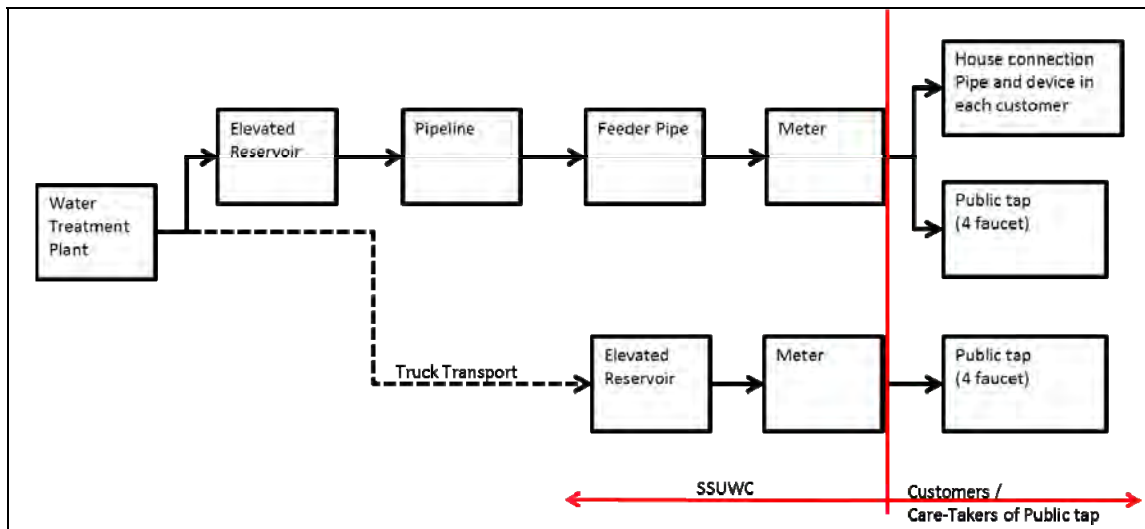
Since the following facilities will be constructed and owned by SSUWC-Malakal, these facilities should be operated, maintained and managed by SSUWC-Malakal. They are:

- (i) Water treatment plant
- (ii) Elevated tanks (water reservoirs).
- (iii) Water transmission/distribution pipelines.

The O&M of the public taps is, however, another issue for management because the customers

are not individual households but groups of residents. It would be difficult for SSUWC-Malakal to contract with individual households and to operate and maintain the public taps due to 1) lower cost efficiency against performance/effectiveness, 2) lower awareness of people of the proper O&M. JICA Project Team accordingly recommends organizing water committees for public taps (organization of residents). The committees are recommended to be formed per one location of public taps and through discussions of users (residents). And the each committee should employ care-takers for the committee's public taps.

The recommended borders of responsibility are as shown in **Figure 5.11-1**. Roles of SSUWC-Malakal and Water Committee are summarized in **Table 5.11-1**.



Note: In some locations, no-meters may be installed, and the flat rate contracts will be concluded with customers.  
Source: JICA Project Team

**Figure 5.11-1 Demarcation Points of Responsibility for O&M**

### 5.11.2 Independence of SSUWC-Malakal

Local branches of SSUWC used to transfer the collected tariff to headquarters. And the budgets for the local branches have been allocated by the headquarters. Based on the decentralization policy of the Government of South Sudan, the system is now being changed to an independent one per region/city. SSUWC-Malakal would be, accordingly, more independent in the near future for business management, including finance and budget preparation. In these circumstances, it is necessary for SSUWC-Malakal to introduce a ring-fenced accounting system (self-management system for finance).

### 5.11.3 Organization of SSUWC-Malakal

SSUWC-Malakal had 93 staff members in 2013. The number of employees will be enough until 2022, however they should be re-organized as shown in **Figure 5.11-2**. Along the construction of Urgent Support Project (WS-1), an exclusive O&M team should be newly established. Since it is difficult to relocate the existing staff members immediately and officially, the O&M team should

be out-sourced (**Table 5.11-1**). This team will be trained through the project especially for water treatment and operation of water tankers, and it should be merged into the SSUWC-Malakal gradually by the commencement of Development Project (WS-2).

**Table 5.11-1 Role of SSUWC-Malakal and Water Committee on the O&M Work**

SSUWC-Malakal	Water Committee
<ol style="list-style-type: none"> <li>1. Periodically monitor water quality of Nile River and treated water at the treatment plant (Water quality analysis, its items and frequency of monitoring by following the regulations/guidelines of WHO).</li> <li>2. Daily inspection and keep security of all the water supply system as follows: <ul style="list-style-type: none"> <li>• Leakage points of service reservoirs, pipelines, gate valves, flow meter and air valves</li> <li>• Handle performance of gate valves and faucets</li> <li>• Water pressure on rising pumps</li> <li>• Performance (vibration, sound, etc.) of generator, rising pumps and booster pumps</li> <li>• Miscellaneous damage on facilities</li> </ul> </li> <li>3. Request the suppliers on overhaul or major inspection of facilities and equipment for every one (1), five (5), ten (10) years.</li> <li>4. Repair, change the damaged parts and change/replenish consumable items.</li> <li>5. Restore the damaged equipment and facilities.</li> <li>6. Record the operation log (water pressure on rising main pipes, water flow, etc.)</li> <li>7. Weekly collect water tariff from the water committee and monthly individual house.</li> <li>8. Train the staff members of water committee about O&amp;M including</li> <li>9. Water flow control and monitoring</li> <li>10. Water pressure control</li> <li>11. Leakage detection</li> <li>12. Treatment plant operation such as chemical dosing, disinfection, generator &amp; pump operation</li> <li>13. Water audit</li> <li>14. Water billing</li> </ol>	<ol style="list-style-type: none"> <li>1. Water tariff collection from tap users and pay SSUWC-Malakal</li> <li>2. Daily inspection and keep security of all the water supply system as follows: <ul style="list-style-type: none"> <li>• Leakage points of pipelines, gate valves, water meters and air valves</li> <li>• Miscellaneous damage on facilities</li> </ul> </li> <li>3. Operation of public taps</li> <li>4. Daily record revenue and water flow at public tap</li> <li>5. Report on trouble of water supply system to SSUWC-Malakal</li> </ol>

Source: JICA Project Team

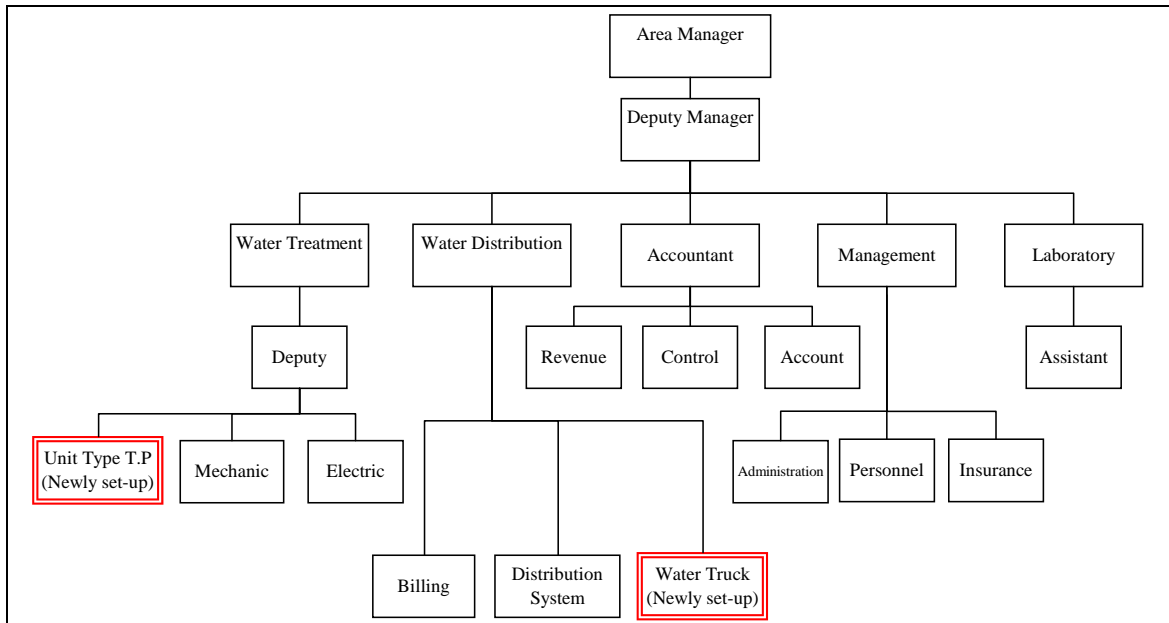


**Table 5.11-2 Recommended Staff Members for Urgent Development Support Project**

SSUWC Staff in Water Truck Section	Number
Section manager	1
Treatment plant operator	2
Drivers	4 (1)*
Store-keeper	1
Water tariff collector	2
Total	10

Note: \*one driver out of four drivers is stand-by in case of unforeseen circumstances.

Source: JICA Project Team



Note: Boxes in red colour means sections of O&M team for urgent support project (WS-1).

Source: JICA Project Team

**Figure 5.11-2 Recommended Organization for SSUWC-Malakal**

### 5.11.4 Organization of Water Committee

The water committees should be formed based on Bomas, but according to location of public taps and appropriate number of users. Boundaries of service areas of public taps should be peacefully determined through discussions in communities. In each community, a management board should be established as well as three persons as board members. Although the board members are expected to work voluntary basis, the committee should employ two persons of care-takers for one location of public taps. The care-takers should work for daily operation of public taps and daily management of accounting.

### 5.11.5 O&M Cost Estimates

**Table 5.11-3** shows the annual O&M cost for the year 2012 and 2022. O&M cost for 2012 is the actual expenses (SSP706,194) of SSUWC-Malakal, while SSP17,119 thousand per year for 2022 is an estimate based on the market prices and water volume to be sold. The personnel cost of SSUWC-Malakal is not involved in this table, because it is borne by the central government

directly.

Unit cost for O&M is SSP6.4/m<sup>3</sup> and SSP5.3/m<sup>3</sup> for 2012 and 2022 respectively. Though the total cost increases, the unit cost for O&M will be lower in 2022 because of promotion of efficiency.

**Table 5.11-3 Annual O&M Cost**

(As of October 2013)

Item		2012		2022	
Revenue Water (m <sup>3</sup> )	[1]	109,500	300m <sup>3</sup> /day x 365days	3,412,750	11,000m <sup>3</sup> /day x 85% x 365days
Personnel at public taps (SSP)	[2]	-	-	4,332,000	SSP1,900/month x 2 persons x about 95 places x 12 months
Chemicals (SSP)	[3]	-	-	1,137,000	Aluminium Sulphate: 36,000kg/month x 12 months x SSP2 Calcium Hypo-chlorite: 990kg/month x 12 months x SSP23
Power (Fuel) (SSP)	[4]	-	-	10,452,000	67,000liters/month x SSP13 x 12 months
Administrative, maintenance, other miscellaneous cost (SSP)	[5]	-	-	1,198,355	7% of total O&M cost
<b>O&amp;M Cost (SSP)</b>	<b>[6]=[2]+[3]+[4]+[5]</b>	<b>706,194</b>		<b>17,119,355</b>	
<b>Unit Cost for O&amp;M (SSP/m<sup>3</sup>)</b>	<b>[7]=[5]/[1]</b>	<b>6.4</b>		<b>5.3</b>	<b>3.9 if excluding personnel cost at public taps</b>

Source: SSUWC-Malakal and JICA Project Team

### 5.11.6 Water Tariff to be Proposed

Expecting a certain amount of saving to SSUWC-Malakal, SSP6 - 7 per m<sup>3</sup> is recommended for average water tariff while the unit cost is calculated at SSP5.3 per m<sup>3</sup>. Assuming SSP6 per m<sup>3</sup> for the average tariff, the water charge for one household would be SSP42/month/household.

Consumption per month: 30l/capita/day x 7.7 persons x 30days = 7m<sup>3</sup>/month

Charge per month: 7m<sup>3</sup>/month x SSP6/m<sup>3</sup> = SSP42/month/household

According to the household survey in this study, the group, "SSP500 to 1,000", is the largest for monthly household income. A monthly expense of SSP42 per household is approximately 4-8% of the household income. It is not too high so as to be refused for payment. It is expected to be within a range of peoples' willingness to pay because they presently pay several times more than the SSP6/m<sup>3</sup> when purchasing from water venders.

## 5.12 IDENTIFIED CD NEEDS FOR WATER SUPPLY SECTOR

Identified CD needs for the Water Supply Sector related to the proposed projects are presented in **Table 5.12-1**. The following training was provided in the course of the Project for capacity development of the MoPI&RD and other departments: 1) GIS training/AutoCAD Training; 2) English documentation training/Information Technology (IT) skill training; 3) Accounting training; and 4) Project Management Training. (See the detail in **Chapter 15**.)

**Table 5.12-1 Capacity Development Logframe (Water Supply Sector)**

(As of August 2012)

Area	CD items	Individual	Organization	Institution	Target	Urgent Project	Technical Cooperation	Training in OECD countries	Training in neighboring countries	WS/Training in South Sudan
Water Supply	Extension, reconstruction, rehabilitation of facilities	Design Construction supervision			SSUWC	✓			Ethiopia	
	Pipeline diagrams	Method of drawing pipe-network by the use of GIS		To set up the standards of drawing pipe-network	SSUWC		✓	✓		
	Planning and Management	Planning method about making an annual action plan Monitoring method of the annual action plan Evaluation method of the annual action plan	To revise (reform) the implementation structure along with the annual plan To allocate human resources	To make mid-term and long-term O&M action plan To set up monitoring system To establish evaluation system	SSUWC		✓	✓		
	O&M of water treatment plant	Operational and maintenance of a filtration plant (chemical dosing, controlling water volume and quality)	To organize the division of O&M To allocate engineers To allocate budget To manage appurtenances	To establish the management plan of the water intake facility and/or water treatment plant To establish the O&M system (including O&M manuals) To introduce and set up the Flow Meter	SSUWC	✓	✓	✓		
	O&M of pipelines	Leakage detection Water audit Repair	To organize the division of water audit To allocate human resources (engineers) To allocate budget To manage appurtenances	Leakage detection plan Active Inspection System	SSUWC		✓	✓		
	Water tariff collection	Awareness raising of beneficiaries Enhancement of community participation on O&M	To organize the division of water tariff collection To allocate human resources To train meter readers and tariff collectors To develop the system of sending bills	To organize the water tariff collection system (including the introduction of meter system)	SSUWC	✓		✓	Zambia	
	Customer service	Method of needs analysis Coordination among stakeholders	To establish the customers' desk To make a complaint handling manual To enhance the coordination with other divisions (departments)	To establish the complaint handling system	SSUWC			✓		
	Water Users' Committee	Method of community mobilization Method of consensus building Facilitation skills	To establish "water users' committee" at each water supply point To set up the regulation/rules of the committee To decide the role of members	To define the purpose and roles of the "water users' committee" (mandate, activities, fee/cost, saving for O&M, etc.)	SSUWC Community	✓			Zambia Senegal	Unicef, NGOs
	Water Quality	Examination of water	To rehabilitate the function of laboratory	To develop the standards of water examination	SSUWC			✓	Egypt	

Source: JICA Project Team

## CHAPTER 6 WATER TRANSPORTATION

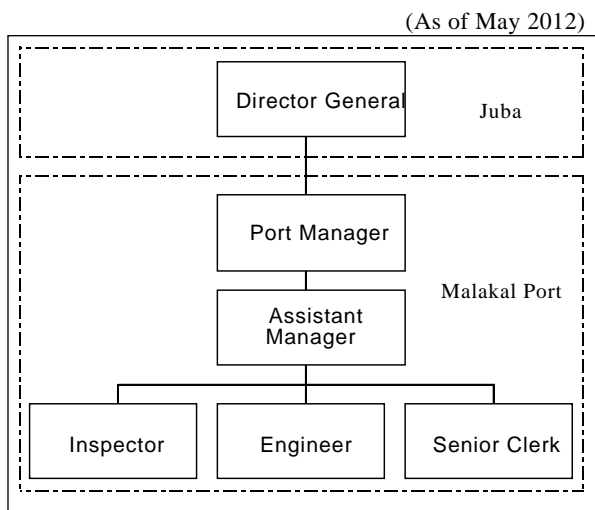
In this chapter, the following perspectives regarding the Water Transport Sector are presented and analyzed; 1) The Institutional Framework, 2) Policies and Strategies, 3) Financial Resources, 4) the Operation and Maintenance System, 5) Facilities and Staffing, 6) the Findings from Relevant Survey(s), 7) Programmes and Projects, and 8) Needs and Issues. Finally, 9) development plans are formulated based on the present situation, needs and issues, and 10) projects are proposed from the technical point of view.

### 6.1 INSTITUTIONAL FRAMEWORK

#### 6.1.1 Joint Operation by ROSS, UNS and the Military

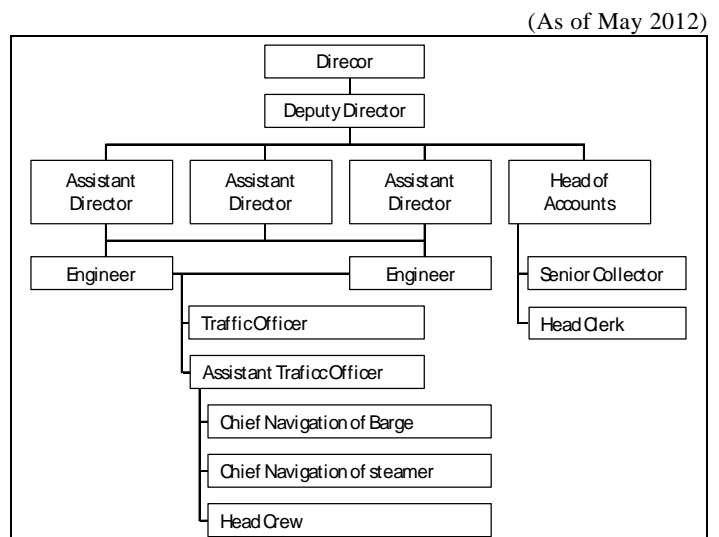
Port facilities were transferred from the central government to the Upper Nile State (UNS) at the time of the Comprehensive Peace Agreement (CPA) conclusion in 2005. However, the facilities are still managed by the central government. Port operation has many divided responsibilities; the central government manages barges, the UNS manages small boats and the military manages port security and access control of ships.

Five officers have been sent to Malakal Town from the Directorate of River Transport of the Ministry of Transport, Republic of South Sudan (ROSS) for port management, while the River Transport Department of State Ministry of Physical Planning and Rural Development, UNS (MoPI&RD) , UNS have dispatched 30 officers to manage the port. The organization chart of each section is shown in **Figure 6.1-1** and **Figure 6.1-2**.



Source: Directorate of River Transport, Ministry of Transport, ROSS

**Figure 6.1-1 Organization Chart of Directorate of River Transport, Ministry of Transport, ROSS**



Source: River Transport Department, MoPI&RD, UNS

**Figure 6.1-2 Organization Chart of River Transport Department, MoPI&RD, UNS**

As shown in **Figure 6.1-1**, the Director General of Port Development is in Juba and the port manager is actually in charge of daily operation. For Juba port, the Juba River Port

Administration (JRPA) was set up in the Juba Port jointly by the ROSS and the Central Equatorial State (CES) for better port management, such similar institution is not established for Malakal Port as yet.

Neither of the organizations has a maintenance section, so there has been no maintenance nor repair work done so far to the steel jetty or riverbank protection at the Malakal Port. There is a shortage of mid-level and young officers for operational control over port management. With the objective of human resource cultivation, it will be necessary to secure those officials in the future.

## **6.2 POLICIES AND STRATEGIES**

According to Ministry of Transport (MOT), ROSS, the Governmental policies and strategies are summarized below.

### **(1) Policies**

- Conduct safe and stable delivery of goods
- Contribute to economic development
- Contribute to improvement in the livelihood of the people

### **(2) Strategies**

#### **(a) Safety navigations**

- Clearance of sedimentation and aquatic plants
- Installation of navigation marks
- Procurement of marine radio

#### **(b) Attraction to both external and internal investment**

- Formulation of seamless integrated multi-modal transport system
- Infrastructure for port facilities

#### **(c) Quality of life**

- Creation of new jobs
- Ensure employment
- Capacity development

## **6.3 FINANCIAL RESOURCES**

The only taxation at the Malakal Port is the docking fee for port charge. The Directorate of River Transport, ROSS charges South Sudan Pounds (SSP) 200 per day for a barge or pusher barge and the River Transport Department of UNS charges SSP50 per docking for a small barge. River Transport Department of UNS charges landing fee of SSP50 for passenger boat with engine coming far from Malakal Town, SSP30 for passenger boat with engine coming from near to Malakal Town, and SSP3 for passenger boat by manpower.

## **6.4 OPERATION AND MAINTENANCE SYSTEM**

### **6.4.1 Categories of Ships Used in Malakal Port**

The categories of ships using Malakal Port are as follows.

#### **(1) Barge**

A fleet consists of three to four flat barges and a pusher barge. It takes 7 to 14 days to navigate 700km between Juba and Malakal stopping by some commercial ports on the way. They transport daily commodities, oils and a variety of goods.

#### **(2) Speed Boat**

A boat around 2m wide and over 10m long with an outboard engine. It takes only 4 days to travel between Juba and Malakal. It transports daily commodities as well as passengers at times. Some of the operators are company employees, but others own their boat and transport goods by direct agreement with the cargo owner.

#### **(3) Passenger Boat**

This is a boat around 2m wide and around 7 to 8m long for the middle size and over 10m for the large size with outboard engine. The middle size of boat can accommodate around 25 passengers and the large size boat can accommodate more than 40 passengers. Boats are used for trips to the opposite shore and also travel to neighbouring area.

#### **(4) Fishing Boat**

Some boats are wooden made and others are steel made like the passenger boats. Fishermen use gill nets for fishing.

#### **(5) Ferry Boat**

There is only one ferry boat in Malakal Town, and this is used for round trips to the opposite shore. It is a landing craft type small barge and it can be loaded with two small trucks. Operation is on the request basis.

### **6.4.2 Freight Management and Trading**

The border of ROSS and Sudan is closed as of August, 2012. All of the commodities except some sugar and agricultural products, which are produced in Renk near the border, are transported from upstream. Most of the goods come from Juba but goods are also imported from Uganda and Kenya adjacent to ROSS by trucks and then transhipped on a barge. Some places in the Nile River are so shallow due to sedimentation that a barge cannot be fully loaded. Most of the pusher barges are of 300t class and flat barges are of 300t to 500t class, but there are 1,000t class flat barges as well.

The following are the freight companys using river transportation.

- SSTC (South Sudan Trans Nile Company)
- SRTC (Sudanese River Transport Company)
- KEER Marine Co.

**Table 6.4-1 Commercial Operator Fleets**

(As of February 2009)

Supplier	Fleet Size and Vessel Types	Cargo Vessel Capacity (m <sup>3</sup> )	Estimated Total Cargo Carrying Capacity (m <sup>3</sup> )
SSTC	34 vessels: - 2 pushers - 32 barges (cargo, flat top, fuel and mixed)	pushers; general cargo; fuel;	50,000
SRTC	28 vessels: - 8 pushers - 18 barges - 2 passenger	pushers; 1200 general cargo and flat top; 600 to 900 fuel; 300	22,200
KEER	13 vessels: - 2 pushers - 2 fuel - 4 flat top - 5 general	pushers; 1800 general cargo; 450 flat top; 400 fuel; 300	10,000

Source: "United Nations Joint Logistics Centre (UNJLC) River Cargo Transportation Assessment White Nile River Sudan" Feb. 2009

An approximate cost that cargo owner pays to a shipping company is:

- Cargo Charge: SSP700/ton: paid to shipping company,
- Porter Charge: paid to stevedores union,
- Equipment Charge: paid to equipment rental companies,
- Insurance Charge: paid to insurance company

Generally, a vessel reports its berthing schedule to the port using marine radio via a shipping company, and then obtains a permission to use the quay. For international vessels, a shipping company will submit documents to Customs, Immigration and Quarantine (CIQ). Marine radio is uncommon at the Malakal Port and port operation is not computerized, hence the arrival control of vessels is not conducted at the Malakal Port. When barges arrive, they are anchored in open water and have to wait for their turn for cargo unloading. In the case that there is no space for berthing, barges have to moor at the opposite shore.

Regulations or rules for arrivals and berthing will be necessary for efficient operation. Navigation aids allow operators to identify hazards such as rocks, water hyacinth and wrecks. However this system has not operated reliably along the Nile River corridor or its tributaries.

The numbers of fleets of barges calling at Malakal Port in 2012 is shown in **Table 6.4-2** while **Table 6.4-3** shows type of cargos and corresponding daily handling volumes in 2012.

It takes long time to unload cargos at berth, this entails prolonged stay of vessels at the port. If cargos are put on a pallet and a crane is used, cargo handling time may be reduce to one or two days.

**Table 6.4-2 Number of Fleet Calling at Malakal Port**

(As of August 2012)

Month	No. of Fleets	No. of Barges	Weight of Cargo(t)	Average Stay
January	6	17	1,166	6
February	4	14	1,900	5
March	4	9	1,820	4
April	4	10	970	5
May	3	9	1,750	7
June	3	11	1,200	6
July	3	8	400*	5
August				

\*Weight of cargo for only one barge, other two no records.

Source: Directorate of River Transport, MOT, ROSS

**Table 6.4-3 Contents of Goods**

(As of August 2012)

Contents	2/21/2012	2/27/2012	2/29/2012	4/18/2012	7/1/2012
Tobacco	6.3t		3.8t		
Beer	97.8t	1t	18.5t		
Coffee	0.6t				
Cooking oil			5.6t	7t	
Soft Drink				5t	
Cloths	—	1.5t	3.2t		
Water				5.9t	
Flour, Beans				26.5t	
Cement	61t		1.3t		
Construction Materials	64.4t		0.8t	0.5t	
Generator			5		
Car	7		7	10	12
Others	72.6t	5.3t		110.8t	22.0t

Source: Cargo Forwarders

### 6.4.3 Water Traffic Management for Passenger Boat

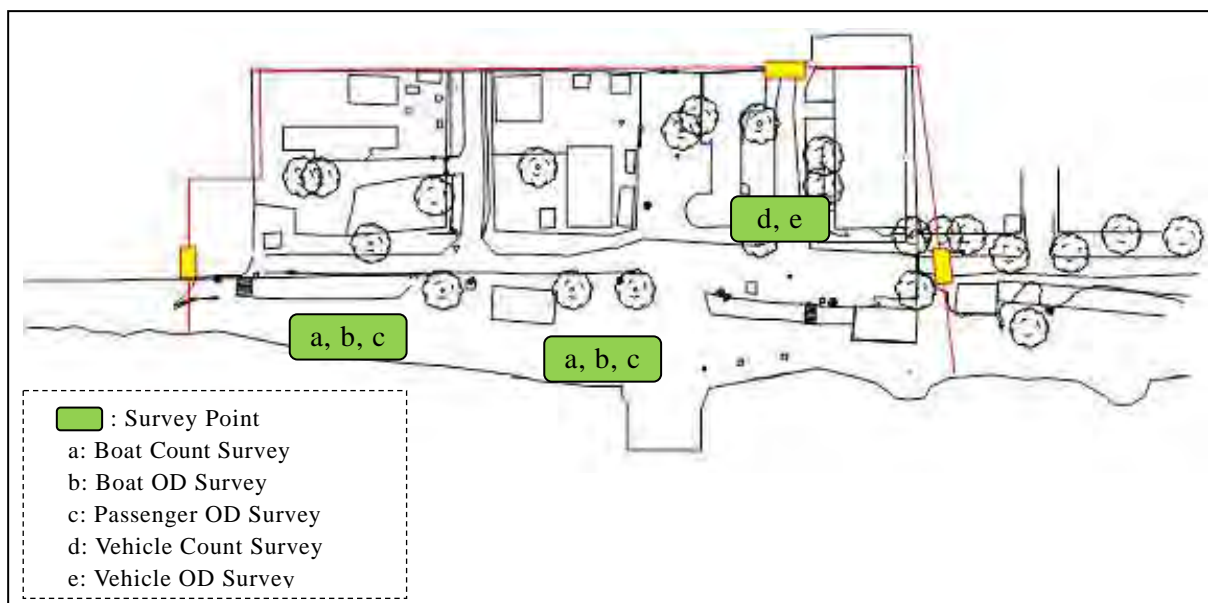
#### (1) Boat Count Survey

A boat count survey was conducted from 20 May and 21 May, 2013. The boat classification is shown in the **Table 6.4-4**. The number of arrivals and departures was counted for 11 hours (from 7:00 a.m. to 6:00 p.m.). The location of the count station is shown in **Figure 6.4-1**. Result of the boat count surveys are shown in **Table 6.4-5**, **Table 6.4-6** and **Figure 6.4-2**.

**Table 6.4-4 Boat Classifications**

1	Barge	4	Fishing Boat
2	Speed Boat	5	Ferry Boat
3	Passenger Boat	6	Other





Source: Field Survey of JICA Project Team

**Figure 6.4-1 Survey Location**

**Table 6.4-5 Result of Boat Count Survey (Monday)**

(As of May 2013)

Time	Barge	Speed Boat	Passenger Boat	Fishing Boat	Ferry boat	Total
7:00	0	0	0	0	2	2
8:00	1	2	0	76	2	81
9:00	2	5	9	43	0	59
10:00	0	8	31	53	0	92
11:00	0	4	10	25	0	39
12:00	0	5	19	26	3	53
13:00	0	8	25	44	0	77
14:00	0	3	26	51	0	80
15:00	0	2	23	51	2	78
16:00	0	2	16	40	0	58
17:00	0	0	9	26	1	36
Total	3	39	168	435	10	655

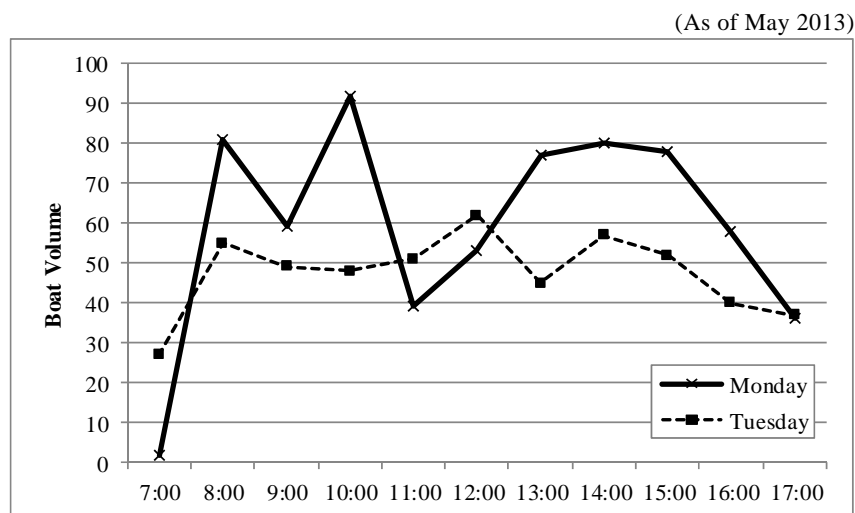
Source: JICA Project Team

**Table 6.4-6 Result of Boat Count Survey (Tuesday)**

(As of May 2013)

Time	Barge	Speed Boat	Passenger Boat	Fishing Boat	Ferry boat	Total
7:00	0	0	0	26	1	27
8:00	0	2	1	48	4	55
9:00	0	2	15	29	3	49
10:00	0	6	15	27	0	48
11:00	0	3	17	30	1	51
12:00	0	1	10	49	2	62
13:00	0	2	17	24	2	45
14:00	0	1	24	31	1	57
15:00	0	1	20	27	4	52
16:00	0	3	14	22	1	40
17:00	0	5	9	22	1	37
Total	0	26	142	335	20	523

Source: JICA Project Team



Source: JICA Project Team

**Figure 6.4-2 Result of Boat Count Survey**

**(2) Boat Origin and Destination (OD) Survey**

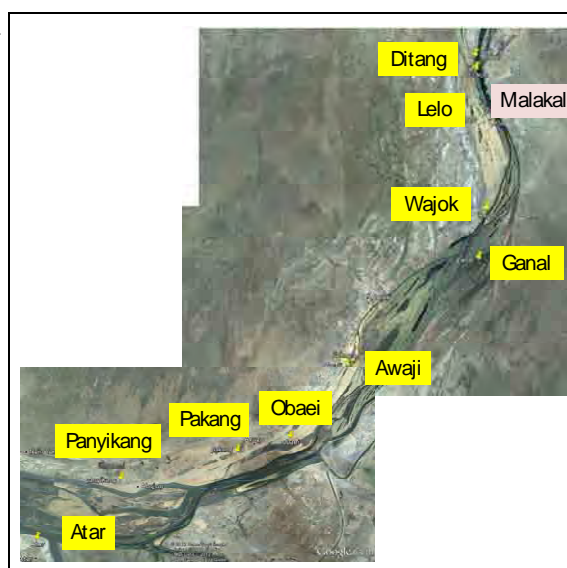
The boat OD survey was conducted on 2 days, Monday and Tuesday (20<sup>th</sup> and 21<sup>st</sup> May, 2013) and for 11 hours on each day (from 7:00 a.m. to 6:00 p.m.). Surveyors asked boat captains about i) their origin and destination and ii) number of passengers. The number and type of boat sampled is shown in **Table 6.4-7** while the major origin and destination points are shown in **Figure 6.4-3**.

**Table 6.4-7 Sample Number of Boat OD Survey**

(As of May 2013)

Boat Type	Monday	Tuesday
Barge	1	0
Speed Boat	12	3
Passenger Boat	38	51
Fishing Boat	5	5
Ferry Boat	0	0
Total	56	59
Rate	8.5%	11.3%

Source: JICA Project Team



Source: JICA Project Team

**Figure 6.4-3 Major Origin and Destination Points Found from the Boat OD Survey in Malakal Port**

Interviews with captains of fishing boats were difficult to achieve, because fishing boats did not stay at the port long enough. Hence only few sample numbers of fishing boats could be surveyed.

Results of OD survey are shown in **Table 6.4-8**, **Table 6.4-9** and **Table 6.4-10**. Almost one half of the boats are plying between Malakal and Lelo.

**Table 6.4-8 OD Trip Pattern (Monday)**

(As of May 2013)

Origin \ Destination	Juba	Renk	Lelo	Malakal	Others	Total
Juba	0	2	0	11	0	13
Renk	0	0	0	1	1	2
Lelo	0	0	0	5	0	5
Malakal	0	2	9	0	12	23
Others	0	0	0	13	0	13
Total	0	4	9	30	13	56

Source: JICA Project Team

**Table 6.4-9 OD Trip Pattern (Tuesday)**

(As of May 2013)

Origin \ Destination	Juba	Renk	Lelo	Malakal	Others	Total
Juba	0	0	0	4	0	4
Renk	0	0	0	6	2	8
Lelo	0	0	0	8	0	8
Malakal	0	1	11	0	8	20
Others	0	1	0	18	0	19
Total	0	2	11	36	10	59

Source: JICA Project Team

**Table 6.4-10 Number of Passengers**

(As of May 2013)

Number of Passenger	Monday	Tuesday
1-10	26	27
11-20	9	7
21-30	4	8
31-50	14	12
50-	3	5
Total	56	59

Source: JICA Project Team

### (3) Passenger OD Survey

The passenger OD survey was conducted on 2 days, Wednesday and Thursday (22<sup>nd</sup> and 23<sup>rd</sup> May, 2013) for 11 hours on each day (from 7:00 a.m. to 6:00 p.m.). Surveyors asked boat passenger about i) origin and destination and ii) trip purpose. The result of passenger OD interview is shown in **Table 6.4-11, 6.4-12 and 6.4-13.**

**Table 6.4-11 Sample Number and Trip Purpose**

(As of May 2013)

Trip Purpose	Monday	Tuesday
To Home	274	201
To Work	168	127
To School	11	13
Personal Business	20	33
Firm Business	95	15
Social	8	184
Shopping	15	15
Others	9	7
Total	600	595

Source: JICA Project Team

**Table 6.4-12 Passenger OD Trip Pattern (Monday)**

(As of May 2013)

Origin \ Destination		Upper Nile			Central Equatoria	Jonglei	Others	Total
		Malakal	Panyikang	Others				
Upper Nile	Malakal	335	65	31	8	44	8	491
	Panyikang	58	0	0	0	0	0	58
	Others	21	0	0	0	3	1	25
Central Equatoria		12	0	0	0	0	0	12
Jongle		13	0	0	0	0	0	13
Others		1	0	0	0	0	0	1
Total		440	65	31	8	47	9	600

Source: JICA Project Team

**Table 6.4-13 Passenger OD Trip Pattern (Tuesday)**

(As of May 2013)

Origin \ Destination		Upper Nile			Central Equatoria	Jongle	Others	Total
		Malakal	Panyikang	Others				
Upper Nile	Malakal	328	62	14	25	33	10	472
	Panyikang	58	0	0	0	0	0	58
	Others	18	0	0	6	9	8	41
Central Equatoria		2	0	3	0	0	0	5
Jongle		16	0	0	0	0	0	16
Others		2	1	0	0	0	0	3
Total		424	63	17	31	42	18	595

Source: JICA Project Team

#### (4) Vehicle Count Survey

The vehicle count survey was conducted with ten (10) vehicle classifications. The vehicle count survey was conducted on 2 days, Monday and Tuesday (27<sup>th</sup> and 28<sup>th</sup> May, 2013). The number of arrivals and departures was counted for 11 hours on each day (from 7:00 a.m. to 6:00 p.m.).

**Table 6.4-14 Vehicle Classifications**

1	Sedan, Sedan Taxi	6	Trailer
2	Pickup / Van	7	Motor Bike
3	Minivan, MinivanTaxi	8	Motorbike Trailer
4	Light Truck	9	Cart
5	Heavy Truck	10	Others

Source: JICA Project Team

Result of vehicle count shows **Table 6.4-15**, **Table 6.4-16** and **Figure 6.4-4**. Cart occupies 30% of all vehicles. Peak hour was in the morning.

**Table 6.4-15 Result of Vehicle Count Survey (Monday)**

(As of May 2013)

Time	Sedan, SedanTaxi	Pickup/Van	Minivan, MinivanTaxi	Light Truck	Heavy Truck	Trailer	Motor Bike	Motorbike Trailer	Cart	Total
7:00	1	8	2	1	0	0	11	5	3	31
8:00	4	12	12	3	0	0	17	3	26	77
9:00	7	25	24	8	0	0	40	10	46	160
10:00	2	16	9	6	2	1	22	9	26	93
11:00	5	16	18	9	2	0	17	4	18	89
12:00	3	13	19	9	0	0	15	2	20	81
13:00	2	9	8	4	0	0	16	2	16	57
14:00	7	10	19	6	1	0	18	6	33	100
15:00	8	11	10	10	0	0	8	5	10	62
16:00	2	14	12	4	4	0	16	8	21	81
17:00	3	8	5	2	0	0	12	3	7	40
Total	44	142	138	62	9	1	192	57	226	871

Source: JICA Project Team

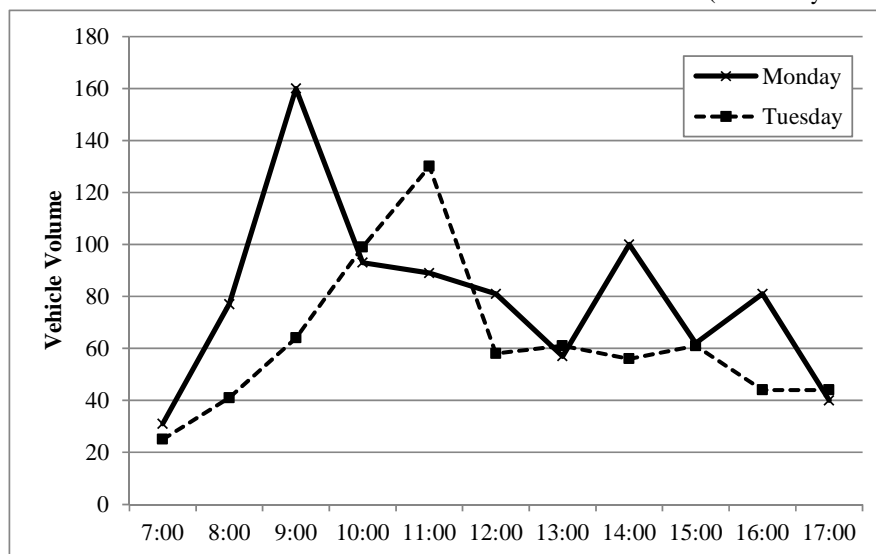
**Table 6.4-16 Result of Vehicle Count Survey (Tuesday)**

(As of May 2013)

Time	Sedan, SedanTaxi	Pickup/Van	Minivan, MinivanTaxi	Light Truck	Heavy Truck	Trailer	Motor Bike	Motorbike Trailer	Cart	Total
7:00	0	2	7	3	0	0	4	3	6	25
8:00	1	4	10	4	0	0	4	5	13	41
9:00	2	10	11	11	0	0	8	5	17	64
10:00	2	21	17	12	1	0	9	8	29	99
11:00	6	12	24	12	2	0	20	17	37	130
12:00	0	10	4	0	0	0	9	4	31	58
13:00	0	6	9	2	0	0	18	8	18	61
14:00	0	12	9	6	2	0	3	1	23	56
15:00	0	17	8	3	1	0	11	2	19	61
16:00	3	4	4	3	0	0	17	1	12	44
17:00	2	15	5	0	0	0	19	0	3	44
Total	16	113	110	56	6	0	122	54	208	685

Source: JICA Project Team

(As of May 2013)



Source: JICA Project Team

**Figure 6.4-4 Vehicle Volume**

### (5) Vehicle OD Survey

The vehicle OD survey was conducted on 2 days, Wednesday and Thursday (29<sup>th</sup> and 30<sup>th</sup> May, 2013) and for 11 hours on each day (from 7:00 a.m. to 6:00 p.m.). Surveyors asked driver about i) origin and destination, ii) number of passengers and iii) major commodity type carried.

The result of the vehicle OD interview is shown in **Table 6.4-17** and **Table 6.4-18**. The sample rate exceeded 10%. Personal Business counted for 60% of all purposes. The result of driver interviews showed that more than 95% of all the vehicles move from Malakal Port to Malakal Town.

**Table 6.4-17 Vehicle Type and Number for OD Survey**

(As of May 2013)

Vehicle Type	Monday	Tuesday
Sedan, Sedan Taxi	5	2
Pickup/Van	12	21
Minivan, Minivan Taxi	2	10
Light Truck	47	54
Heavy Truck	10	7
Trailer(Semi & Full)	1	1
Motor Bike	6	9
Motorbike Trailer	12	13
Cart	9	21
Total	104	138
Rate	11.9%	20.1%

Note: Rate (%) = sample number of total vehicle type / total OD sample number x 100.

Source: JICA Project Team

**Table 6.4-18 Trip Purpose**

(As of May 2013)

Trip Purpose	Monday	Tuesday
To Home	5	11
To Work	22	31
Personal Business	68	85
Firm Business	1	1
Others	8	10
Total	104	138

Source: JICA Project Team

#### 6.4.4 Existing Port Operation and Maintenance System

When barges arrive at Malakal Port, a shipping company or the captain of the fleet will request the labour union of stevedores to unload the cargos. Tax on cargos is payable to the UNS, that for vessels and the docking fee for barges and pusher are payable to the ROSS and that on the speed boat to the UNS. There is a checker standing by at the barge who checks cargo volumes and taxes.

There are 700 stevedores in Malakal Town, who are members of the labour union. One team is consisted of 25 to 30 workers and they unload from barges and speed boats. The teams'

membership consists of not only one tribe, but a mix of tribes of people. And their residential areas also varies. The Malakal Port has no commercial crane for rent. So, all cargo handlings are conducted by manpower. United Nations Mission in South Sudan (UNMISS) owns a 15 lifting tons capacity crane and uses for loading/unloading of their containers, ships and automobiles.

ROSS has a record for ship docking, but UNS does not keep any data, and does not keep track of the numbers of speed boats docking at Malakal Port. The following are the handling charge from ship to truck by stevedores.

**Table 6.4-19 Unloading Fees**

(As of August 2013)

Item	Unit	Price (SSP)
Flour	50kg	2.5/bag
Cement	50kg	2.5/bag
Beverage	less than 50kg	1/carton
	more than 50kg	2/carton
Bale	100kg or more	6/package
Salt	70kg or more	8/pack
Sorghum	80kg or more	7/bunch
Onion	Bunch*	1/bunch
Drum	Piece	20/piece
Rice	25kg	1.05/pack
Beans	80kg or more	6/pack
Others	less than 50kg	1.5/pack

Note: weight of a bunch of onion is unknown.

Source: The Project for Enhancement of Operation and Management Capacity of Inland Waterway in Southern Sudan

## **6.5 FACILITIES AND STAFFING**

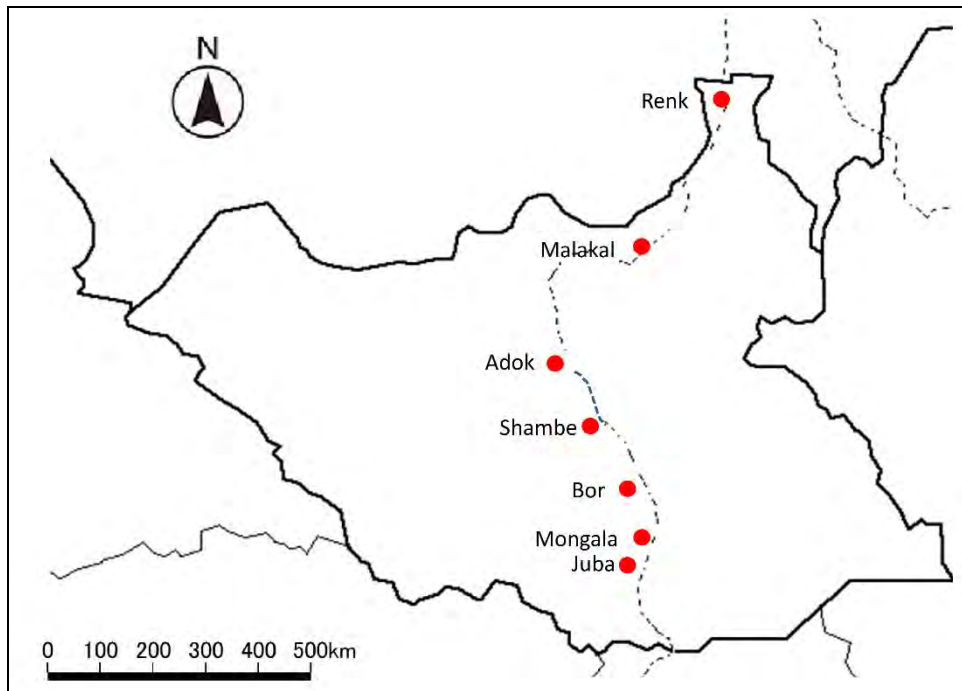
### **6.5.1 Port Facilities**

The main means of transportation in South Sudan are by land transport (on road networks) and by inland water transport (on the Nile River). There are limited air and railway transportation options. There are seven main upstream ports in south Sudan along the Nile River, namely Juba, Mongala, Bor, Shambe, Adok, Malakal and Renk.

The road network connecting Juba to Renk runs almost parallel to the Nile River until Bor, then it separates from the Nile River and runs straight north to Malakal Town and then runs parallel again to the river to Renk. Although road networks are one of the main means of transportation, they have not been developed, managed nor maintained properly due to more than 20 years of civil war.

During the rainy season, inland water transport on the Nile River is the only reliable means of transportation between the south and north areas of South Sudan. The Nile River affords access to points east and west of the main river through connections with its streams. There are seven major river ports along the Nile River in South Sudan as shown in **Figure 6.5-1**.

Table 6.5-1 describes these river ports.



Source: Interview Survey to MOT of ROSS and MoPI&RD of UNS

**Figure 6.5-1 Major River Ports along Nile River in ROSS**

**Table 6.5-1 Information of Seven River Ports**

(As of February 2009)

Item	Juba	Mongalla	Bor	Shambe
Location (long./lati.)	31°36'52"/4°49'52"	31°46'12"/5°12'7"	31°33'43"/6°12'51"	30°46'8"/7°6'0"
Jetty for Docking	35m x 16m	60m	No	Yes
Natural Embankment	Yes	No	Yes	No
Lifting Equipment	1.5t Commercial crane	No	No commercial crane	No commercial crane
Loading/Unloading Capacity	4 barges per day	No operation	2 barges per day	1 barge per day
Population	372,410 (2011)	2,439 (2008)	26,800 (2006)	6,458 (2008)
Characteristics	*Ship imported food and household goods	*Constructed in 2010. *Port area: 60m*55m *Port facilities -passenger terminal -warehouse -lighting system -water supply facility -generator *Port is not in use.	*Barges dock at the natural embankment.	*Access to the Lakes, Warrap and Unity States *Large barges can dock during the rainy season only.
Item	Adok	Malakal	Renk	
Location (long./lati)	30°19'15"/8°11'4"	31°6'55"/9°53'0"	32°48'0"/11°45'0"	
Jetty for Docking	No	18m x 10m	Yes	
Natural Embankment	Yes	No	No	
Lifting Equipment	No commercial crane	No commercial crane	No commercial crane	
Loading/Unloading Capacity	No data	3 barges per day	2 barges per day	
Population	10,872(2008)	139,450 (2010)	26,850 (2004)	
Characteristics	No data	*No particular commodities *Consuming region *Hub for supply goods to	*Ship agricultural products to other towns	



		neighbour villages	
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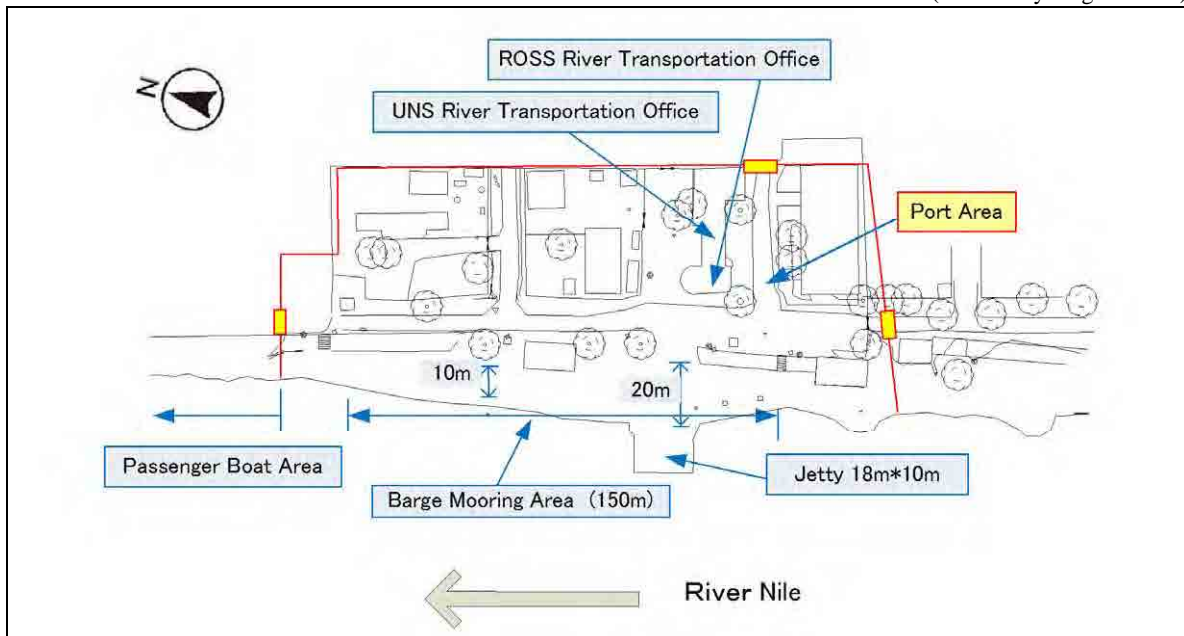
Source: UNJLC River Cargo Transportation Assessment White Nile River Sudan Feb. 2009

Mongala Port was constructed in 2010. It is located about 45km northeast of Juba. The road to Mongala Port from Juba is rough and in such very bad condition that cargo trucks are unable to pass through. There are two big ports in UNS, the Malakal Port and the Renk Port. These will become international ports when the border to Sudan is opened and exchange of products beyond national barriers starts or routes to seaports passing through Ethiopia developed.

The Malakal Port is located almost in the middle of Malakal Town, the capital of UNS. The layout of Malakal Port is shown in **Figure 6.5-2**. Although the port area is surrounded by a fence and has three gates, there is no security control over access. The width of the apron varies from 10m to 20m and there is no land behind for freight handling. No manoeuvring space for cargo truck and it has to k-turn (3 point turn). Therefore the port area is very narrow. The length of the berthing space for barges is around 150m. The slope protection is made with the stone pitching method, but stones are collapsed and scattered due to age degradation.

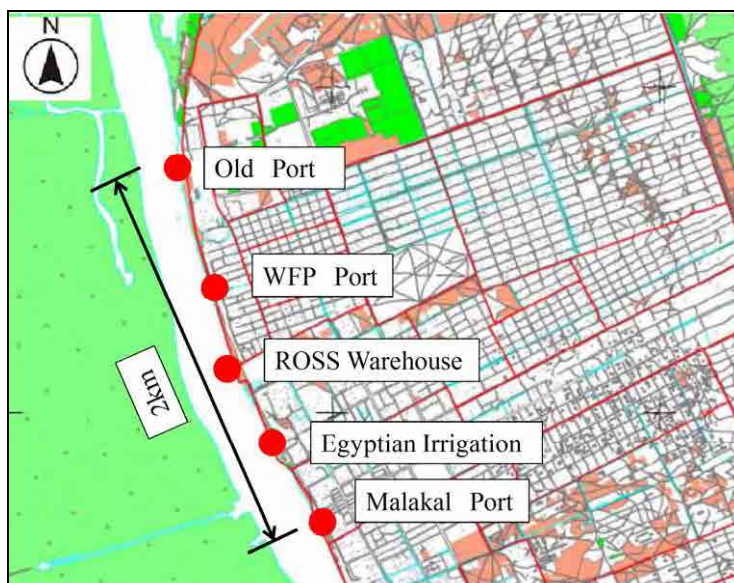
There is a steel-made 18m x 10m jetty built around the centre, slightly upstream. The jetty was constructed in 2003, but it has not been maintained, and rough berthing has made it unusable. In addition, there is only one mooring bit and there is no water supply system for ships. Located in the port area are warehouses of the United Nations Mission in South Sudan (UNMISS), a hall, a guesthouse, and ROSS and UNS's offices. Possible berthing areas for barges at Malakal Town beside the port are the Egyptian Irrigation, ROSS warehouse area, World Food Programme (WFP) Port and Old Port in the upstream as shown in **Figure 6.5-3**.

(As of May August 2012)



Source: Field Survey of JICA Project Team

**Figure 6.5-2 Layout of Malakal Port**



Source: Field Survey of JICA Project Team

**Figure 6.5-3 Possible Berthing Area in Malakal Town**

Table 6.5-2 shows outline of Malakal Port facilities.

**Table 6.5-2 Outline of Malakal Port Facilities**

(As of August 2012)

Item	Details	Specification
Length		150m
Width		10 to 20m (apron)
Water Depth		4m to 6m
Facilities	Jetty	10m*18m
	Warehouse	3units (1unit managed by UNMISS)
	Guest House	1unit
	Office	2units
	Hall	1unit
	Loading Equipment	none
Cargo Handling	Incoming	daily commodity, fuel
	Outgoing	almost none
Road	Access Road	Broken paved road of 10m width and 100m in length from the main street
	Port Road	Very narrow that cars cannot pass

Source: Field Survey of JICA Project Team

In summary, the current status of Malakal Port is assessed as follows.

- Essentially, Malakal Port is used exclusively for barges. However speed boats are mooring downstream and loading/unloading cargos.
- Guesthouse and hall are not in use.
- UNMISS crane is used infrequently.
- Malakal Port has few loading goods to be transported.
- There are many street vendors inside the port area.
- Both sides of the port are natural slope. Bank of the river and apron came together.

## 6.6 FINDINGS FROM RELEVANT SURVEY(S)

See the Boat Count Surveys and OD Surveys in **Section 6.4** for the details as findings and the result of surveys conducted by the Project are referred in the above section.

## 6.7 PROGRAMMES AND PROJECTS

**Table 6.7-1** shows transportation-related projects assisted by Japan in ROSS.

**Table 6.7-1 List of Japanese Assisted Projects for Transport Sector**

Contents	Year	Project Name	Contents
Development Study	2006 to 2007	Emergency Study on the Planning and Support for Basic Physical and Social Infrastructure in Juba Town and the Surrounding Areas	-Construction of jetty -Procurement of hoist crane
	2008 to 2009	Emergency Study on the Planning and Support for Basic Physical and Social Infrastructure in Juba Town and the Surrounding Areas (Follow up)	-Rehabilitation of jetty -Improvement of port management ability
Technical Cooperation	2011 to 2015	The Project for Enhancement of Operation and Management Capacity of Inland Waterway in Southern Sudan	-Technical transfer of port operation and management -Compilation of port statistics
Grant Project	2012	The Project for Improvement of Juba River Port	-Detailed design

Source: JICA Web Page (<http://gwweb.jica.go.jp/km/ProjectView.nsf/NaviProPj?OpenNavigator>)

With regards to the port sector, most of the projects are exclusive to Juba Port. The Project for Enhancement of Operation and Management Capacity of Inland Waterway in South Sudan is a capacity enhancement program for Juba Port and five other ports, including Malakal Port. This project should enhance links among ports and hinterlands and contribute to strengthening South Sudan's harmony. The project consists of the components shown in **Table 6.7-2** for capacity development.

**Table 6.7-2 Contents for the Capacity Development Project for Inland Waterway**

Title	Contents
Operation & Maintenance	Draw up operation manuals Procedure for port call Administration Various application forms Draw up maintenance manuals Port facility Inventory Equipment Check list
Safety	Emergency contact list Safety organization for fire prevention and oil spillage prevention Procedure for safe berthing Safety procedures for wire rope works
Organization	Draw up JRPA internal rules Organize shipping companies
Data management	Cargo volume OD data

Source: The Project for Enhancement of Operation and Management Capacity of Inland Waterway in Southern Sudan

In addition, port management capability of these commercial ports will likely increase by

creating an efficient system of port management. Larger volumes of goods can be transported to wider areas with lower freight costs. Economic effects such as lower prices and distribution of various items in South Sudan can be expected. It will contribute to remedy regional differences by stabilising prices. There is no major contributions in the port sector. Japan is the only donor for inland water transport.

## **6.8 NEEDS AND ISSUES**

The river port in Malakal Town is a broad array of transportation facilities. The port services cargoes and passenger transportation to Malakal town, and in addition it also maintains an important role as a strategic river port for UNS and northern part of ROSS. The issues of the river transport sector for port reconstruction and development are summarized below.

- Decrepit and/or damaged port facilities
- Lack of passenger port facilities
- Lack of coordination with development of passenger's facility and public transportation
- Lack of statistical data processing for port operation
- Lack of capacity of port management officials (safe navigation, cargo handling, management of maintenance and repair for port facilities and management of data)
- Lack of maintenance and repair budget for port facilities
- Lack of safety transportation system by river
- Lack of passenger transport capacity

### **6.8.1 Port Improvement for Cargo Transport**

#### **(1) International Corridor Development**

During the rainy season, many roads in this area are flooded and are not accessible. Hence, river transportation assumes an important role as the only method of transportation. However, a stable goods distribution system, using the Nile River, is not operating at present. The levels of price are higher in Malakal Town than that of Juba due to the vulnerability of the distribution route. The price investigation at Malakal Town conducted by the Project Team found that when diesel fuel becomes out of stock in the town, prices almost double.

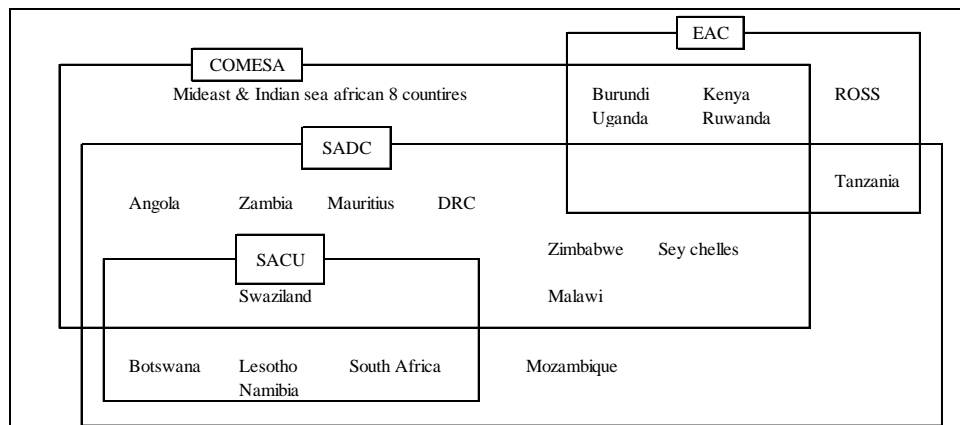
It is necessary to strengthen the distribution routes centred in the Malakal Port to secure goods and to stabilize prices in UNS, including Malakal Town. Strengthening the function of distribution including the port shall be done in collaboration with infrastructural development, such as power supply, water supply sewage and so on, as based on the future vision of Malakal Town.

There are only two international commercial ports in the East African economic block including the southern part of Sudan. They are the Mombasa Port in Kenya and the Dar es Salaam Port in Tanzania. The ports are very important for landlocked countries and essential for importing and exporting, and for the effective distribution of goods. Malakal Town is a

strategically important place for economic development in the Greater Upper Nile region. Thus, it is crucial to develop Malakal Port with building facilities and to be able to cope, in future, with the development of new distribution routes through places such as Ethiopia or Egypt.

Lamu Port-Southern Sudan-Ethiopia Transport (LAPSSET) Corridor is the name of a plan to connect Lamu Port in Kenya, ROSS and Ethiopia. However, if Addis Ababa in Ethiopia and Malakal Town is connected and an inland depot is set in Malakal Town, there could be a new Malakal-based movement of commodities by multi-modal water transport. The distance between Addis Ababa and Malakal Town is around 1,000km, which is about the same as the distance between Nairobi and Juba. Imported goods (in containers) from Ethiopia can be kept in a bonded area after crossing the border. After customs clearance, these imported goods can be distributed by water transportation.

The road network from Addis Ababa to Malakal Town passes through Gambela in Ethiopia. During the rainy season, the road between Gambela and Malakal is closed, and only speed boats are able to pass by using the river. By positioning a road network or a water passage, imported goods from Ethiopia can be distributed to ROSS via Malakal Town throughout the year.



Note: ROSS is an accession candidate country for EAC as of 2014 April.

Source: JICA Project Team

**Figure 6.8-1 Regional Economic Cooperation of East Africa**

For the accessibility of transit cargo by a land route, the following efforts have been conducted by the East African Community (EAC), Southern African Development Community (SADC), and Common Market for Eastern and Southern Africa (COMESA). Efficient cargo transportation and distribution systems are developed to support landlocked countries. And ROSS is an accession candidate country for EAC (as of April 2014).

- Adoption of common forms of customs documents and procedures
- Setting up common border posts
- Capacity building for border posts officers

Development of an inland container depot to cope with international multimodal transport is

necessary along with the development of an international logistics route.

**Table 6.8-1 Cargo Distribution Patterns in UNS**

(As of September 2012)

Products	Description
Petroleum Oil and Products	<ul style="list-style-type: none"> <li>• UNS produces petroleum oil which is the major source of income in ROSS. However due to the conflict between Sudan, crude oil export by pipelines are stopped.</li> <li>• Since ROSS does not have its own petroleum refining plant, oil transportation is dependant on river transportation via the Nile River from Juba.</li> </ul>
Agricultural Products	<ul style="list-style-type: none"> <li>• UNS is said to have fertile land, but animal industry and agricultural industry are not showing their potentials. Therefore importation of animal products and agricultural products are dependent on Juba and Ethiopia by river transportation and land transportation, respectively.</li> </ul>
Mineral Products	<ul style="list-style-type: none"> <li>• Mineral products other than petroleum are not developed in UNS. Therefore construction materials such as sands and stones have to be brought in from other places/countries.</li> </ul>
Industrial Products	<ul style="list-style-type: none"> <li>• North Corridor, Beira Corridor and the road connecting Dar es Salaam Port provide route for imported industrial products to landlocked countries.</li> <li>• Items of imported air cargos are electrical devices and clothes and most of them are from China.</li> </ul>
Container	<ul style="list-style-type: none"> <li>• Container handling ability in Malakal Port is very poor. UN crane was provided for container handling, but lifting capacity is too small.</li> </ul>

Source: Market Survey Conducted by JICA Project Team

## (2) Rehabilitation of Present Port

After more than 20 years' civil war, port facilities such as jetty and riverbank protection are damaged or deteriorated. Rehabilitation of the present port is an urgent issue not only for price stability and stable supply of goods, but also transportation of goods and construction equipment for recovery and reconstruction.

## (3) New Port Development

When considering future industrial development and containerization, the expansion of the current port or a new port development will become an issue. Considering how the current Malakal Port will function as a regional logistics hub facility, it is clear that berth, yard and storage warehouse are insufficient. This area has been built-up as an urban area already and the main facilities of the Town is already located. It is difficult to expand the port yard.

Due to the proximity to the Main Market and Grain Market of the city centre present, logistics functions for the general cargo of Malakal Port shall be kept in the future.

## 6.8.2 Port Improvement for Passenger Transport

### (1) Improvement of the Eastern Bank Port

Malakal Port also accomplishes the role of passenger transport like an airport. It plays a part in transporting passengers over wide areas using the Nile River and also for community residents' accessible transportation to connect to nearby counties.

Although there is strong passenger flow, facilities use the natural levee of the Nile River. Using the boats is not safe for old people, ladies and children. Moreover public transportation connecting services are insufficient.

Construction of a passenger platform at the current passenger boarding place adjacent to the market and town centre will be an issue to be addressed.

**(2) Improvement of the Western Bank Port**

The location of the boat landing differs between dry season and rainy season at the opposite shore of Malakal Town because of the change in water level of Nile River. Although water passage was constructed to the western bank, there seems no boarding facility for passengers. It is necessary to construct a boarding platform.

**(3) Improvement of the Ferry Service**

In Malakal Town, there is only one small ferry that can carry a few small cars across the river. A ferry for big cars exists in the south about 50km away from Malakal Town. Since transport demand for cars and trucks is expected to increase for the transportation of raw materials used for industry and people to access urban functions, construction of ferry facility to accommodate larger ferry boats and procurement of such boats will become an issue in the near future.

Development of passenger facilities at the port for the community will contribute to the advancement of accessibility to urban services in Malakal Town and help people in the neighbouring regions (Shilluk People) bring agricultural products to the market. Therefore it will help social stabilization and help improve domestic living conditions and prevent conflicts.

**(4) Fish Port Improvement**

There are small fishermen's boats in Malakal Town, which use the natural river bank of the Nile River outside of the port. They need an independent landing facility. It will be more effective to consider this as well as a fishery development issue in an integrated manner.

**(5) Capacity Development**

As for capacity development, such as know-how of port operation and management, safety measure for navigation including procurement of port radio and training of pilot, a database of statistical port data, enhancement of the organization and CIQ (Customs, Immigration and Quarantine) at the international port, these have all become an issue.

**6.8.3 Consideration for the Comprehensive Plan**

**(1) Relationship to the Comprehensive Social Economic Infrastructure Plan**

Land-use and transportation planning (port, airport and road) is the one of main determinants of urban structure. In particular, the port is a regional transportation facility and Malakal Town is formed around Malakal Port, so the port has a significant meaning in with respect to the Social Economic Infrastructure Comprehensive Plan.

Since urban functions corresponding to logistics and human flow are already located in the vicinity of the present Malakal Port, it is reasonable to keep the function of the port (especially passenger boat facility) at present Malakal Port. Urban structure will differ if enhancement of port function for cargo transportation is expanded at existing port or at a new port area.

It is necessary to consider the enhancement of cargo port function in connection with the industrial development. The same applies to the ferry terminal improvement.

## **(2) Cooperation Work with Other Sectors**

Land-use planning of Malakal Town shall assume the functional location of a future port. Improvement of connecting road to the port is important for port function. Hence it is necessary to consider port location together with the access road.

And also, it is necessary to improve the existing port on a priority basis for transport of goods for social and economic infrastructure and price stability.

## **(3) Application to the Comprehensive Plan**

A distribution network using the Nile River is a means to overcome the physical isolation of Malakal Town together with the road, airway and the information network.

### **(a) Co-existence with Nile River**

Although Malakal Town is isolated in geographically, there is a history that the town was evolved linked with other areas by using Nile River for logistics and people movement. It is presumable that importance of the river transport will change in future, but the significance of the river transportation will still remain.

### **(b) Symbiotic**

Construction of a passenger platform and ferry terminal will activate the exchange between regions and contribute to peace links between the region.

### **(c) Water Transport**

The main purpose of individual capacity development (CD) is to contribute to increasing the utility of Malakal Port and to increasing the volume of cargo. For them, the port management system has to be established, and then along with the system, manuals have to be prepared. The manuals should include port management, operation and maintenance of the facilities, goods traffic and ship movement (navigation), and port safety supervision. This skill training will be conducted along with the manuals. Also it needs to be considered in the future to provide the trainings for taxation, quarantine and immigration (or “One Stop Service”/a “Single Window Service”).



## **6.9 WATER TRANSPORT SECTOR DEVELOPMENT PLAN**

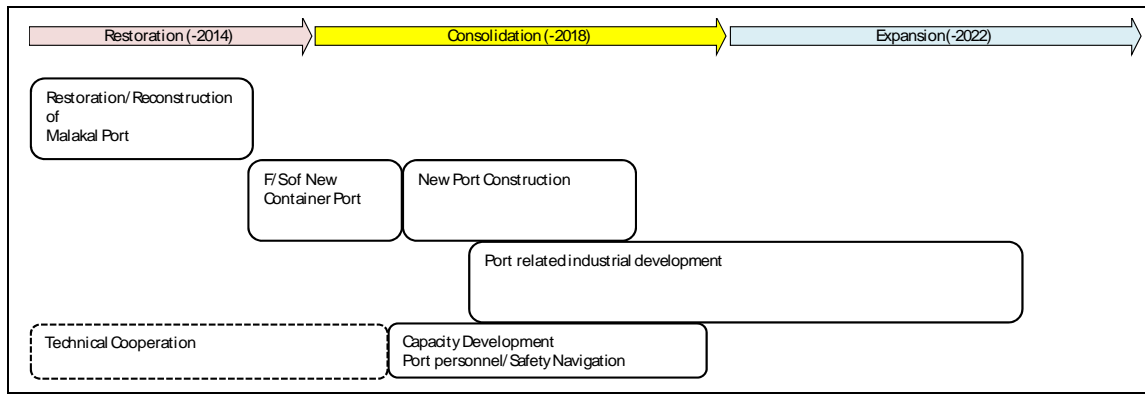
### **6.9.1 Objectives of River Transport Sector**

In the year 2022, containerization will have already been started. The Malakal Port (new port) will become an international port and goods from Malakal and Juba shall be exported to Ethiopia by road network. On the other hand, goods from Ethiopia shall be consumed both in Malakal and Juba. Therefore the Malakal New Port will have a role of the feeder port. For this flow of logistics, an inland container depot shall have a big role to play.

With regards to passenger boat, passengers shall be much more comfortable for embarkation and disembarkation by the use of mooring platforms.

- For the pressing issue to cope with the cargo and passenger transport demand, measures for port restoration are reasonable.
- With regards to the resident passenger transport demand a strong link between the central market and opposite bank has been observed. Therefore, not only the present Malakal Port restoration or reconstruction, but also public transport and access road to the port will be improved. Also, port facilities on the opposite site of the bank (western bank) including ferry boats will be improved.
- In the medium and long term span, however, port development shall be made based on the economic development and future urban structures. In this respect, the present Malakal Port has a very limited room for expansion. Therefore other sites suitable for new ports will be pursued. For this purpose, feasibility studies, including justification of candidate sites will be required.
- Safe navigation and navigable routes development will be conveyed without delay.
- Capacity development of the port related personnel will also be promptly implemented expecting synergistic or effective results from concerted efforts of existing technical cooperation projects.
- For the industrial development, improvement of infrastructures other than the port (roads, electricity and so on) will be required; however, it will take a considerable time. Hence it is reasonable to conduct F/S for new port to strengthen the port function at Malakal Town and to embody the new port construction.

The following figure shows above strategy in chronological order.



Source: JICA Project Team

**Figure 6.9-1 Port Improvement Stages**

### 6.9.2 Forecast of River Transport Demand

The projection of future demand of river transport is based on the following assumptions:

- Low Estimate

River transport demand increase at the same rate as population growth rate which is equivalent to average annual growth rate of 2.9% per year.

- High Estimate

Taking into account the increase in per-capita transport demand in addition to the above estimate, the growth rate of river transport demand is assumed to be 4.6% increase per year.

The river transport demand forecast results are shown in **Table 6.9-1**.

**Table 6.9-1 Forecast of River Transport Demand**

(As of August 2012)

	Present Demand (2012)		Future Demand (2022)			
	Volume	No. of vessels	Volume		No. of Vessels	
			Low estimate	High Estimate	Low estimate	High Estimate
Cargo	1,500t/mo.	13 barges/mo.	2,000t/mo.	2,400t/mo.	17 barges/mo.	20 barges/mo.
Passenger	31,800 persons/m	1,400 vessels/m	42,000 persons/m	50,000 persons/m	1,900 vessels/m	2,200 vessels/m

Source: JICA Project Team

Currently beverage and construction materials share half of the general cargo. Container operations could improve efficiency and flexibility of cargo transport especially international cargo transport. It is therefore assumed in 2022 that part of the cargo will be containerized. General cargo will remain, especially for local cargo. As a basis to determine the future infrastructure requirements, it is assumed that dry cargo will be split in 2022 as follows:

- General Cargo 70%
- Container Cargo 30%

In above assumption, future container transport demand is estimated at 34-40 twenty-foot equivalent units (TEUs) in 2022.

### 6.9.3 Port Sector Plan

The Port Plan is the plan to show the direction of future development, improvement and conservation of the port by the port authority.

The Port will undertake a close role in economy such as transportation, as a distribution centre for personnel and goods, industry as a use of hinterland for cultivation of crops and life as leisure and disaster prevention space. When the port plan is considered, the following four items should be considered.

**Table 6.9-2 Items to be Considered for Port Planning**

Items	Contents
Logistics	<ul style="list-style-type: none"> <li>• Strengthen the function of distribution routes based on the container terminal</li> <li>• Effective use for port space corresponding to the change in demand of goods</li> <li>• Strengthen the transportation system for the port area</li> <li>• promotion of Industry in the port area</li> </ul>
Interchange	<ul style="list-style-type: none"> <li>• Port construction together with town construction</li> <li>• Formation of waterfront as a place of tourism and meeting of people</li> <li>• Secure space for waterfront and recreational site</li> </ul>
Environment	<ul style="list-style-type: none"> <li>• Construction of waste disposal site</li> <li>• Purification of water</li> <li>• Prevention of oil spills</li> </ul>
Safety	<ul style="list-style-type: none"> <li>• Enhancement of disaster prevention function</li> <li>• Transportation of refugee and emergency supplies.</li> </ul>

Source: JICA Project Team

#### (1) Port Improvement for Cargo Transport

##### (a) Port Restoration

The existing Malakal Port shall be utilized until the completion of the new port. The present Malakal port will be restored in terms of jetty, apron and approach road. Maintenance and repair of the port facilities are very important for sound management of the port operation. One of the reasons for aging of port facilities is that maintenance and repair has not been conducted. Therefore it is necessary to appoint an inspector and to conduct inspection to prevent or to minimize damage to port facilities.

##### (b) New Port Development

Building a new port requires a large budget and a long period of time. This project shall be undertaken together with the ROSS and the UNS from the planning stage, and the ROSS and the UNS should work closely together. When planning a new port, social and natural conditions must be taken into account as shown in **Table 6.9-3**.

**Table 6.9-3 Social and Natural Condition Considerations**

Social Conditions	Natural Conditions
Land utilization plan	Geographic
Access	Terrain
Surrounding environment	Soil conditions
Relevant Plan	

Source: JICA Project Team



Source: JICA Project Team

**Figure 6.9-2 Potential Locations for New Ports**

There are two potential locations for a new port. One is the Old Port which is located about 2km north from the present Malakal Port. The other is Ogot Nyithok north east of Malakal Town, around 6km from the Outer Ring Road. Ogot Nyithok was used for berthing location since 1940's. During the conflict, it was used by UN or WFP for food support to Shilluk.

Malakal Town was developed around Malakal Port. In a similar way, it will be necessary to make a new town planning when constructing a new port in Ogot Nyithok. Budget for construction of the port as well as for infrastructures, such as electricity, water supply, road and so on, would be required.

**Table 6.9-4 Candidate Locations for New Port**

	Old Port	Ogot Nyithok
<b>(1) Social Conditions</b>		
Land Utilization	<ul style="list-style-type: none"> <li>Possible utilization area is narrower than Ogot Nyithok.</li> <li>Considering the expansion of Malakal Town, old port is the only location for multipurpose use along the Nile River.</li> </ul>	<ul style="list-style-type: none"> <li>There is no restriction of the size for land utilization due to undeveloped location and various plans can be created.</li> <li>Only a few people are living and construction can be done without harming regional environment.</li> </ul>
Access	<ul style="list-style-type: none"> <li>Very near from Malakal Port and not necessary to construct a new access road.</li> </ul>	<ul style="list-style-type: none"> <li>Around 15km from the centre of Malakal Town and have to improve Outer Ring Road that container truck can pass whole year.</li> </ul>
Surrounding Environment	<ul style="list-style-type: none"> <li>Related infrastructures can be used because the location is inside the town.</li> <li>There are many residents near the planned site. Increase number of vehicle may cause the traffic nuisance.</li> </ul>	<ul style="list-style-type: none"> <li>No facility around and it will be hard to commute from Malakal Town.</li> <li>It will be necessary to create environment for workers.</li> <li>No infrastructures are provided.</li> </ul>
Relevant Plan	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>There is a plan to construct oil storage station in the neighbourhood.</li> </ul>
Others	<ul style="list-style-type: none"> <li>Initial investment will be less than Ogot Nyithok because of the location</li> </ul>	<ul style="list-style-type: none"> <li>The construction project to will be equivalent to construction of new town and would need a feasibility study.</li> <li>Huge amount of budget will be required.</li> </ul>
<b>(2) Natural Condition</b>		
Geographic Conditions	<ul style="list-style-type: none"> <li>Water depth is more than 3.5m during dry season. It is deeper than the draft of full loaded 1,000t barge which is around 2.5m.</li> </ul>	<ul style="list-style-type: none"> <li>Unknown. Topographic survey has not been conducted.</li> </ul>
Terrain	<ul style="list-style-type: none"> <li>Northern part is almost flat or gentle slope, but bankside of southern part is a little steep.</li> <li>Soil jetty was constructed, but collapsed now and cannot use.</li> </ul>	<ul style="list-style-type: none"> <li>Unknown. Geotechnical survey has not been conducted.</li> </ul>
Soil Conditions	<ul style="list-style-type: none"> <li>Soil condition is mostly clay. Bearing layer is around -9 to -10m.</li> </ul>	<ul style="list-style-type: none"> <li>Unknown. Geotechnical survey has not been conducted.</li> </ul>
Others	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Need to conduct F/S</li> </ul>

Source: JICA Project Team

**Table 6.9-5 Direction of Role Allotment of Port**

Location	Major Function	Related Facilities	Role in M/P
Existing Malakal Port	Passenger terminal (broad area passengers, river crossing passengers)	Central market Public Transportation	Development of infrastructure to enhance residents' living standards (advancement of accessibility to urban services, service to broad area passengers)
New Port	Container and general cargo terminal	To be concluded after F/S	To be concluded after F/S

Source: JICA Project Team

Based on the future vision of Malakal Town, strengthening the function of distribution by the port will be done in cooperation with the infrastructural development, such as power supply, water supply sewage and so on. As a part of formation of distribution system including

hardware and software, regional development by constructing distribution base, custody base and processing base would be necessary. Modernization of distribution including international integrated multi-modal transport system, infrastructure for distribution, information and so on would need to be considered.

Considering the expansion of Malakal Town, the old port cannot anticipate occupying a huge area. Ogot Nyithok has a potential to be a satellite of Malakal Town. In addition, Ogot Nyithok is planned as a national strategic facility. However, an actual study has not taken place. Appropriate feasibility studies will be conducted as necessary for national strategic investments planning.

#### Inland Container Depot Development

The current distribution via Juba is intended as a major international freight route to Malakal. Transportation from Sudan and Ethiopia is small, but when an all-weather international road corridor is constructed, transport by road will increase as seen in the example of Juba. Then an inland container depot to accommodate containers will be constructed.

## **(2) Port Improvement for Passenger Transport**

#### Port Improvement on the Eastern Bank

Traffic volume is expected to be around 1,900 to 2,200 people per day in 2022. Accordingly, the number of boats is expected to be around 82 to 95 per day. This is 8 to 10 vessels per hour when converted. It is expected that about twice the average amount of traffic is expected in the morning and in the evening for commute, thus mooring platform for 15 to 20 boats shall be required.

As shown in **Chapter 21**, platforms for 10 vessels will be planned in an urgent support project. Therefore, 1.5 to 2 times bigger platforms will be required as a whole. The location for these additional platforms will be recommended at the upstream location of the urgent support project where speed boats are currently unloading goods. In case the platforms cannot be constructed at the upstream location, it is recommended to be constructed downstream.

#### Port Improvement on the Western Bank

At the west bank of the Nile River, the water level differs greatly between the rainy season and in the dry season. In the rainy season, boats can pass a narrow waterway (canal) inland for about 1,000m. Hence, a permanent mooring platform shall be prepared at the location of the boarding during rainy season and the waterway shall be dredged for all-season use.

Since the number of the passenger at the west bank is about 1/3 of the east bank, the required capacity of the mooring platform shall be about 5 to 7 boats mooring at the same time.

#### Ferry Service Improvement

It is desirable to construct a ferry terminal near the passenger terminal at Malakal Port considering the urban planning. However there is no enough space for waiting area of the vehicles. Those places that can ensure sufficient spaces are Egyptian Irrigation, Hai El Shatti

where government workshop exists and the Old Port. Distance from Malakal Port is 500m, 1,000m and 2,000m respectively. The necessary facility will be a concrete ramp with width more than 3.5m, longitudinal gradient less than 17% and a shed for waiting passengers.



Source: JICA Project Team

**Figure 6.9-3 Port Improvement of Western Bank**

### **(3) Capacity Development**

In the current Malakal Port, operational management has not been carried out most of the time. It is necessary to understand that port operation is a service industry. In order to operate safe and comfortable port, the following education shall be required.

#### **(a) Port Management**

A manual on the procedures with respect to the flow of entering and departure of the vessels and creation of forms.

#### **(b) Operation and Maintenance**

Creation of a manual and forms for the operation and maintenance of the facilities.

#### **(c) Statistic Management**

Extraction of statistical data necessary for port operations and creation of forms.

#### **(d) Safety**

Implementation of safety education about navigation and handling of cargo.

#### **(e) Education towards Internationalization of the Port**

Implementation of education about CIQ management and port security.

#### **(f) Water Transport**

Single Window System, Loading/Unloading System, Port Tariff and Taxation System, Safety Standards and the like are identified as and recommended for prioritized CD activities.

## **6.10 WATER TRANSPORT SECTOR PROJECT**

**Table 6.10-1** shows proposed projects for project implementation.

**(1) Reconstruction of Jetty at Malakal Port Project (PT-1)**

**(a) Background**

As per the result of the port use survey conducted in May 2012 by JICA project Team, there are five passenger boats coming and going per hour. In the morning, though, it is very crowded since more than ten passenger boats use the Malakal Port every hour. Since the mooring time of each ship is not the same and hard to define, admissible numbers of ships should be limited to ten.

**Table 6.10-1 Proposed Plan for the Port Project**

No.	Name of the Project	Contents	Cost (mil US\$)
PT-1	Reconstruction of Jetty at Malakal Port	Remove and reconstruct a jetty for barges at Malakal Port	2.0
PT-2	Procurement of Crane	Provide 40t class mobile crane for cargo operation	0.75
PT-3	Construction of New Port (Phase-1)	Construct a 30m-jetty for effective port operation	3.0
PT-4	Extension of New Port (Phase-2)	Construct 300m jetty to extend the wharf and port facilities	21.0
PT-5	Construction of Passenger Jetty	Provide a platform for passengers	0.6
PT-6	Development of West Side (Left Bank) of Nile River	Provide a platform for passengers	0.5
PT-7	Improvement of Malakal Port	Renovate Malakal Port and access road for passengers, fishermen, citizens and tourists	2.1
PT-8	Procurement of Ferry	Provide 500t class ferry	6.0
PT-9	Improvement of River Bank Protection	Rehabilitation of revetment at Malakal Port	0.15
PT-10	Improvement of New Port Road	New port road improvement for new port	2.0
PT-12	Capacity Development for port Management	Education and training for port management, operation, safety and so on.	0.3

Source: JICA Project Team

**(b) Objectives**

To meet river transport demand of people and goods and to stimulate the social and economic activities.

**(c) Location**

The present Malakal Port

**(d) Scope of the Project**

Remove old jetty and construct a new one.

**(e) Project Cost**

Total Cost: US\$2.0 million.

**(f) Project Details**

The apron is around 10m wide in most area of the Malakal Port. Only in front of the jetty is 20m wide. It is the best way to remove the wrecked jetty and reconstruct a new jetty in the same place. Based on the result of the soil analysis, the support method would require pile driving and construction shall be done in the active port. Therefore a gravity type jetty using cellular blocks shall be proposed.



**(g) Remarks**

There is a 300t class pusher barge owned by UNS which sank in the middle of the Malakal Port.

**(2) Procurement of Crane Project (PT-2)**

**(a) Background**

There is no commercial unloading equipment in Malakal Town. The UN owns a 15-ton (t) lifting capacity crane, but it is too small for unloading containers. When a container comes to Malakal Port, stevedores open the container on the barge and they unload goods manually. If a general cargo is loaded on a pallet, it can be loaded by crane. Container cargoes are expected to increase, hence, efficient cargo handling will be required. Equipment for unloading are needed.

**(b) Objectives**

Strengthening the function of distribution.

**(c) Location**

Present Malakal Port and New Port

**(d) Scope of the Project**

Procurement of mobile crane (40t~50t)

**(e) Project Cost**

Total Cost: US\$0.75 million.

**(f) Project Details**

The lifting capacity of crane in Juba now is 35t. The minimum working radius when loading a container is approximately 6.6m (length of outrigger 3.4m, a half of container width 1.25m and distance between crane and the container 2m), of which loading capacity is 15t.

Considering the operation efficiency at Malakal Port, container shall be unloaded at the long-side direction. Then the working radius shall be increased by about 2m. Therefore, 45t crane shall be required to lift 15t with working radius of 8.6m.

**(g) Remarks**

It is necessary to build a consensus among stevedores (union), cargo owners and the government.

**(3) Construction of New Port Project (Phase 1) (PT-3)**

**(a) Background**

The existing Malakal Port is very narrow and there is no manoeuvring space for trailer trucks. The apron is blocked by a slope and cannot expand towards land. It is expected that cargo handling volume will increase in the near future, which Malakal port is incapable of coping with, because the new container yard in Juba will be completed in 2015 and use of containers

will then start. Therefore, the construction of a new jetty will be absolutely imperative.

**(b) Objectives**

Correspond to international multi-modal transport system and strengthening of function of distribution.

**(c) Location**

To be studied

**(d) Scope of the Project**

Construction of jetty for barges and access road

**(e) Project Cost**

Phase-1 Cost: US\$3.0 million.

**(f) Project Detail**

Construct 35m jetty. The 1,000t barge is around 15m wide, so two barges can be moored at the same time.

**(g) Remarks**

Location of the new port must be finalized as early as possible.

**(4) Construction of New Port Project (Phase 2) (PT-4)**

**(a) Background**

To meet requirements of increasing cargo volumes, extension of the previously constructed new jetty will be required. The extension length shall be to a total of 300m. This will make cargo handling more efficient.

**(b) Objectives**

Correspond to international multi-modal transport systems and strengthening of function of distribution.

**(c) Location**

To be determined

**(d) Scope of the Project**

Construction of new port

**(e) Project Cost**

Phase-2 Cost: US\$21.0 million.

**(f) Project Detail**

It will be constructed with steel piles and concrete. A slope shall be constructed for ferry boat. Related facilities such as office, warehouse, a water tank and others will be constructed.

**(g) Remarks**

Location of the new port must be finalized as early as possible.

**(5) Construction of Passenger Jetty Project (PT-5)**

**(a) Background**

Transportation by water is very important around Malakal Town due to the poor condition of roads. Moreover, there is no bridge over the Nile River and passenger boat is the only way to across the river. Although many use a passenger boat, there is no boarding facilities. Passengers sometimes walk into the river to board in dry seasons, and they have to board from the dike unsteadily during rainy seasons.

Passengers can board in safety regardless of weather or seasons by providing a platform.

**(b) Objectives**

Advancement of accessibility to urban service in Malakal Town and help people in the neighbouring regions bring agricultural products to the market. To meet river transport demand of people and goods and to activate various social and economic activities.

**(c) Location**

The current Malakal Port

**(d) Scope of the Project**

Installation of platform together with riverbank protection

**(e) Project Cost**

Total Cost: US\$0.6 million.

**(f) Project Details**

As per the findings of the port use survey conducted in May 2012, the numbers of coming/going passenger boats per hour is five. But in the morning, it is very crowded and more than ten passenger boats are using the Malakal Port in one hour. Since the mooring time of each ship is not same and hard to define, the admissible numbers of ships will be limited to ten.

**(6) Development of West Side (Left Bank) of Nile River Project (PT-6)**

**(a) Background**

Around 300 people use Malakal Port daily to go back and forth between Malakal Town and the opposite shore (Lelo). Passengers from the opposite shore also have difficulty in safe boarding. Since the left bank is lower than the right bank, the left bank will be submerged widely during the rainy season. Embarkation and disembarkation locations differ between dry season and rainy seasons. Hence only a mobile type floating platform can be used and it will be moored at Malakal Port during the rainy season

**(b) Objectives**

To meet river transport demand of people and goods and to stimulate various social and economic activities.

**(c) Location**

Lelo (opposite share of Malakal Port)

**(d) Scope of the Project**

Procurement and installation of floating platform

**(e) Project Cost**

Total Cost: US\$0.5 million.

**(f) Project Detail**

Around 27% of the passenger boats which use the Malakal Port are going or coming to or from the opposite shore. Therefore, the size of the platform should be smaller than that of Malakal Port.

**(7) Improvement of Malakal Port Project (PT-7)**

**(a) Background**

After a new port is constructed, the existing Malakal Port will end its function as a commercial port. It can be repurposed as a port for passenger boats and fishing boats. Moreover, as written in the Malakal City Physical Development Plan, placement of water access and boating facilities along the waterfront will give multiple access points for recreation and emergency services.

**(b) Objectives**

To renew the function of Malakal Port for passengers, fishermen, citizens and tourists.

**(c) Location**

Present Malakal Port

**(d) Scope of the Project**

- Provision of boat stations
- Improvement of port facilities such as clean toilets, waiting lounge, fishery market and etc.
- Access road improvements.

**(e) Project Cost**

Total Cost: US\$2.1 million.

**(f) Project Detail**

Improvement of port roads and river bank protection will be carried out. Remove all building facilities inside the port area and reconstruct recreation space, shopping space and others.

**(8) Procurement of Ferry Project (PT-8)**

**(a) Background**

There is one small ferry boat which can carry one car in Malakal Town. Although the ferry is used for round trips to the opposite site of the port, there is no slope for boarding. For stimulating social and economic activities with the west river bank, provision of slope and a

bigger ferry which can carry more cars at a time will be very effective.

**(b) Objectives**

To meet river transport demand of people and goods and to stimulate various social and economic activities.

**(c) Location**

To be determined

**(d) Scope of the Project**

Procurement of ferry boat

**(e) Project Cost**

Total Cost: US\$6.0 million.

**(f) Project Details**

The existing ferry boat at Malakal Town is around 150t and very small, which can load only one or two cars at a time. Provide a 300t class ferry which can load 4 to 6 cars at a time.

**(9) Improvement of Riverbank Protection Project (PT-9)**

**(a) Background**

The riverbank protection at Malakal Port is a stone-pitched revetment with 30 to 50cm rubble. Due to wear and tear, more than half of the revetment is collapsed and the stones are scattered. Sometimes the ship collides with stones and Stevedores are swept off by the stones. Implementation of riverbank protection will clear those problems and people and ships will be able to operate safely.

**(b) Objectives**

To meet river transport demand of people and goods and to stimulate the social and economic activities.

To maintain safe operation.

**(c) Location**

Present Malakal Port

**(d) Scope of the Project**

Improvement of riverbank protection

**(e) Project Cost**

Total Cost: US\$0.15 million.

**(f) Project Detail**

The Bank of the Nile River will be improved and reinforced to resist erosion and provide a slope and amenity facilities to enable better utilization.

**(10) Improvement of New Port Road Project (PT-10)**

**(a) Background**

Since there is no road to the new port, the road branching from the main road to the new port shall be constructed.

**(b) Objectives**

To provide a better transport service

To meet river transport demand of goods and to activate various social and economic activities.

**(c) Location**

To be studied

**(d) Scope of the project**

Construction of road and apron

**(e) Project Cost**

Total Cost: US\$2.0 million.

**(11) Port Management Capacity Development Project(PT-11)**

**(a) Background**

In Malakal Port, port operations are not implemented smoothly. There are no port statistical data and the roles of the staffs have not been utilized efficiently. In order to improve the situation, necessary know-how for port operation shall be transferred.

**(b) Objectives**

To contribute to effective operation of the port to deal with increasing cargo volume.

**(c) Location**

Malakal Town

**(d) Scope of the Project**

Technical transfer of port management, operation, safety and so on

**(e) Project Cost**

Total Cost: US\$0.3 million.

**(f) Project Detail**

To conduct workshops and seminars at Malakal Town

To send promising people to third party countries for further study

**(g) Special Note**

The capacity development shall be conducted in collaboration with the Project for Enhancement of Operation and Management Capacity of Inland Waterway in ROSS funded by JICA and where it cannot be done together shall be covered by this project.

**Table 6.10-2 Project List of Port Sector (1/2)**

Project Name	Reconstruction of Jetty at Malakal Port (PT-1)	Procurement of Crane (PT-2)	Construction of New Port (PT-5)	Construction of Passenger Jetty (PT-5)	Development of West Side of the River Nile (PT-6)
Contents	<ul style="list-style-type: none"> <li>Removal of existing jetty &amp; sunken barge</li> <li>Construction of a new jetty</li> </ul>	<ul style="list-style-type: none"> <li>Provision of a 40 - 50t crane</li> </ul>	<ul style="list-style-type: none"> <li>Construction of a 30m long jetty at New Site</li> </ul>	<ul style="list-style-type: none"> <li>Provision of a platform for passengers</li> </ul>	<ul style="list-style-type: none"> <li>Provision of a floating platform at west bank</li> </ul>
Purpose	<ul style="list-style-type: none"> <li>Promote safe and effective cargo handling</li> </ul>	<ul style="list-style-type: none"> <li>Promote effective cargo handling</li> </ul>	<ul style="list-style-type: none"> <li>Eliminate congestion of cargo handling space in Malakal Port</li> </ul>	<ul style="list-style-type: none"> <li>Eliminate inconvenience and unsafe of passengers</li> </ul>	<ul style="list-style-type: none"> <li>Eliminate inconvenience and unsafe of passengers at west bank</li> </ul>
Precondition Project	<ul style="list-style-type: none"> <li>Berth allocation during the removal of existing jetty</li> </ul>	<ul style="list-style-type: none"> <li>Provision of wide &amp; flat wharf and well experienced operator</li> </ul>	<ul style="list-style-type: none"> <li>Clear demarcation of roles of existing port and new port.</li> </ul>	<ul style="list-style-type: none"> <li>Permission from Ministry of Public Services for installation of pontoon in front of their lands</li> </ul>	<ul style="list-style-type: none"> <li>Platform at Malakal Port</li> <li>Security of west bank</li> </ul>
Problems of the Project	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Settlement of new port location</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Relocation during rainy season</li> </ul>
Budget (million US\$)	2.0	0.75	3.0	0.6	0.5
Consideration of conflict prevention	<ul style="list-style-type: none"> <li>None</li> <li>New employment shall arise</li> </ul>	<ul style="list-style-type: none"> <li>Need to find alternative jobs for stevedores</li> </ul>	<ul style="list-style-type: none"> <li>None</li> <li>New employment shall arise</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>It will contribute to only western side of people</li> </ul>
Urgency	<ul style="list-style-type: none"> <li>High</li> <li>Existing jetty is dilapidated and dangerous to use. Regular function of port operation is interfered.</li> </ul>	<ul style="list-style-type: none"> <li>High</li> <li>Port is congested and barges are paying demurrage fee because of waiting for unloading goods</li> </ul>	<ul style="list-style-type: none"> <li>High</li> <li>Port is congested and barges are paying demurrage fee because of waiting for unloading goods</li> <li>Considering the port situation, existing port cannot deal with increasing future demand of cargo volume</li> </ul>	<ul style="list-style-type: none"> <li>High</li> <li>Although there is strong passenger flow, facilities use the natural dike of the Nile River. So it is not safe for old people or ladies and children to use the boats.</li> </ul>	<ul style="list-style-type: none"> <li>Low</li> <li>Facility for east side (Malakal Port) shall be the first priority.</li> </ul>
Impact	<ul style="list-style-type: none"> <li>High</li> <li>It shall be contributed to safe and smooth operation of the port</li> </ul>	<ul style="list-style-type: none"> <li>High</li> <li>Prices decline shall be expected due to reduction of unloading fee and decrease in demurrage.</li> </ul>	<ul style="list-style-type: none"> <li>High</li> <li>Correspondence to international integrated multi-modal transport system shall be expected.</li> </ul>	<ul style="list-style-type: none"> <li>High</li> <li>Contribute to more than 1,000 people per day</li> <li>It will contribute to the advancement of accessibility to urban service in Malakal Town</li> </ul>	<ul style="list-style-type: none"> <li>Low</li> <li>Contribute to 300 people per day</li> </ul>

Source: JICA Project Team

**Table 6.10-3 Project List of Port Sector (2/2)**

Project Name	Improvement of Malakal Port (PT-7)	Procurement of Ferry (PT-8)	Improvement of River Bank Protection (PT-9)	Improvement of New Port Road (PT-10)	Capacity Development for Port Management (PT-11)
Contents	<ul style="list-style-type: none"> <li>Improvement of waterfront</li> </ul>	<ul style="list-style-type: none"> <li>Provision of a 300t class ferry</li> </ul>	<ul style="list-style-type: none"> <li>Rehabilitation of revetment</li> </ul>	<ul style="list-style-type: none"> <li>Construction of port road to the new port</li> </ul>	<ul style="list-style-type: none"> <li>Conduct workshop and seminar</li> </ul>
Purpose	<ul style="list-style-type: none"> <li>Port infrastructure development for upgrading living standards</li> </ul>	<ul style="list-style-type: none"> <li>Vitalization of traffic between the both banks</li> </ul>	<ul style="list-style-type: none"> <li>Safety improvement for port users</li> <li>Protect riverbank from erosion.</li> </ul>	<ul style="list-style-type: none"> <li>To enhance the function of the new port</li> </ul>	<ul style="list-style-type: none"> <li>Technical transfer of Port operation and management</li> </ul>
Precondition Project	<ul style="list-style-type: none"> <li>Inauguration of new port and/or redevelopment of old port</li> </ul>	<ul style="list-style-type: none"> <li>Construction of slopes and access ways at both banks</li> </ul>	<ul style="list-style-type: none"> <li>Berth allocation during the riverbank protection works</li> </ul>	<ul style="list-style-type: none"> <li>Construction of new port</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Problems of the Project	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Possibility for pressure to private business</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Budget (million US\$)	1.5	6.0	0.15	1.0	0.3
Consideration of conflict prevention	<ul style="list-style-type: none"> <li>None</li> <li>New employment shall arise</li> </ul>	<ul style="list-style-type: none"> <li>There were two ferries at Malakal Port before, but now only one is in operation. So additional ferry is not competitive</li> </ul>	<ul style="list-style-type: none"> <li>None</li> <li>New employment shall arise</li> </ul>	<ul style="list-style-type: none"> <li>None</li> <li>New employment shall arise</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Urgency	<ul style="list-style-type: none"> <li>Low</li> <li>Building of basic infrastructure shall be superseded.</li> </ul>	<ul style="list-style-type: none"> <li>Low</li> <li>Demand is only dry season</li> </ul>	<ul style="list-style-type: none"> <li>High</li> <li>It shall be leaded to erosion of riverbank</li> </ul>	<ul style="list-style-type: none"> <li>High</li> </ul>	<ul style="list-style-type: none"> <li>High</li> </ul>
Impact	<ul style="list-style-type: none"> <li>High</li> <li>Provision of place where people can relax.</li> </ul>	<ul style="list-style-type: none"> <li>Low</li> <li>Although there is no bridge crossing Rive Nile in Malakal Town and ferry is the only way for a car to go opposite shore, however period of use is limited.</li> </ul>	<ul style="list-style-type: none"> <li>Considering relocation of port function in near future, impact is not high.</li> </ul>	<ul style="list-style-type: none"> <li>High</li> <li>New road shall be required when the new port operation is started.</li> </ul>	<ul style="list-style-type: none"> <li>High</li> <li>It is necessary to educate promising young officials.</li> </ul>

Source: JICA Project Team



## **6.11 OPERATION AND MAINTENANCE PLAN**

As shown in **Figure 6.1-1** and **Table 6.7-2** neither ROSS nor UNS has an Operation and Maintenance Section. It is necessary to establish these sections for effective port management and continuous maintenance.

### **6.11.1 Operation Section**

#### **(1) Port Charge Pricing System**

It is essential to maintain a disciplined operation in order to establish a port charge pricing system. There are several types of port charges, such as dockage, wharfage, transit storage, stevedorage, warehousing and other tariffs. The major aim of port pricing is to ensure that port facilities are used in the most efficient manner.

#### **(2) Port Information System**

When a ship calls a port, shipping agency shall submit documents to the port office in advance. When it is an international port and international ship, the agency shall inform CIQ (Customs, Immigration and Quarantine).

The agency shall pay necessary port charges to conduct efficient cargo handling, and secure berthing for the ship. The agency shall notify the port office in advance the departure of the ship. A system to smoothly carry out the above items would need to be established.

Establish Port Operation Section and Taxation Section and split their work. Each split of works is shown below.

- Operation Section
- Port entry processing
- Distribution of mooring
- Cargo handling relating service
- Taxation Section
- Collection of port charges

### **6.11.2 Maintenance Section**

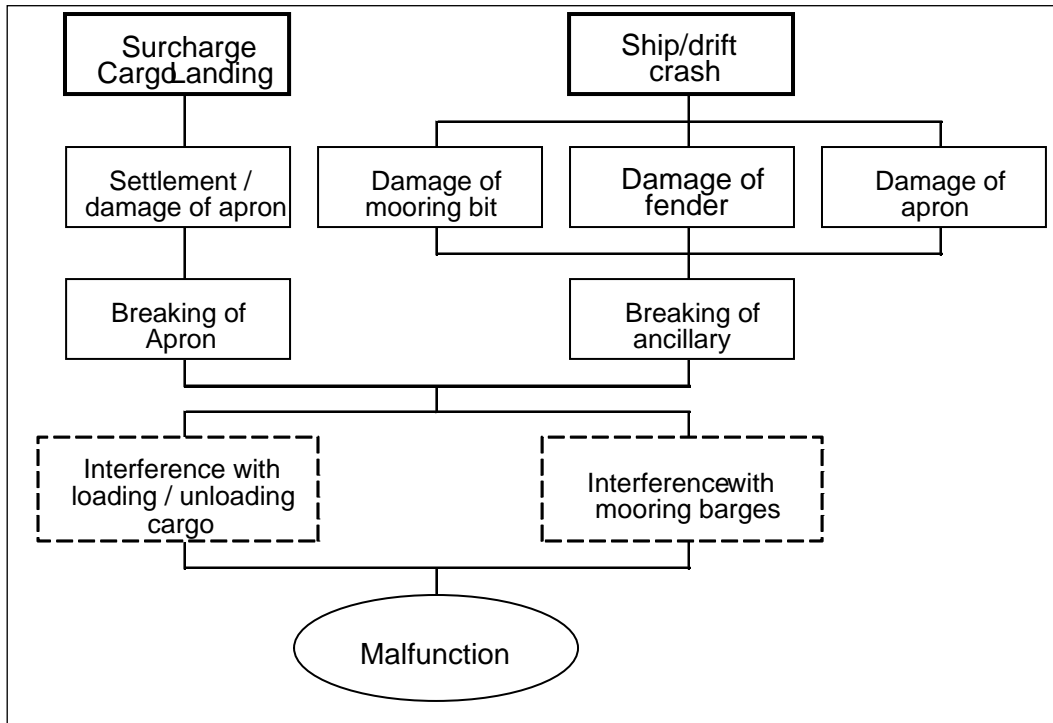
#### **(1) Maintenance of Port Facilities**

The target facilities for maintenance are the buildings, such as warehouses, a guest house, offices and a hall and also civil structures such as a jetty, mooring bits and revetment.

##### Check-ups

Check-up shall be conducted daily and weekly by means of visual inspection. The purpose of daily check-up is to eliminate obstacles that may harm port facilities and that of weekly check-up is to assess the facilities. The result of weekly check-up shall be noted in a proper format and records kept for a certain period. The position of inspector shall be created.

At the Malakal Port, check-ups should especially focus on the jetty. The jetty may be weakened by being struck by a barge and over loading. If permanent deformation occurs it will cause the malfunction of the jetty.



Source: JICA Project Team

**Figure 6.11-1 Deformation Chain of Jetty**

### Repair

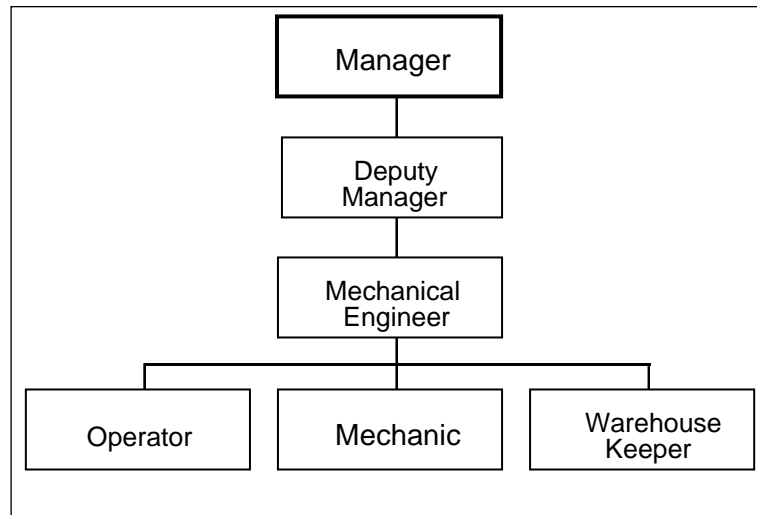
The inspection result is evaluated and the effect on safety and usability of structure and the urgency of repair is confirmed. Based on the result of this evaluation, the repair issue shall be cleared. If difficulties arise from the point of view of budget, usability, importance and /or future plan, the possibility of early countermeasure or alternative proposals (emergency measures or limitation of usage) is studied.

### **(2) Maintenance of Equipment**

Although neither ROSS nor UNS owns lifting equipment, Operation and Maintenance Plan shall be proposed by 40t class mobile crane as example.

### Organization Chart

The proposed organization chart of the Maintenance Section is shown below. An operator, a mechanic, a warehouse keeper and a checker shall be employed for the Maintenance Section.



Source: JICA Project Team

**Figure 6.11-2 Organization Plan for Maintenance Section**

Roles of Each Personnel

**Table 6.11-1 Roles of Personnel**

Position	Roles
Manager	<ul style="list-style-type: none"> <li>• Approve fuel procurement</li> <li>• Approve replacement of spare parts</li> <li>• Approve utilization of crane by other party</li> <li>• Manage Operation and Maintenance (O&amp;M) section</li> </ul>
Deputy Manager	<ul style="list-style-type: none"> <li>• Assist Manager</li> <li>• Manage attendance record of the staff</li> <li>• Manage work schedule</li> <li>• Determine the necessity of countermeasure</li> </ul>
Mechanical Engineer	<ul style="list-style-type: none"> <li>• Receive and check daily and pre-operation checklist from the operator</li> <li>• Request fuel procurement to the manager</li> <li>• Request replacement of spare parts to the manager</li> <li>• Arrange repair works when the equipment is breakdown</li> </ul>
Operator	<ul style="list-style-type: none"> <li>• Conduct daily and pre-operation check</li> <li>• Operate the equipment</li> </ul>
Mechanic	<ul style="list-style-type: none"> <li>• Repair and maintain the equipment</li> <li>• Order spare parts and consumable items</li> </ul>
Warehouse Keeper	<ul style="list-style-type: none"> <li>• Parts inventory control</li> <li>• Request to purchase spare parts and consumables</li> </ul>

Source: JICA Project Team

Warehouse

Spare parts, necessary tools, and consumables must be properly stored in the warehouse. The warehouse keeper shall record the incoming and outgoing materials in a log book. The government’s workshop in Hai El, Shatti shall be utilized for the warehouse.

Check-ups

The operator shall conduct pre-operation check-ups in accordance with the check lists whenever equipment is used. Whenever a defect is found the operator shall immediately report to the mechanical engineer in charge and conduct countermeasures.

### Operation, Maintenance and Repair Costs

Annual budget shall be provided by the authority for all expenses on the crane usages such as operation, maintenance and repair costs once the crane is given to the authority.

The budget shall be determined based on estimated operational days. Annual standard operation days will be 140 days as prescribed in the Japanese estimation standard called “Estimation Standard for Ports and Harbours Construction 2011”, Ministry of Land, Infrastructure, Transport and Tourism (MLIT), the Government of Japan (GOJ). In the calculation, the depreciation of the crane is excluded, but prevailing price of fuel is used.

### Operation Cost

**Table 6.11-2 Operation Cost per Day**

(unit: SSP)

Items	Spec	Unit	No.	Unit cost	Total	Remarks
Fuel	diesel	liter	161.1	20	3,222	*assume 6.6h for daily operation

Note: Fuel consumption=engine power x fuel consumption rate x operation hour=237 x 0.103 x 6.6=161.1

Fuel consumption rate includes oils and consumables

Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan

**Table 6.11-3 Annual Operation Cost**

(unit: SSP)

Items	Unit Cost (per day)	Annual Standard Operation Days	Annual Operation Cost
Rough Terrain Crane	3,222	140	451,080

Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan

### Annual Maintenance and Repair Cost

Calculation of the annual maintenance and repair cost for a crane is shown below.

Where,

Maintenance and repair costs per year = Basic value x Rate of maintenance and repair cost/  
Standard years of service

The Basic value of the equipment refers to “Estimation for Depreciation Cost of Construction Equipment” by MLIT, which is generally used for the calculation of equipment expenses in Japan.

**Table 6.11-4 Annual Maintenance and Repair Cost**

(SSP1 = JP¥26.554)

Items	Basic Value (1000 JP¥)	Standard Year of Service	Maintenance and Repair Cost Rate (%)	Annual Maintenance and Repair Cost (SSP)
Rough Terrain Crane	43,400	10.5	25	38,929

Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan

### Total cost: for O&M Section

Only three employees (operator, mechanic and warehouse keeper) will be paid under the O & M budget.

**Table 6.11-5 Total Annual Cost**

(unit: SSP)

Items	Unit	No.	Unit Cost	Total
Annual operation cost	year	1	451,080	451,080
Annual maintenance and repair cost	year	1	38,929	38,929
Operator	month	12	1,500	18,000
Mechanic	month	12	1,200	14,400
Warehouse keeper	month	12	1,000	12,000
Improvement of workshop	unit	1	9,730	9,730
Total				544,139

\* Total annual cost includes improvement of workshop for the 1<sup>st</sup> year.

Source: Ministry of Land, Infrastructure, Transport and Tourism, Japan

Therefore, operation cost per day is:

$$SSP544,139/140 \text{ days} = SSP3,886/\text{day}$$

#### Utilization of the Crane by Other Parties

When the crane is not in use for loading/unloading cargo materials, it can be utilized for another purpose by the written approval of the manager.

#### Rental Fee

Rental fee of the crane per hour (per day) shall be specified separately.

## **6.12 IDENTIFIED CD NEEDS FOR WATER TRANSPORT SECTOR**

The identified CD needs for the Water Transport Sector related to the proposed projects are presented in **Table 6.12-1**. The following training is to be provided in the course of the Project for capacity development of the State Ministry of Physical Planning and Rural Development, UNS (MoPI&RD), and other departments: 1) Geographic Information System (GIS) training/AutoCAD Training; 2) English documentation training/Information Technology (IT) skill training; 3) Accounting training; and 4) Project Management Training. (See the detail in **Chapter 15**.)

**Table 6.12-1 Capacity Development Logframe (Water Transport Sector)**

(As of August 2012)

Area	CD items	Individual	Organization	Institution	Target	Urgent Project	Technical Cooperation	Training in OECD countries	Training in neighboring countries	WS/Training in South Sudan
Water Transport	Maintenance of port facilities	Design, Supervision O&M Data collection and management	To organize a section (department) in charge of maintenance and repair	To set up the life cycle management plan of port facilities	Public offices	✓	✓	✓		
	Rehabilitation of port facilities	Data analysis Planning Drawing the detail design	To draft a Port Development Plan To conduct an EIA To set up the measures for disaster management	To establish the Harbor Law To establish the Port Development Plan	Public offices	✓	✓	✓		
	Port O&M	Planning method M&E Coordination among stakeholders Financial management	To reform the departments of port management under the new institution To reform the responsibility of each department and demarcate the duty of each member To set up the supervision system including monitoring and evaluation	To establish co-management institution like the JRPA To authorize the mandate (responsibility) and rights of the institution To regulate the financial management of the institution	Public offices		✓	✓	✓	
	Container/storage facilities	Design, Supervision Maintenance Data collection and management	To reform the departments of port management under the new institution	To authorize the establishment and operation of inland depots	Private sector		✓	✓	Kenya, Tanzania, Egypt, Gulf Countries	
	Efficient loading/unloading operation	Efficient loading/unloading method, Automatic control (IT management) method Data collection and management	To set up communication network To employ workers for loading/unloading To manage the stevedore	To establish loading/unloading system To establish communication network system	Private sector Public officers		✓	✓	Kenya, Tanzania	
	Taxation	Examination of cargo/containers Statistics	To organize a section (department) in charge of taxation in the new institution	Single Window System	Public offices		✓	✓	Kenya, Tanzania	
	Quarantine	Quarantine inspection Laboratory work Statistics	To organize a section (department) in charge of quarantine in the new institution	Single Window System	Public offices		✓	✓	Kenya, Tanzania	
	Immigration control	Disembarkation/embarkation procedure Immigration control Statistics	To organize a section (department) in charge of Immigration control in the new institution	Single Window System	Public offices		✓	✓		
	Port security	Management Planning	To make an implementation plan of port security To organize facilities for security	To be a member of IMO (International Maritime Organization)	Public offices		✓	✓	Kenya, Tanzania	
	Safety supervision	Safety supervision Planning	To set up safety facilities To provide education of safety	To develop laws related to safety standards To set up the Labor Standards Inspection Office	Public officers, (partly) private sector		✓	✓	Kenya, Tanzania	
	Ship repairs (Dock)	Repairing technology			Private sector		✓	✓	Gulf Countries, Egypt	
Supply system of drinking water, food, fuel				To subsidize drinking water, food, fuel for ships	Public offices		✓			

Source: JICA Project Team

## CHAPTER 7 ROAD TRANSPORTATION

In this chapter, the following perspectives regarding the Road Transport Sector are presented and analysed; 1) Institutional Framework, 2) Policies and Strategies, 3) Financial Resources, 4) the Operation and Maintenance System, 5) Facilities and Staffing, 6) the Findings from Relevant Survey(s), 7) Programmes and Projects, and 8) Needs and Issues. Then in section, 9) development plans are formulated based on the present situation, needs and issues, and in 10) projects are proposed from technical point of view.

### 7.1 INSTITUTIONAL FRAMEWORK

**Table 7.1-1** shows the agencies involved in the Road and Transport Sector in Upper Nile State (UNS). Before Republic of South Sudan (ROSS) achieved independence, the State Ministry of Physical Planning and Rural Development, UNS (MoPI&RD) has been responsible for the rehabilitation and reconstruction of the economic and social infrastructure, in UNS.

**Table 7.1-1 Institutional Framework of Road and Transport Sector**

Organization	Major Activities
1 Department of Roads and Bridges, MoPI&RD	<ul style="list-style-type: none"> <li>• Establishment and management of master plan</li> <li>• Planning of transport system</li> <li>• Planning of roads network in UNS (i.e. connection of Malakal with county capitals)</li> <li>• Building and maintaining roads, bridges and public buildings</li> <li>• Improvement of walkway and lane for non-motorized transport (NMT)</li> </ul>
2 Department of Road Transport Safety, MoPI&RD	<ul style="list-style-type: none"> <li>• Management of government vehicle registration</li> <li>• Enforcement of road transport safety regulations<sup>1</sup>.</li> </ul>
3 Directorate of Physical and Urban Planning, MoPI&RD	<ul style="list-style-type: none"> <li>• Management and administration of urban planning and zoning</li> </ul>
4 ROSS Feeder Road Technical Committee	<ul style="list-style-type: none"> <li>• Fund finding support</li> <li>• Funding</li> </ul>
5 Traffic Police	<ul style="list-style-type: none"> <li>• Vehicle registration and vehicle inspection except government vehicles</li> <li>• Issuance of driving license</li> <li>• Traffic control</li> <li>• Investigation of traffic accident</li> </ul>

Source: MoPI&RD, UNS

#### 7.1.1 Directorate of Roads and Transport, MoPI&RD

The MoPI&RD has eight directorates under its umbrella as shown in **Figure 7.1-1**, and each of these directorates is in charge of rehabilitation and reconstruction works in its field of operation. These directorates also have some departments under them which carry out practical works.

The Directorate of Roads and Transport is in charge of the transport sector which is divided into the following four departments;

- (i) Department of Roads and Bridges,
- (ii) Department of Road Transport Safety,
- (iii) Department River Transport and

<sup>1</sup> Present work of this department is only to manage government vehicles

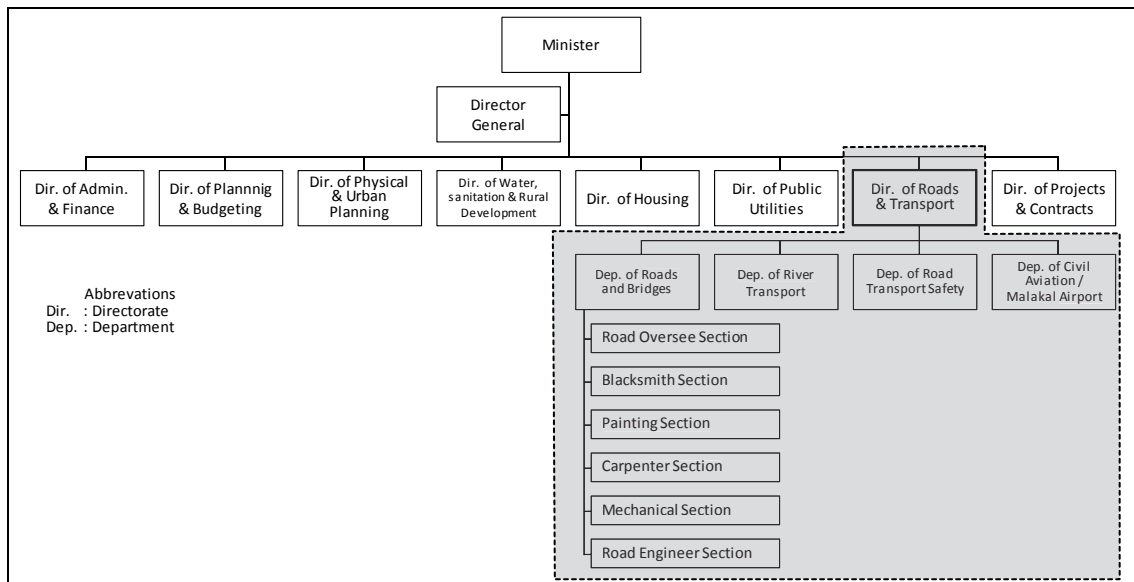
(iv) Department Civil Aviation/Malakal Air Port.

The Department of Roads and Bridges, and The Department of Road Transport Safety are thus together responsible for the road transport sector.

### 7.1.2 Traffic Police

The Traffic Police has six departments, namely; Register, License, Investigation, Charge, Administrative Affair, and Finance. The Department of Register is in charge of vehicle registration and inspection except government vehicles. The Department of License is in charge of issuing driver’s licenses and vehicle number plates. The Department of Investigation is in charge of investigating traffic accidents. The Department of Charges is in charge of custody of suspects. The Department of Administrative Affair is in charge of office work. The Department of Finance is in charge of the management of money. The traffic police in Malakal Town have 78 officers.

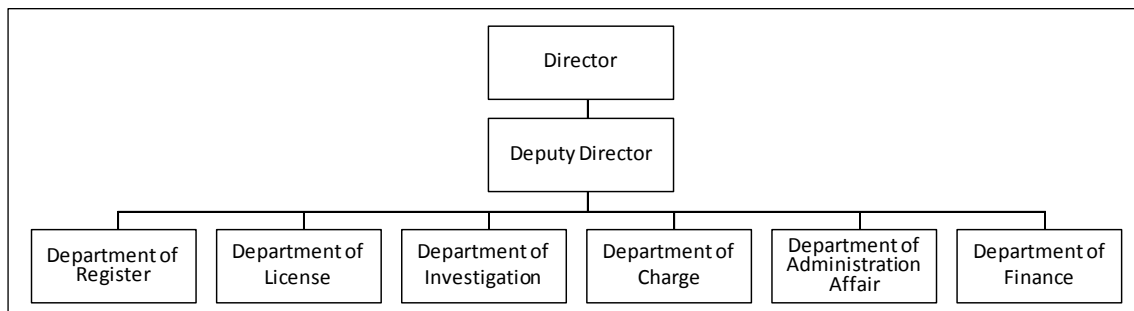
The organization structure of traffic police is presented in **Figure 7.1-2**.



Source: MoPI&RD, UNS

**Figure 7.1-1 Organization Structure of MoPI&RD**

(As of August 2012)



Source: Traffic Police, UNS

**Figure 7.1-2 Organizational Structure of Traffic Police**



### **7.1.3 Public Land and Air Transport Trade Union Cooperation (PLATUC)**

The Public Land and Air Transport Trade Union Cooperation (PLATUC) is composed of public transport business operators, and managed by them. Public transport business operators in Malakal Town register with PLATUC. Leaders of PLATUC are chosen by a vote of the union's members. Functions of PLATUC include management of public transport rules, bus routes, and bus fares and support of public transport business operators.

## **7.2 POLICIES AND STRATEGIES**

### **7.2.1 Policies and Strategies for Roads and Transport Issued by the MoPI&RD, UNS**

MoPI&RD issued the "Policy Framework" on September 10, 2011. The Policy Framework declares that MoPI&RD shall construct roads to connect the state's capital with the county capitals and Malakal internal roads as all-weather roads. In relation to this, the construction of Malakal-Nasir-Jekow Road was started. Furthermore, important feeder roads, which will connect all the county capitals to the state's capital and other important areas, have been identified and communicated to ROSS Feeder Road Technical Committee for funding by a donor group. The MoPI&RD is working and preparing for the construction of more than 85km of Internal Malakal Roads. There are seven feeder roads to be constructed. They will connect county capitals with the state capital, Malakal.

Through the construction of the seven roads, The MoPI&RD expects increasing of trade and investment that will enhance economic growth in UNS. The Policy Framework also declares that the MoPI&RD shall strengthen the capacity of the Directorate of Roads and Transport through staff recruitment and training. The MoPI&RD will also provide the Directorate with some earth moving equipment which enables it to undertake urgent road maintenance, construction and annual grading for rural roads.

### **7.2.2 Target and Goal of the Policies and Strategies for Roads and Transport Sector of the MoPI&RD**

The target and goals of the policies and strategies of the priority interventions for roads and transport sector within UNS are;

- (i) To ensure that all roads, which are the link roads connecting the state capital with the county capitals and Malakal internal roads, are functional year-round.
- (ii) To ensure necessary capacity building and procurement of construction equipment for the system of operation and maintenance.
- (iii) To improve the roads and transport sector in Malakal with policies, strategies and systems of roads and transport sector and recovering and reconstructing of infrastructure which create reliable and efficient traffic services.

## 7.3 FINANCE RESOURCES

Financial resources consist of a subsidy provided by central government plus the budget from UNS. To implement the feeder roads development plan under the strategies, the lists of important feeder roads which connect all county capitals to the state's capital and other primary rural areas should be submitted to the ROSS Feeder Road Technical Committee for funding by a donor group.

The budget and expenditure for roads and transport sector in MoPI&RD is shown in **Table 7.3-1** and **Table 7.3-2** respectively.

**Table 7.3-1 Budget Plans of the MoPI&RD in 2011 by Resources**

Sector	Spending Agency	Budget Plan in 2011 (Unit: SSP)			
		Central Gov't Conditional Transfer	Central Gov't Block Transfer	Resources collected by State	Total
Infrastructure	MoPI&RD	4,100,000	10,000,000	31,650,000	45,750,000

Source; Upper Nile State 2011 State Budget

**Table 7.3-2 Budget Plans of the MoPI&RD in 2011 by Expenditures**

Sector	Spending Agency	Staff in Post in 2010	Budget Plan in 2011 (Unit: SSP)				
			Planned Staff in Post in 2011	Salaries	Operating	Capital	Total
Infrastructure	MoPI&RD	474	655	6,611,811	941,728	38,196,461	45,750,000

Source: Upper Nile State 2011 State Budget

The capital budget of the MoPI&RD in 2011 at planning stage and final proposed amount are shown in **Table 7.3-3**.

**Table 7.3-3 Capital Budget of the MoPI&RD in 2011**

Item		Plan in 2011 (SSP)	Proposed Amount (SSP)
Furniture & General Equipment		204,016	204,016
Vehicles & Other Transport Equipment		839,845	839,845
Specialized Plant, Equipment & Machinery		0	0
Preparation, Design & Supervision of Capital Works		1,933,000	966,500
Construction & Civil Works	Construction of Malakal Internal Road	15,000,000	15,000,000
	Construction of Pagak – Mathiang Road	7,000,000	0
	Construct damp and Haffirs	600,000	0
	Construction of Mangok – Nasir Road	5,000,000	0
	Construction of New Headquarters	2,500,000	2,500,000
Rehabilitation & Renovation of Assets		5,119,600	1,220,269
Total		38,196,461	20,730,630

Source: MoPI&RD

## 7.4 OPERATION AND MAINTENANCE SYSTEM

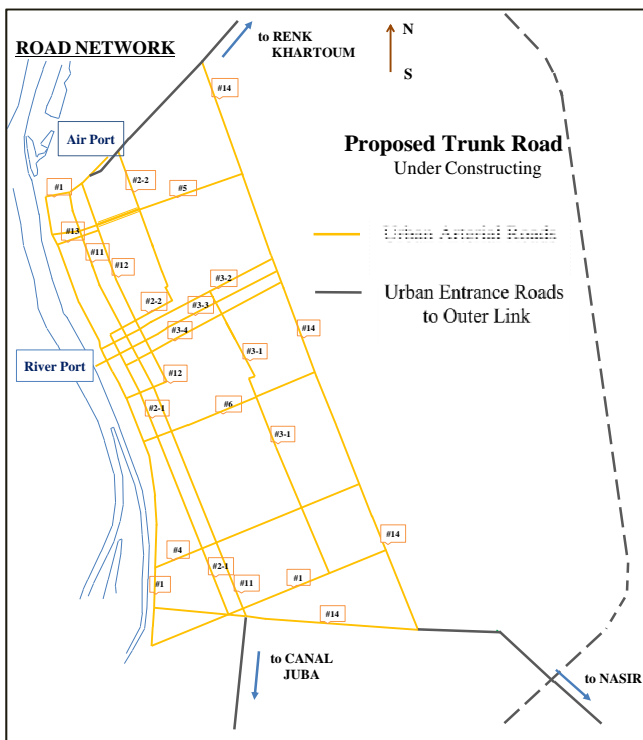
### 7.4.1 Existing Road Network System

**Figure 7.4-1** shows the existing road network system in Malakal Town. The road network in

Malakal Town forms a grid with major roads and minor (sub-major) roads. The local and community road network, which forms blocks of residential plots in the residential area, also forms a grid inside the major road network. The surface of most roads in the town is unpaved, and many of the roads become impassable during the rainy season. Three major and sub-major roads (four roads in central zone) running on a north – south axis, six major and sub-major roads (three roads in central zone) running on an east - west axis, and an Inner Ring Road surrounding the eastern and southern current perimeter built-up area in Malakal Town are now being improved so that those roads can be used during the rainy season.

There are three entrance roads Malakal Town. One is in north-eastern direction which leads to the northern part of the State and from there leads to Renk and Khartoum in Sudan. Another is in mid-south direction leading to Juba via Canal in southern neighbouring states. The remaining one is in south-eastern direction which leads to Nasir in the south-eastern part of the state and further east to Ethiopia. Since all of those roads often become impassable during the rainy season, improvement projects of these roads are now under way as shown in **Photo 7.4-1**.

Feeder roads connecting national and state roads with county capitals are also in planning and/or in implementation stages. The Outer Ring Road at the eastern edge of Malakal Town (about 4km east from the town’s current perimeter line) is also at the construction stage. However the present progress of either program is not remarkable at this moment, except for the Malakal Internal Road Network Project.



Source: JICA Project Team

**Figure 7.4-1**  
**Major & Sub-Major Road Network in Malakal**



Source: JICA Project Team

**Photo 7.4-1**  
**Road under Construction (Ring Road)**

## 7.4.2 Present Condition of Public Transport

### (1) Public Transport Vehicles

**Photo 7.4-2** shows public transport vehicles currently used in Malakal Town. The auto rickshaw (tri-wheeler), small car, sedan and minivan are used as a public transport vehicle in Malakal Town. The sedan, minivan, midi bus and large bus are used for the connection between Malakal Town and other towns. Each vehicle is operated as a private taxi or public bus in Malakal Town. Bus routes are selected by the PLATUC.

### (2) Fare

Bus fare in Malakal Town is fixed at South Sudan Pounds (SSP3) per person-trip by PLATUC. Bus fare is fixed based on fuel cost.

### (3) Business Hours

Business hours of public transportation are not laid down by the PLATUC. Generally, public transportation operates from 5 a.m. to 9 p.m. Public transport service is suspended frequently during the rainy season due to deteriorated conditions of roads and transport terminals.

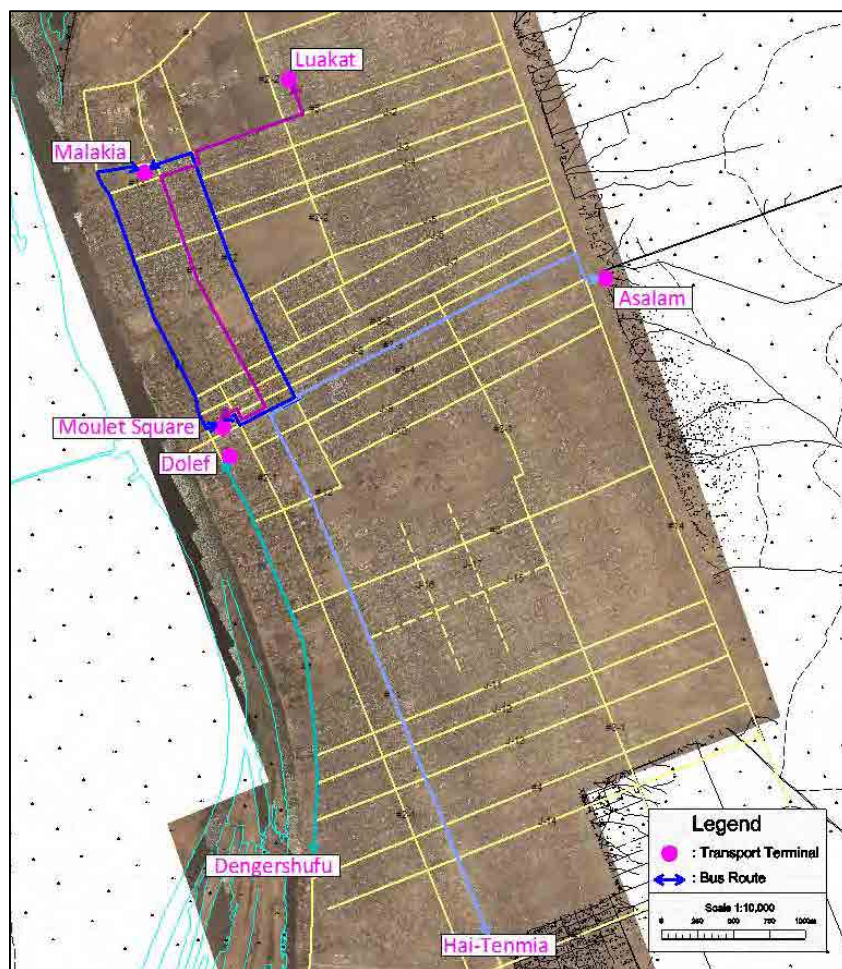


Source: JICA Project Team

**Photo 7.4-2 Public Transport Vehicles Used in Malakal Town**

### (4) Transport Terminal and Bus Routes

There are five transport terminals in Malakal Town. Transport terminals are dedicated as the departure and arrival places for large buses. Five bus routes in Malakal Town are settled by the PLATUC. Bus travel between Malakal Town and other towns/counties use the transport terminals. Location of transport terminals and bus routes in Malakal Town are shown in the **Figure 7.4-2**.



Source: PLATUC

**Figure 7.4-2 Location of Transport Terminals and Bus Routes**

### 7.4.3 Present Condition of Traffic Control

#### (1) Vehicle Registration

The Department of Road Transport Safety is in charge of vehicle registration and issue of vehicle number plates for government vehicles. The traffic police are in charge of vehicle registration and issue of vehicle number plate for all vehicle categories except for government vehicles. Vehicle classifications are shown in **Table 7.4-1**.

**Table 7.4-1 Vehicle Categories**

Category	Colour of License Plate	Registration Organization
Private	White	Traffic Police
Public Transport	Green	Traffic Police
Cargo	Black	Traffic Police
Police	Blue	Traffic Police
NGO*	Red	Traffic Police
Government	Yellow	Department of Road Transport Safety

\*NGO:Non-governmental Organization

Source: MoPI&RD, Traffic Police

## (2) Vehicle Inspection

The traffic police are in charge of vehicle inspections. Vehicle inspection is performed every year for each vehicle. Traffic police issue a vehicle inspection certificate after vehicle inspection.

## (3) Driving License

The traffic police are in charge of driving tests and issuing of driving licenses. Driving test includes a knowledge test of road traffic rules and a driving skill test.

## (4) Traffic Accident

About 20 traffic accidents per month were recorded in Malakal Town during the months from March to May 2012. About a half of traffic accidents lead to death or injury. According to the traffic police, a typical situation of traffic accident is collision and/or contact between the two vehicles (car, motorbike and donkey cart), and major grounds of the traffic accidents are due to bad road condition, lack of driving manners or courtesy, and lack of driving skill.

**Table 7.4-2 Number of Traffic Accidents in Malakal Town (March – May 2012)**

Month	Death	Injury	Light Injury	Damage	Total
March - 2012	1	10	4	5	20
April - 2012	5	6	2	9	22
May - 2012	2	8	2	5	17

Source: Upper Nile State Traffic Police

## (5) Traffic Facility

There are no traffic signals in Malakal Town. There is only one roundabout and few traffic signs. There are no lane markings, guard rails, sidewalks, crosswalks, median strips and other traffic safety facilities. Traffic police are in the process of having approximately 30 traffic sign poles because they have recognized the necessity of traffic signs. However, the signs have not been installed yet as shown in **Photo 7.4-3**.

## (6) Traffic Management Equipment

The traffic police are in charge of road traffic control and have only two pickups and three motorbikes. This makes it difficult for them to conduct road traffic control with vehicles.

The traffic police do not have their own communication system, such as radio transceivers. Contacts with each other are done by using their own mobile telephone.





Condition of Intersection (#3-3 & #12)



Traffic Sign Poles held by Traffic Police

Source: JICA Project Team

### **Photo 7.4-3 Traffic Facility and Traffic Management Equipment**

#### **7.4.4 Existing Road Maintenance System**

Before the ROSS achieved independence, MoPI&RD had the necessary equipment and carried out a certain extent of management and maintenance. Nowadays MoPI&RD has no equipment and no system for road maintenance and only manages cleaning ditches and excavating emergency ditches before and during the rainy season using rented equipment. After the completion of major road project, a budget which allows MoPI&RD to carry out more frequent maintenance works will be expected.

#### **7.5 FACILITIES AND STAFFING**

The main facilities in the road transportation sector are the roads in Malakal. The road network in Malakal Town forms grid, with major roads and minor (sub-major) roads. The local and community road network, which forms the blocks of the residential plots forms the smaller grid inside the major road network. Most roads in the town are unpaved, and many of the roads become impassable during the rainy season. Several major roads, such as the Ring Road, are under improvement works in order to make these roads passable year-around. Construction of Malakal-Nasir-Jekow Road has commenced, while important feeder roads, which will connect all the county capitals to the state's capital and other important areas, have been listed and communicated to ROSS Feeder Road Technical Committee for funding by the donor group. Furthermore, construction of more than 85km the Malakal Internal Roads has been planned. There are no traffic safety facilities such as the traffic sign, sidewalks, crosswalks, medians and others.

Although MoPI&RD had been able to maintain the roads during the Sudanese time to a certain extent, MoPI&RD does not have enough capacity for current road maintenance. Only one organization remains and this is for managing the cleaning of ditches and excavating emergency ditches before and during the rainy season. They use rental equipment. This situation implies that although construction and rehabilitation of roads are carried out, less attention is paid to

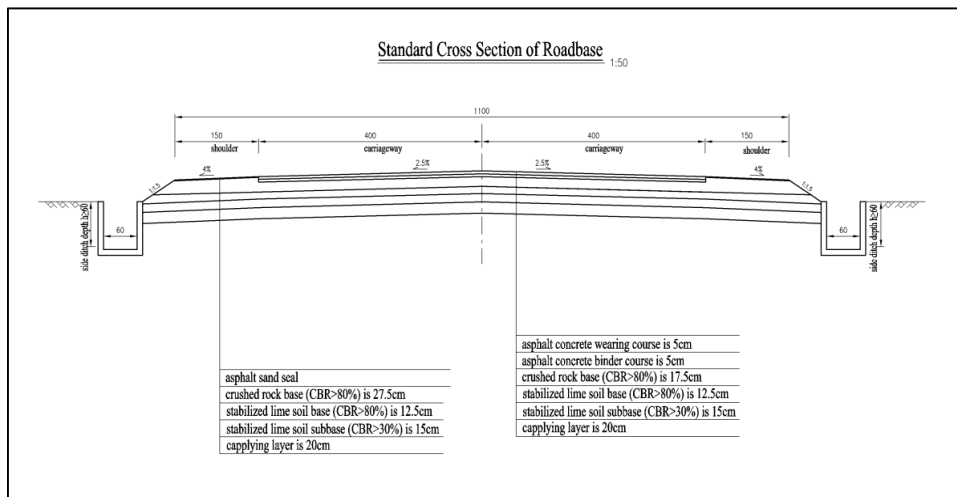
maintenance of the road and other related facilities. Considering the increase of traffic volumes in and around Malakal, and heavy rains during the rainy seasons, maintenance of the road and related facilities needs to be planned at the early stage of road transportation improvement.

## 7.6 FINDINGS FROM RELEVANT SURVEY(S)

### 7.6.1 Result of Road Inventory Survey

#### (1) Road Condition

The right of way of major roads and sub-major roads now under construction in Malakal Town is 20m or 40m in width. The standard cross section is shown in **Figure 7.6-1**. The carriage way consists of two lanes (one lane is 4.0m in width). There is no median. The shoulder is 1.5m in width. There are side ditches which are 0.6m in width at both sides of road and no walk way provided.



Source; Sino Hydro

**Figure 7.6-1 Standard Cross Sections (Malakal Town Internal Main Roads)**



Source: JICA Project Team

**Photo 7.6-1 Inventory Survey on Community Road**



Thus the total width of the road becomes 13.5m. Sino Hydro is constructing 37.9km and Kano is constructing 17km of roads within Malakal Town. The right of way of local and community roads in the residential zone is 15m or 20m in width. However, some house buildings are encroaching about 5m inside the right of way. There are drainage culverts at some junctions.

The results of the road inventory survey of community roads is shown in the **Table 7.6-1**.

**Table 7.6-1 Results of Road Inventory Survey of Community Roads**

Road No.	Length (m)	Right of Way (m)	Road Side Land	Road Condition			
		Actual Width (m)	Use	Pavement	Side Ditch	Cross Drain	Traffic
J-1	1,614	20	Resident Class 2 & 3	NIL BCS**	NIL	NIL	Very few
		20					
J-2	2,273	20	Resident Class 3	NIL BCS	NIL	NIL	Very few
		16-17					
J-3	2,293	20	Resident Class 3	NIL BCS	NIL	NIL	Very few
		16-17					
J-4	2,905	20	Resident Class 3	NIL BCS	NIL	NIL	Very few
		18-20					
J-5	2,254	20	Resident Class 3	NIL BCS	NIL	NIL	Very few
		15-24					
		17-20					
J-6	1,628	20	Resident Class 3	NIL BCS	NIL	NIL	Very few
		15-18					
J-7	1,811	20	Resident Class 3	NIL BCS	NIL	NIL	Very few
		17-20					
J-8	2,721	20	Market & Resident Class 3	NIL BCS	NIL	NIL	Market section is very crowded
		19					
J-9	2,142	20	Resident Class 2 & 3	NIL BCS	NIL	NIL	Very few
		17-20					
J-10	2,113	20	Resident Class 2 & 3	NIL BCS	NIL	NIL	Very few
		19-20					
J-11	2,915	20	Resident Class 3	NIL BCS	NIL	NIL	Very few
		15-20					
J-12	2,975	20	Resident Class 3	NIL BCS	NIL	Pipe Culvert under #1 & #2	Very few
		19.5-20					
J-13	3,001	20	Resident Class 3	NIL BCS	NIL	NIL	Very few
		17-20					
J-14	3,247	20	Resident Class 3	NIL BCS	NIL	NIL	Very few
		17-20					

NIL\*: \*\*BCS: Black Cotton Soil

Source: JICA Project Team

## (2) Results of the Road Inventory Survey

Before commencement of the present improvement project, most of major roads and minor (sub-major) roads in Malakal Town could hardly cope with traffic in the rainy season, because of puddles and mud. On the other hand, even during the dry season pedestrian, road side parking

and street vendors reduce the capacity of traffic volume and obstruct smooth flow of traffic. Therefore it can be said that a reliable and efficient road traffic system has not been built yet.

Many of the local and community roads in the grid system of major roads have not been developed and remain as non-improved black cotton soil roads. Some local and community roads have earth ditches, however. Some areas of the community are flooded during the rainy season. Such puddles and mud would completely cut off the traffic in many community areas even remaining after the rainy season for some time without proper forced drainage system.

As for the road traffic in Malakal Town, several issues are observed, such as lack of all-weather roads, lack of maintenance works, lack of particular car parking zones, lack of future plan for extension of road network, lack of walkways and lanes for non-motorized transport, and so on.

Only a few storm drains were observed, beside some major roads and beside a few local and community roads. Most of the storm drains are connected with the Nile River and/or the channel along the Ring Road. Some storm drainages are connected through pipe and/or box culverts under the junctions, however many culverts are filled full with soil and mud due to lack of maintenance works. The Malakal area is basically very flat. Therefore it is very difficult to improve the inner water discharge system with only storm drainage networks.

Existing Bridge Condition

There are no bridge structures along major and/or sub-major roads in town and suburb.

**7.6.2 Traffic Volume Survey**

**(1) Outline of Traffic Volume Survey**

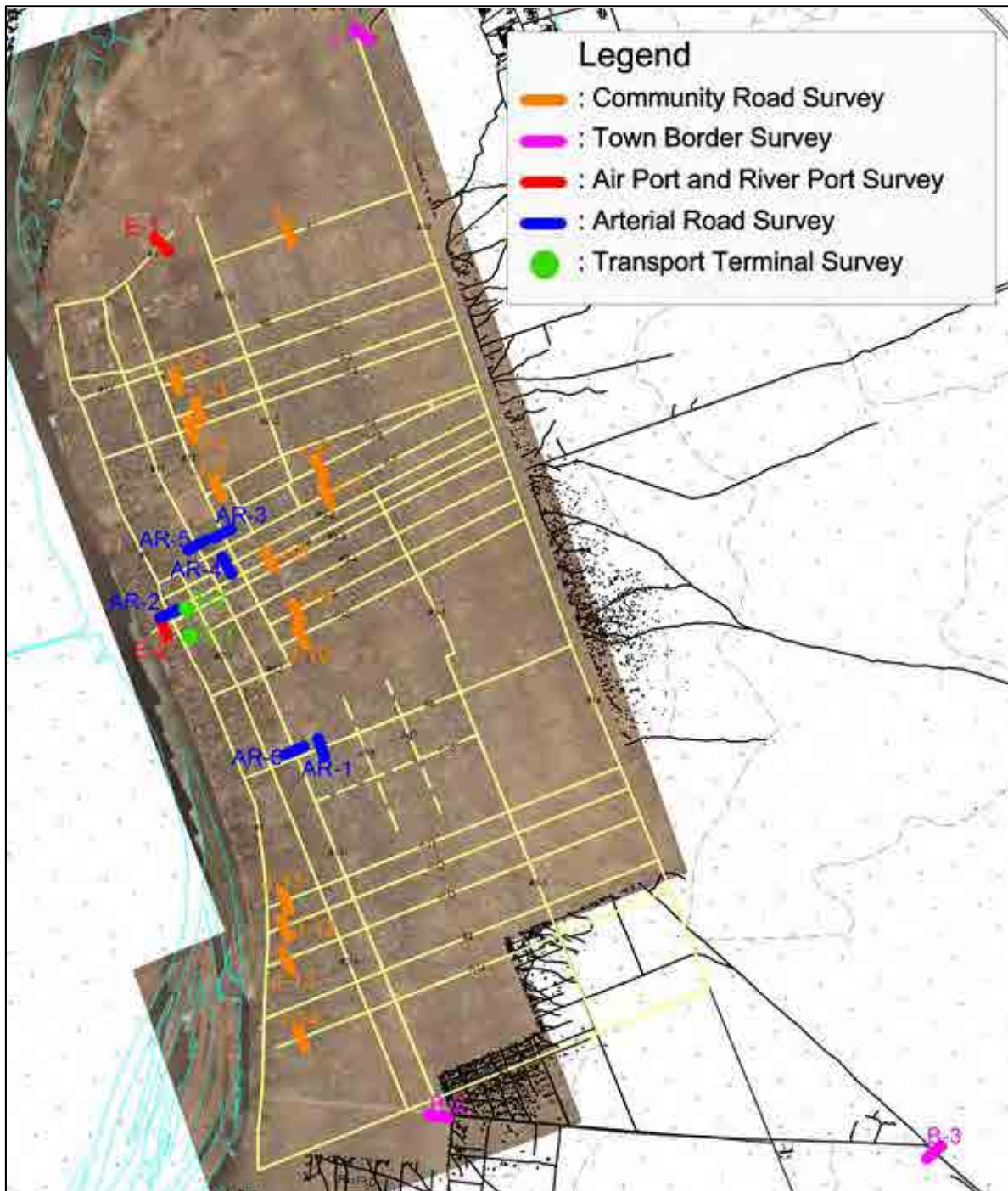
A series of traffic volume surveys were conducted throughout the Malakal Town to identify traffic issues. Traffic surveys were conducted from May 8 to 14, on June 28, and July 1, 2012. The duration of survey was planned to be 12 hours from 7 a.m. to 7 p.m., however due to the security situation, most of points except the entrance of the river port, were surveyed for only 11 hours, between 7 a.m. and 6 p.m.

**Table 7.6-2** shows a summary of the traffic count survey points while **Figure 7.6-2** presents location of each survey point.

**Table 7.6-2 Summary of Traffic Survey Points**

Survey Point	Objective	Number of Survey Point	Number of Survey Days
J: Community Road	Traffic Volume Count	14	1 day (Weekday)
B: Town Border	Cordon line survey	3	3 consecutive days (Weekday)
E: Entrance of Airport	Traffic Volume Count	1	3 consecutive days (Weekday)
E: Entrance of River Port	Traffic Volume Count	1	7 consecutive days
AR: Arterial Road	Traffic Volume Count	6	2 days (Weekday and Weekend)
T: Transport Terminal	Passenger Volume Count	2	2 days (Weekday and Weekend)

Source: JICA Project Team



Source: JICA Project Team

**Figure 7.6-2 Location of Survey Point**

**(2) Results of Traffic Volume Count Survey**

**(a) Community Road, Entrance of River Port, Entrance of Air Port, and Town Border**

The results of the traffic volume count survey for community roads, entrance to river port, entrance to airport, and town border are summarized in **Table 7.6-3**.

**Table 7.6-3 Result of Traffic Volume Count Survey-1**

(Total of both direction)

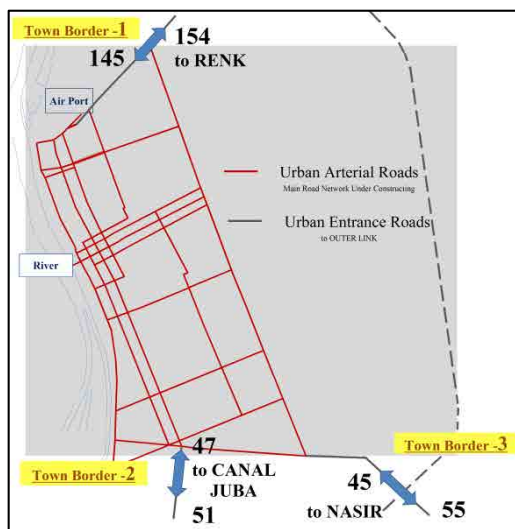
Place	NMT (PSN)	MT (PCU)	Remark
J: Community Roads	1,962	70	Average of 14 places in one day (07:00-18:00)
E: Entrance of River Port	7,570	515	Average of 1 place in seven days (07:00-19:00)
E: Entrance of Air Port	574	871	Average of 1 place in three days (07:00-18:00)
B: Town Border-1 (North East)	463	291	Average of 1 place in three days (07:00-18:00)
B: Town Border-2 (South)	12	93	Average of 1 place in three days (07:00-18:00)
B: Town Border-3 (South East)	15	95	Average of 1 place in three days (07:00-18:00)

Source: JICA Project Team

NMT: Non-Motorized Transport, MT: Motorized Transport, PSN: Persons, PCU: Passenger Car Unit

At most of the community roads, many non-motorized transport (NMT) and very few motorized transport (MT) were observed. Traffic volumes at each entrance from community road to major road are around 180 persons per hour in average. Traffic volume to/from river port and airport differs from day to day, depending on number of arrival and/or departure of ships and/or airplanes at the river port and airport, respectively.

As shown in **Figure 7.6-3** and **Table 7.6-4**, traffic volume (excluding motor bike) at town border survey points was about 500 pcu per 12-hr in total and average number of passenger on board in one vehicle is 13.8 persons per vehicle.



Unit: PCU per 12hr

**Figure 7.6-3 Number of Vehicles at 3 Town Borders**

**Table 7.6-4**

**Average Vehicle Occupancy/ (Passengers per Vehicle)**

unit: passenger (include driver)

Location	Sedan, Pickup, Minivan	Taxi	Mini Bus	Mid Bus	Truck, Trailer
Border -1 North East	3.0			50.0	6.0
Border -2 South	3.0	4.7	13.9	36.1	3.8
Border -3 South East	11.6	4.3	17.5	40.0	19.4
Whole Mean	10.6	4.6	14.1	37.2	7.2

Source; JICA Project Team

**(b) Arterial Road**

Weekday and weekend traffic volume along arterial roads are shown in the **Table 7.6-5**. Obviously, NMT is dominant compared with MT throughout the town.

**Table 7.6-5 Traffic Volume on Arterial Roads**

time	Weekday – 12 hours			Weekend – 12 hours		
	Pedestrian (Persons)	Bicycle & Cart (Numbers)	MT (PCU)	Pedestrian (Persons)	Bicycle & Cart (Numbers)	MT (PCU)
AR-1	5,791	558	850	2,974	648	839
AR-2	8,803	1,135	1,146	7,253	1,296	911
AR-3	7,145	1,526	1,354	5,603	1,102	1,038
AR-4	4,711	998	1,652	4,081	1,247	1,563
AR-5	5,761	1,387	2,955	3,002	894	1,743
AR-6	5,714	1,062	3,135	2,782	910	2,415

Source: JICA Project Team

### (c) Transport Terminal

The number of vehicles and passengers in transport terminals are shown in the **Table 7.6-6** and **Table 7.6-7** respectively. About 280 vehicles and 1,600 passengers were recorded at Terminal-1 (Dolef Terminal). About 300 to 400 vehicles and 2,000 or 2,600 passengers were recorded at Terminal-2 (Moulet Square Terminal).

**Table 7.6-6 Number of Vehicles and Passengers in Bus Terminal-1 (Dolef Terminal)**

Origin / Destination	Weekday				Weekend			
	Arrival		Departure		Arrival		Departure	
	Vehicle (number)	Passenger (person)	Vehicle (number)	Passenger (person)	Vehicle (number)	Passenger (person)	Vehicle (number)	Passenger (person)
Bum - Dengershufu	280	856	182	809	224	749	207	877
Others	0	0	0	0	0	0	14	0
Unknown	4	4	102	6	61	0	64	22
Total	284	860	284	815	285	749	285	899

Source: JICA Project Team

**Table 7.6-7 Number of Vehicles and Passengers in Bus Terminal-2 (Moulet Square Terminal)**

Origin / Destination	Weekday				Weekend			
	Arrival		Departure		Arrival		Departure	
	Vehicle (number)	Passenger (person)	Vehicle (number)	Passenger (person)	Vehicle (number)	Passenger (person)	Vehicle (number)	Passenger (person)
Malakia	246	484	217	815	58	455	54	728
Luakat	81	522	55	655	224	400	201	596
Others	22	44	14	38	2	3	0	0
Unknown	69	0	132	12	51	0	80	0
Total	418	1,050	418	1,520	335	858	335	1,324

Source: JICA Project Team

## 7.7 PROGRAMMES AND PROJECTS

The proposed and on-going road projects in UNS are summarized in **Table 7.7-1** while the location of three principal road projects listed in the table are indicated in **Figure 7.7-1** together with photographs showing the existing condition of the Malakal Nasir Road.



**Table 7.8-1 Issues of Road and Transport Sectors in Malakal**

Sector	Issues
Road Network	<ol style="list-style-type: none"> <li>1. Storm drainage system is formed by side ditches along above mentioned major road network system. However, since storm drainage system along local and community roads has not been established yet at this moment, there are still many issues to be addressed on storm drainage system within the local and community areas.</li> <li>2. Although a grid road network is already established, Rights of Way (ROWs) are not clearly understood on some roads due to the lack of pavement and corner stones.</li> <li>3. In Malakal Town, there are not many vehicles operating yet, however many pedestrians come onto the major roads from residential area or from transport terminals. There is a lack of walk ways and lanes for non-motorized transport (NMT).</li> </ol>
Road Condition	<ol style="list-style-type: none"> <li>1. Major roads have had improvement works at this moment however, maintenance works of such roads has not been performed yet.</li> <li>2. Most of local and community roads in Malakal Town are non-paved and BCS roads. These roads become impassable during the rainy season, and it leads increase of transport cost and areas being cut off.</li> <li>3. Number of vehicles is not high yet, while number of pedestrians are high already. Number of vehicle and pedestrians is expected to increase in accordance with increase in population.</li> <li>4. Many passengers are compelled to walk on the carriageway. The road capacity of even major roads, such as in central area as well as local market area, has been reduced by road side parking, street vendors, pedestrians, and other NMT.</li> <li>5. Many carts which obstruct traffic of vehicles still exist.</li> </ol>
Road Maintenance	<ol style="list-style-type: none"> <li>1. No equipment and no budget for road maintenance has been secured.</li> <li>2. Roads and transport sector can hardly manage the operation and maintenance works of the roads.</li> </ol>
Public Transport	<ol style="list-style-type: none"> <li>1. Public transport is currently managed by private sector organisation called Public Land &amp; Air Transport Trade Union Cooperation and public sector is not involved in public transport management at all.</li> <li>2. Bus routes cover small area in Malakal Town.</li> <li>3. Public transportation service is suspended frequently during the rainy season due to the deteriorated condition of roads and transport terminals.</li> </ol>
Traffic Management	<ol style="list-style-type: none"> <li>1. Public sector is not in charge of traffic management and/or traffic control.</li> <li>2. There is only one roundabout and no traffic signal at other intersections.</li> <li>3. There are no traffic safety facilities such as traffic sign, sidewalks, crosswalks, medians and others.</li> <li>4. Traffic control equipment such as police car and communication system is insufficient.</li> </ol>

Source: JICA Project Team

### 7.8.1 Identified Issues

The road network in Malakal Town is well organized following a grid pattern. However road facilities for traffic safety, traffic control, smooth traffic and public transport are insufficient. The major issues on road and transport sector are as follows:

- (i) The grid pattern road network is well organized in Malakal Town. This pattern shall be respected not only within existing Malakal Town but also in the new development area to the east of Malakal Town.
- (ii) Currently road pavement works are being done by KANO and Sinohydro, however many of the existing roads remain unpaved or BCS roads. Considerable parts of those roads become impassable during the rainy season. Those roads will be paved.
- (iii) The road section shall be divided into car lanes and non-motorized traffic for safety and travel time reduction.
- (iv) The road facility shall provide space for public transport.
- (v) Road network shall be well coordinated with drainage systems.
- (vi) The funding sources for road network improvement and public transport facilities shall be



established so that the road construction work can be implemented without delay.

- (vii) A systematic public transport network system shall be established. A scheme to organize bus route networks and a way to transport the poor and give them access to public transport should be devised.
- (viii) The Technical Cooperation Projects will be implemented when needs arise.
- (ix) Bus routes do not cover a wide area in Malakal Town. Bus service area shall be expanded to cover broader areas than present service areas.
- (x) According to interviews with citizens, some persons are not able to use public transport due to expensive fares. It should be considered how to provide much cheaper public transport.
- (xi) When the traffic volume increases, road traffic control will be a solution to reduce traffic accident and traffic congestion. Road traffic control should be introduced in Malakal Town.

## **7.8.2 Consideration for the Comprehensive Plan**

### **(1) Relation to the Social Economic Infrastructure Development**

The road network plan is the basis of the Social Economic Infrastructure Plan that is the objective of this project. The land use plan and the transport plan (for roads, river port and airport) are key determinants for the city plan. The road network in present Malakal Town is arranged as a grid with major roads and minor roads. However, to the east side of the Ring Road and south area of present Malakal Town, which are expected to be developed, no road infrastructure has been constructed yet.

For the Comprehensive Plan including the road network, which constitute frame of town, shall be improved in the present Malakal Town and developed in the new urban area. Public transport services are currently limited in Malakal Town. It is expected that public transport services will be improved and developed in Malakal Town and new urban area as well.

### **(2) Cooperation Work with Other Sectors**

The road network shall be formulated with due consideration of pavement and drainage. The road network is an infrastructure which enables access to river port, airport, schools, business offices, hospitals and others necessary for economic and daily life activities.

Deterioration of road conditions in the rainy season interferes with the commute to schools and offices, various economic activities, public services, and the transport of water and sewage sludge. It might also threaten the life of people.

Therefore, the improvement of roads to all-season passable roads network with improved storm drainage system will solve everyday life issue. However, success partly depends on communication and cooperation with water supply sector and power supply sector as they share the space in the right of way.



### (3) Application to the Comprehensive Plan

The feeder roads links with other provinces and towns and the road network access to the river port and airport are quite significant for Malakal Town which is isolated from other towns.

The geographical isolation of Malakal makes it difficult to procure appropriate road building materials. One way to overcome this difficulty is to encourage the growth of local industry in Malakal to supply these materials. The planning and design of road structures with local materials and reused materials shall be adopted as much as possible. The adoption of Labour Based Technology (LBT) with community activity will also help overcome the limited public budget.

Roads design shall also consider the NMT traffic such as pedestrians and hand cargos for safe co-existence with the road transport.

### (4) Capacity Development (CD)

There are five (5) capacity development (CD) areas needed in the road and transport sub-sector; namely, 1) design including baseline survey and environment and social consideration, 2) construction order and procurement, 3) supervision of construction, 4) O&M of roads and equipment/machineries, 5) management of public transportation and traffic control.

### (5) Organization

Road and Transportation Sub-Sector: The division of EIA, the division of road traffic control.

## 7.9 ROAD TRANSPORT SECTOR DEVELOPMENT PLAN

### 7.9.1 Objectives of Road Transport Sector

According to the draft “Upper Nile State Physical Planning and Development Regulations, 2012” prepared by MoPI&RD UNS in May 2012, road reserve (Right of Way / RoW) by road type is specified as shown in **Table 7.9-1<sup>2</sup>**.

**Table 7.9-1 Highways and Roads (Original)**

No	Types	RoW	Minimum Setbacks
1	Primary Highway	90m	45 meters from the centre
2	Secondary Highway	60m	30 meters from the centre
3	Local Road Type I	24m	12 meters from the centre
4	Local Road Type II	18m	9 meters from the centre
5	Local Road Type III	15m	7.5 meters from the centre
6	Local Road Type IV	12m	6 meters from the centre
7	Access Road / Street	-	9 meters or 6 meters from the edge

Source: “Upper Nile State Physical Planning and Development Regulations, 2012 (Draft)”, MoPI & RD

<sup>2</sup> RoWs in Malakal Town seemed using metric system such as 10m, 20m, 30m, 40m, 50m, and 60m wide, however the RoWs shown in the regulation are obviously based on the British Imperial System which is very common in the East African Countries as the multiples of 10 feet (nearly equal to 3 meters).

However, as shown in the above table, there is a big gap in RoW between (b) Secondary Highway and (c) Local Road Type I, and there are no definitions for Urban Roads in the draft regulations. Therefore, the JICA Project Team proposes following integral version of highways and roads network system together with its standard interval of development of each type of roads in line with de-facto standards of road reserves and residential plot allocations in Malakal Town as shown in **Table 7.9-2**.

**Table 7.9-2 A Proposed Standard of Highways and Roads (Integral)**

No	Type	Right of Way		Std. Interval	Class	Construction Method	Hierarchical Road Classification
		m	feet	m			
1	Primary Highway	90	300	8,000	Class-1a	MBT	Regional Highway
2	Secondary Highway	60	200	4,000	Class-1b	MBT	Trunk Road
3	Urban Road Type I	48-(50)	160	2,000	Class-2a	MBT	Arterial Road
4	Urban Road Type II	36-(40)	120	1,000	Class-2b	MBT	Collector Road
5	Urban Road Type III	30	100	500	Class-2c	MBT	Distributor Road
6	Local Road Type I	24-(25)	80	250	Class-3a	LBT	Local Road
7	Local Road Type II	18-(20)	60	60 / 120	Class-3b	LBT	Community Road

Note: Figures of RoW in the parentheses are applied currently in MoPI&RD.

Source: JICA Project Team

Based on the road network development policies and the concept to integrate the land use plan and the transport system, the future basic road network system is proposed as follows;

**Table 7.9-3 Proposed Design Standards by Road Class**

Classification	Design Speed (km/h)	Lane Width (m)	Typical Number of Lanes	Shoulder (m)	Sidewalk (m)
Class 1	60 - 80	3.25 - 3.50	4 - 6	2.0 - 3.0	3.0 - 4.5
Class 2	40 - 60	3.00 - 3.25	2 - 4	1.0 - 2.0	1.5 - 3.0
Class 3	30 - 40	2.75 - 3.00	1 - 2	0.5 - 1.0	0.0 - 1.5

Source: Proposed by the JICA Project Team based on the "Road Structure Ordinance" in Japan

The main characteristics of each functional hierarchy and classification of the roads in Malakal Town are summarized in the **Table 7.9-4**.

**Table 7.9-4 Definition of Road Classification for Malakal Town**

Hierarchy & Road Class	Function
Class-1 (Primary & Secondary Highways) Regional Highways and Trunk Roads	To link to national primary road and outside of Malakal Town area To form transport spines of Malakal Town area To connect locations of major trip generators
Class-2 (Urban Roads Type I, II, III) Arterial, Collector, and Distributor Roads	To link between townships To link to Class-1 roads To provide public transport service network
Class-3 (Local Roads Type I & II) Local and Community Roads	To link between communities To provide circulation within as well as between townships and communities

Source: JICA Project Team

The goals and objectives of roads transportation planning are summarized in the **Table 7.9-5**.

**Table 7.9-5 Framework of Roads and Transport Plan for Malakal Town**

Term	Goal	Objective
Urgent (2012 - 2014)	<ul style="list-style-type: none"> <li>▪ To ensure social integration</li> <li>▪ To reduce poverty</li> <li>▪ To recover economic activities</li> <li>▪ To improve living environment in community area</li> </ul>	<ul style="list-style-type: none"> <li>▪ To improve community roads by LBT with community involvement</li> <li>▪ To improve living environment of community residential area</li> <li>▪ Community road improvement</li> </ul>
Short (2015 - 2018)	<ul style="list-style-type: none"> <li>▪ To ensure road maintenance system</li> <li>▪ To facilitate capacity building</li> </ul>	<ul style="list-style-type: none"> <li>▪ To introduce capacity building and development programme for road maintenance and management technology through the training of civil engineers, mechanical engineer and other concerned personnel for operation and management through the On the Job Training (OJT) during the community roads improvement project by LBT and/or MBT</li> <li>▪ To improve road maintenance management</li> </ul>
	<ul style="list-style-type: none"> <li>▪ To secure peaceful conditions</li> <li>▪ To raise living standards</li> <li>▪ To facilitate economic activities</li> </ul>	<ul style="list-style-type: none"> <li>▪ To build paved road network as all-weather road with MBT and to facilitate road maintenance and management</li> <li>▪ To ensure all season trafficability by improvement of storm drainage system</li> <li>▪ To improve local and distributor roads</li> </ul>
	<ul style="list-style-type: none"> <li>▪ To support economic growth</li> <li>▪ To address transportation for the poor</li> </ul>	<ul style="list-style-type: none"> <li>▪ To enhance the function of road network (increase traffic capacity, development of road network in expanded area, link roads, etc.)</li> <li>▪ To introduce hierarchical road network system</li> <li>▪ To improve collector and arterial roads</li> </ul>
Medium Term (2019 - 2023)	<ul style="list-style-type: none"> <li>▪ To introduce fundamental public transport service</li> </ul>	<ul style="list-style-type: none"> <li>▪ To improve terminals and to introduce comprehensive public transport system</li> <li>▪ To provide NMT lanes according to the categorized traffic for safety aspect</li> </ul>
	<ul style="list-style-type: none"> <li>▪ To react to additional needs of citizens and facilitate efficient transport system</li> </ul>	<ul style="list-style-type: none"> <li>▪ To introduce and research traffic control and management system (traffic education, traffic signal, traffic sign and traffic regulation, etc.)</li> <li>▪ To construct discharge station</li> </ul>
	<ul style="list-style-type: none"> <li>▪ To support economic growth</li> </ul>	<ul style="list-style-type: none"> <li>▪ To enhance the function of transport network (airport expansion &amp; runway extension, etc.)</li> <li>▪ To construct Outer Ring Road / Bypass</li> <li>▪ To construct Nile River Bridge</li> </ul>

Source: JICA Project Team

## 7.9.2 Strategy for Road Transport Sector

It is a necessary condition for the recovery and economic activities and improvement of living environment that roads transport is able to operate in all seasons. Projects that help improvement of community living environment and self-help of community shall be commenced as soon as possible and shall be progressed continuously.

In future, as the area east of Malakal Town is developed, main roads and storm water drainage in the new urban area shall be developed at the same time. On the other hand, for reconstruction of economic activities and growth, enhancement of networks with other modes of transports shall be accomplished as well.

The bottleneck of storm water drainage should be solved as a priority, together with road improvement. In this meaning, drainage system will be designed at early stage with trunk road improvement.

LBT and beneficiary pay principle shall be introduced for the road construction work to overcome the budget constraint. The access roads to the airport and port, road to/from public transport and central area of the Malakal Town shall be prioritized for the social and economic activities.

Financial contributions from various donors for the development of the new urban area shall be pursued. However the finances shall in the main be covered by UNS itself. It is expected to have the particular finances (taxes and commission on fuel, car and economic activities by transportation) for the roads section so that MoPI&RD can manage the operation.

### 7.9.3 Road Plan

#### (1) Traffic Forecast

This section sets out a rough traffic volume estimate, due to the insufficiency of the data for the traffic volume estimate in the strict sense. Development of roads normally leads to a sharp increase in traffic volume. According to the survey of Town Profile Survey conducted by the Project Team, traffic by cars accounts for 50% of the whole traffic on person trip base. In the future the proportion of pedestrians may decrease and transport by car may increase. Therefore, the traffic volumes on the trunk roads, has been estimated assuming that the number of person trips increases in accordance with the population increase, that transport by foot, motorbike and cart decrease, and that the average number of passenger by car decreases from 13.8 persons per car to 10 persons per car.

#### (2) Road Network Plan

The present residential plot areas occupy 60% - 65% of the existing urban Malakal Town area. Future residential plot areas which are under planning in eastern extension area (suburb and exurb) are also going to occupy 60% - 65% of extension areas. Extension areas have free or open areas which are about 8% of extension areas.

**Table 7.9-6 Traffic Volume Estimate on the Trunk Road**

Survey Point	2012				2022			
	Pedestrian	Bicycle & Cart	MT (PCU)	Estimated Person Trips	Pedestrian	Bicycle & Cart	MT (PCU)	Estimated Person Trips
AR-1	5,791	558	850	18,100	5,800	600	2,200	28,500
AR-2	8,803	1,135	1,146	25,800	8,800	1,200	3,050	40,600
AR-3	7,145	1,526	1,353	27,400	7,150	1,600	3,450	43,100
AR-4	4,711	998	1,652	28,600	4,700	1,000	3,900	45,000
AR-5	5,761	1,387	2,955	48,000	5,750	1,400	6,850	75,500
AR-6	5,714	1,062	3,135	50,100	5,700	1,100	7,200	78,900

Note: 10 persons is assumed for average occupancy of MT in 2022

Source: JICA Project Team

The rights of way are designed to be as 60 / 90 meters in width for Class 1 (Highways), 30 / 40 /

50 meters in width for Class-2 (Urban Roads), and 20 / 25 meters in width for Class 3 (Local Roads), the same as the existing roads in the present urban area of Malakal Town. The Grid pattern system matching the existing urban area in Malakal Town will be used for the extension area.

As stated earlier, the road network in Malakal Town is basically a grid pattern, and the new land development plan to the east of Malakal Town is also formulated as a grid road pattern. The east-west trunk roads in the existing Malakal Town and those within the new land development are almost coordinated but not entirely consistent each other. In this regard, existing and planned arterial, and secondary or collector roads shall be carefully adjusted.

In addition to the above, attention shall be paid to NMT, amenity, public utilities and parking demand.

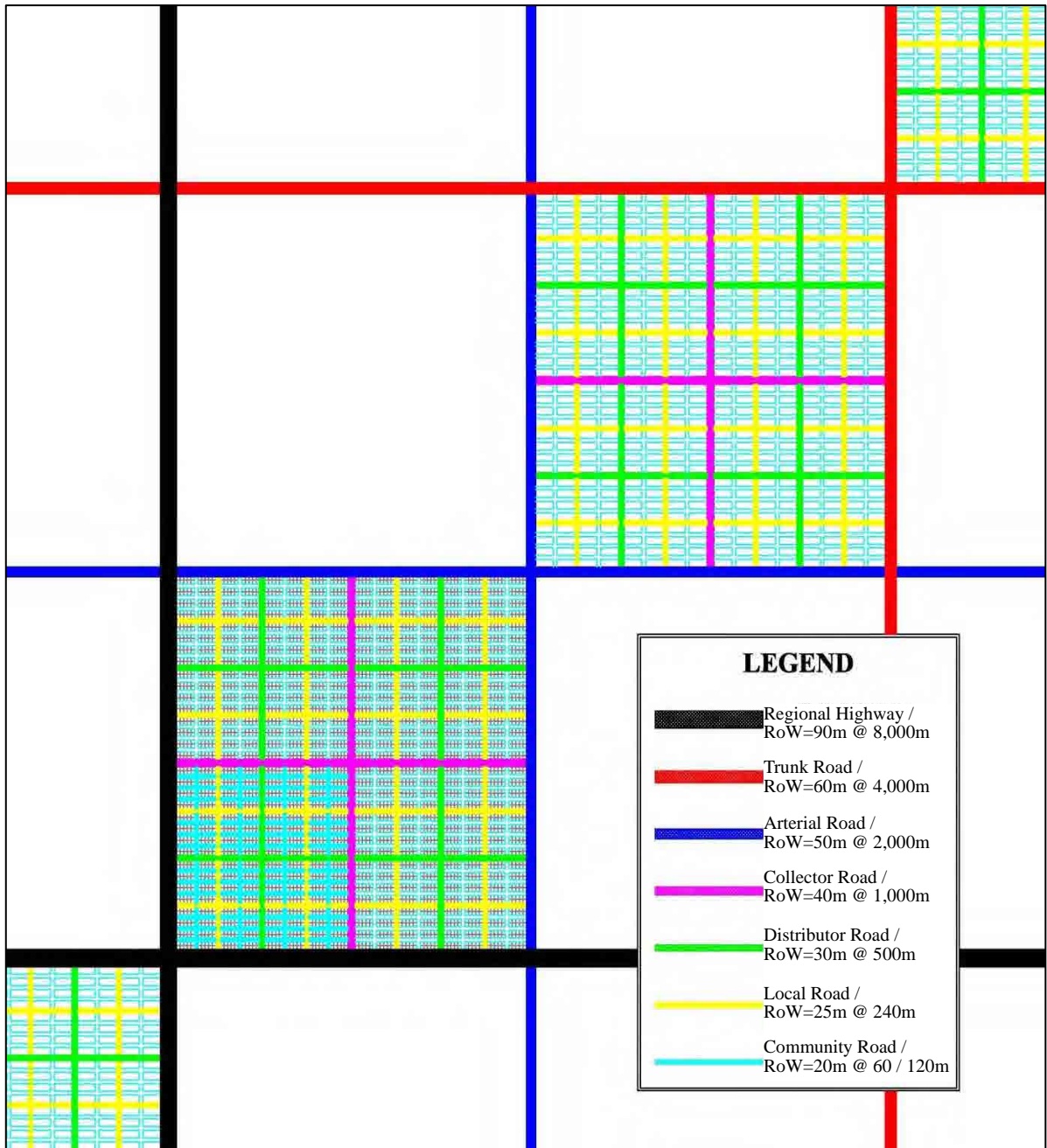
**Table 7.9-7 Summary of Road Network Plan**

Road Class	Classifications	Length
Class 1	Trunk Roads	75km
Class 2	Arterial, Collector, and Distributor Roads	215km
Class 3	Local and Community Roads	1,140km
Total		1,430km

Source: JICA Project Team

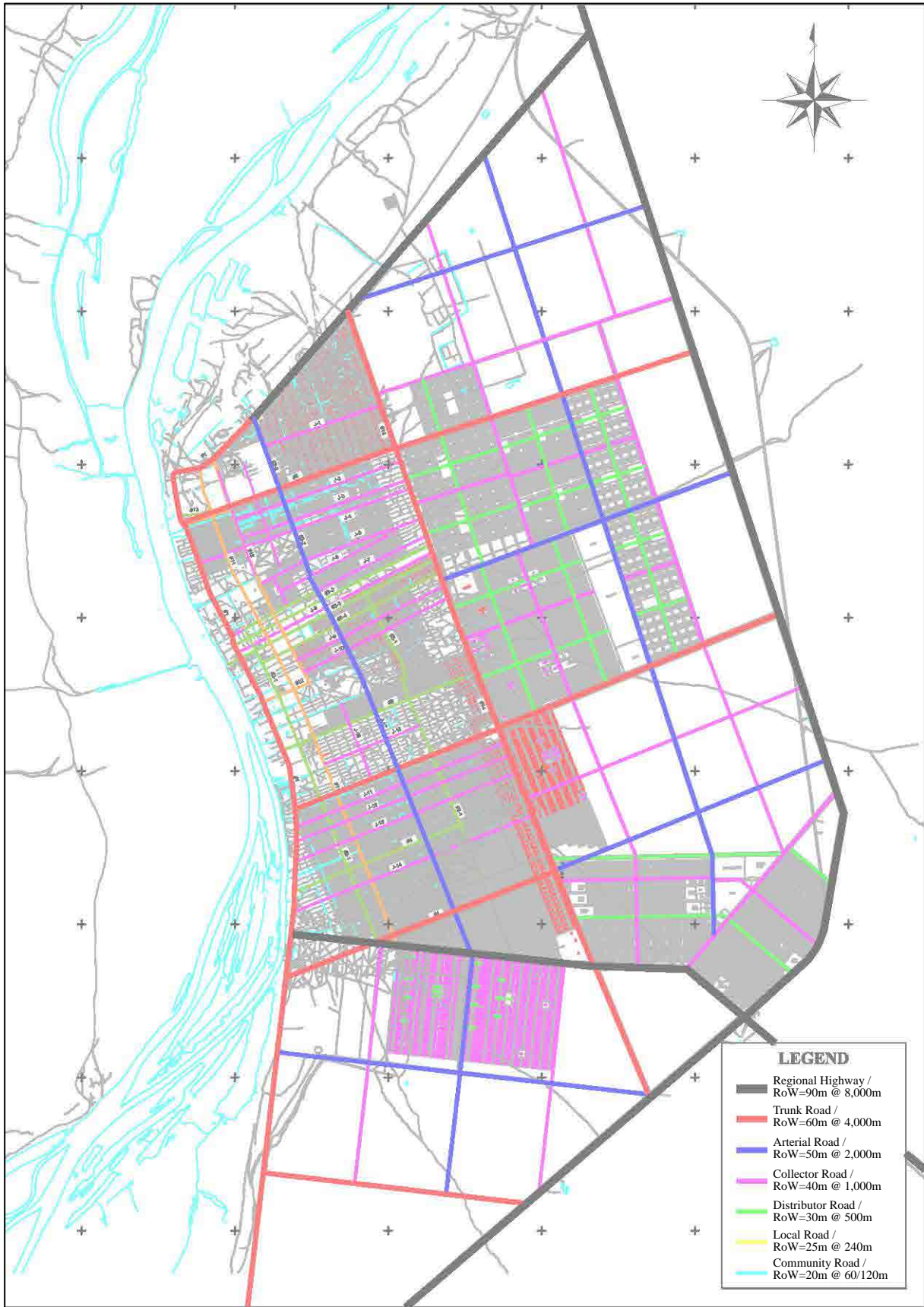
### (3) Standard Road Cross Section

Based on the proposed design standards, the typical cross sections by road class (except regional highway) are illustrated in the **Figure 7.9-3** to **Figure 7.9-5** respectively.



Source: JICA Project Team

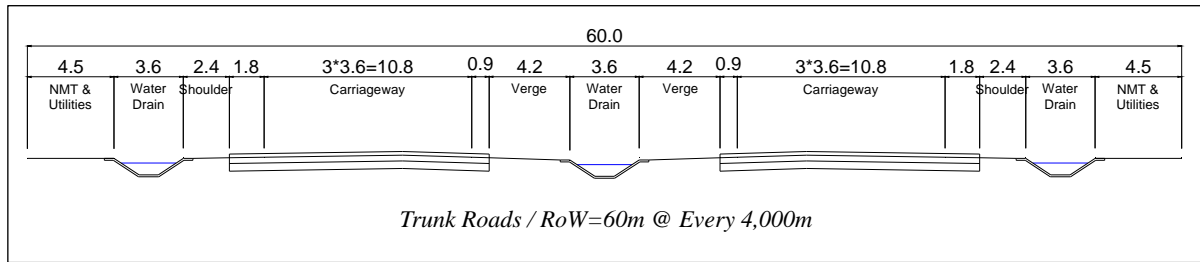
**Figure 7.9-1 Schematic Road Network Development Plan**



Source: JICA Project Team

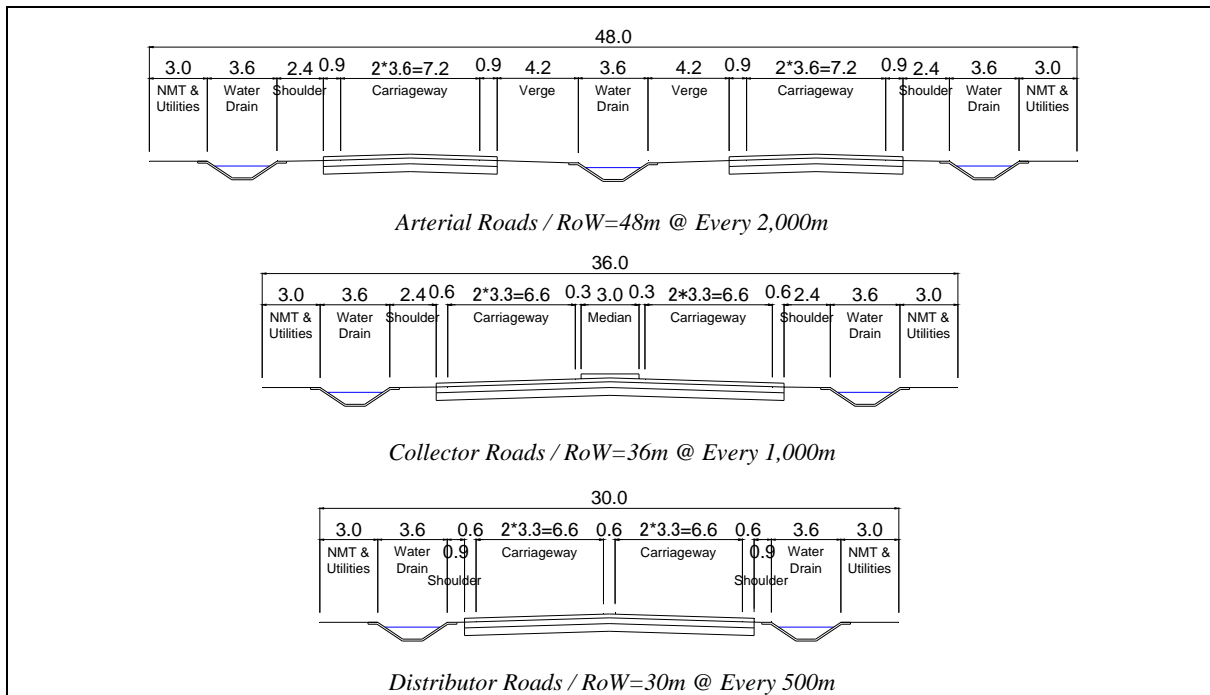
**Figure 7.9-2 New Land Development and Proposed Road Network**





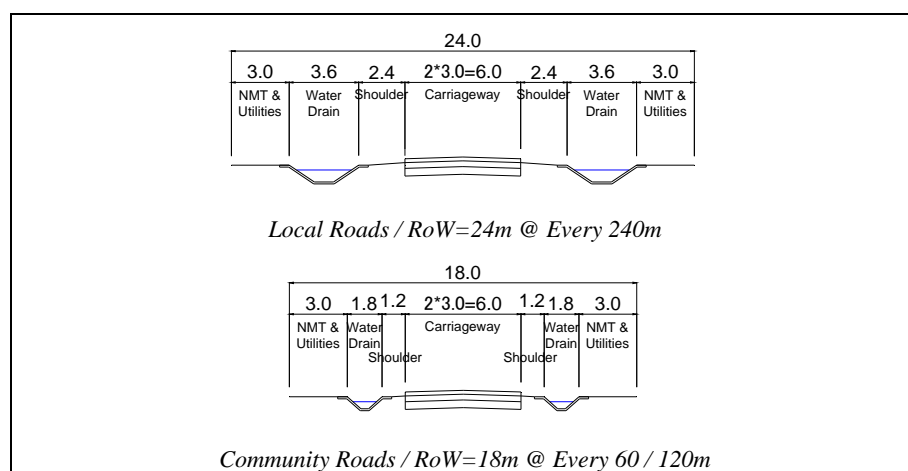
Source: JICA Project Team

**Figure 7.9-3 Typical Cross Section (Class 1)**



Source: JICA Project Team

**Figure 7.9-4 Typical Cross Section (Class 2)**



Source: JICA Project Team

**Figure 7.9-5 Typical Cross Section (Class 3)**

Main roads in Malakal Town, including new urban areas, shall be improved and developed by the



current roads project and new projects by 2022. However the improvement and development of many minor roads such as the local and community roads in town is not expected. This matter shall be accomplished with LBT and MBT by the continuous effort of UNS.

## 7.10 PUBLIC TRANSPORT PLAN

### 7.10.1 Targets for Public Transport

The road plan should include consideration of public transport. Public Land & Air Transport Trade Union Cooperation which is a private organization in charge of decisions of public transport rule, bus route, and bus fare in Malakal Town. When a private organization is in charge of the operation of public transport, socially vulnerable users are affected because of bus route and bus fare is decided by economic principles. The targets for public transportation is shown below.

- (i) To secure public transport space in road construction
- (ii) To rearrange the public transport terminal to better location

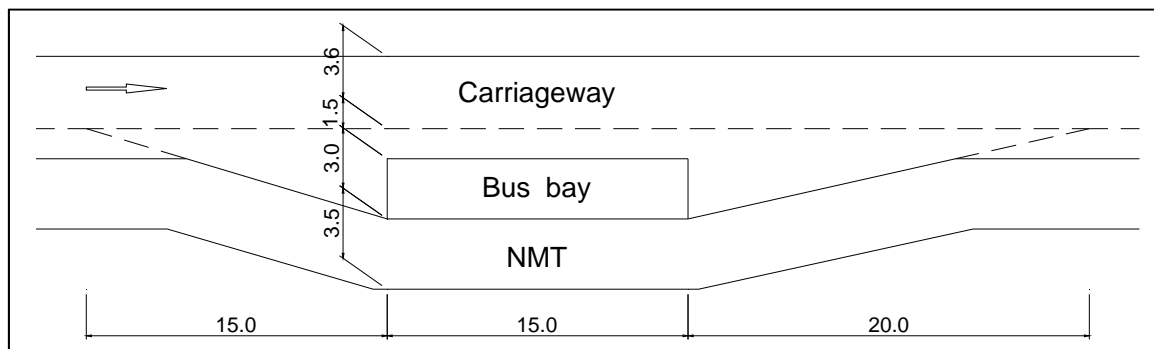
The government needs to consider public transport service areas and governmental subsidization of transport for the poor, before the town area expands. So the government officials require training in policy options in these areas.

### 7.10.2 Public Transport Plan

#### (1) Public Transport Facility

##### Bus Bay

The proposed typical cross section for arterial road has public transport space, but the proposed typical cross section for Class 2 road does not have public transport space. If public transport space is not planned on road, public transports can disturb the traffic flow. Thus a bus bay should be planned at every 500m.



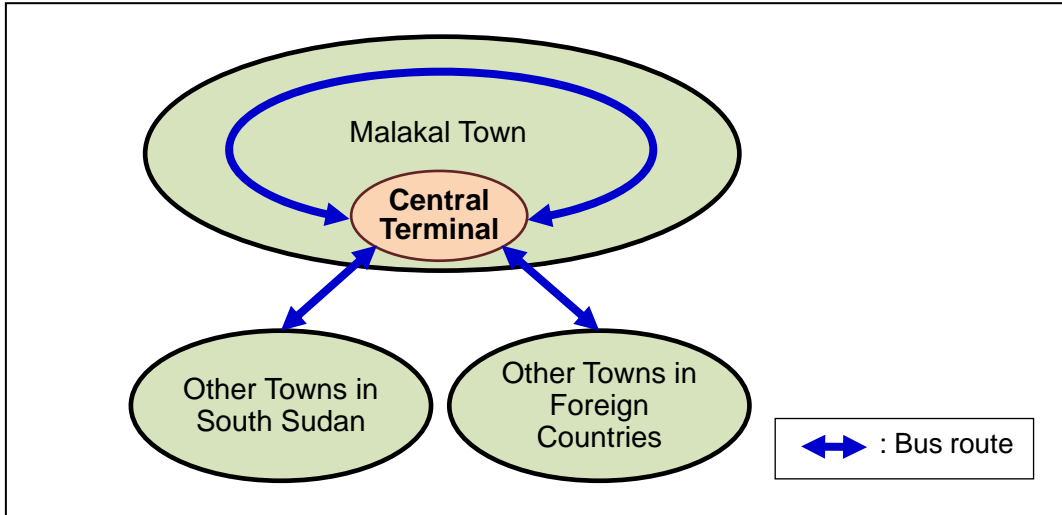
Source: JICA Project Team

**Figure 7.10-1 Bus Bay**

The bus bay project is included in road network improvement project.

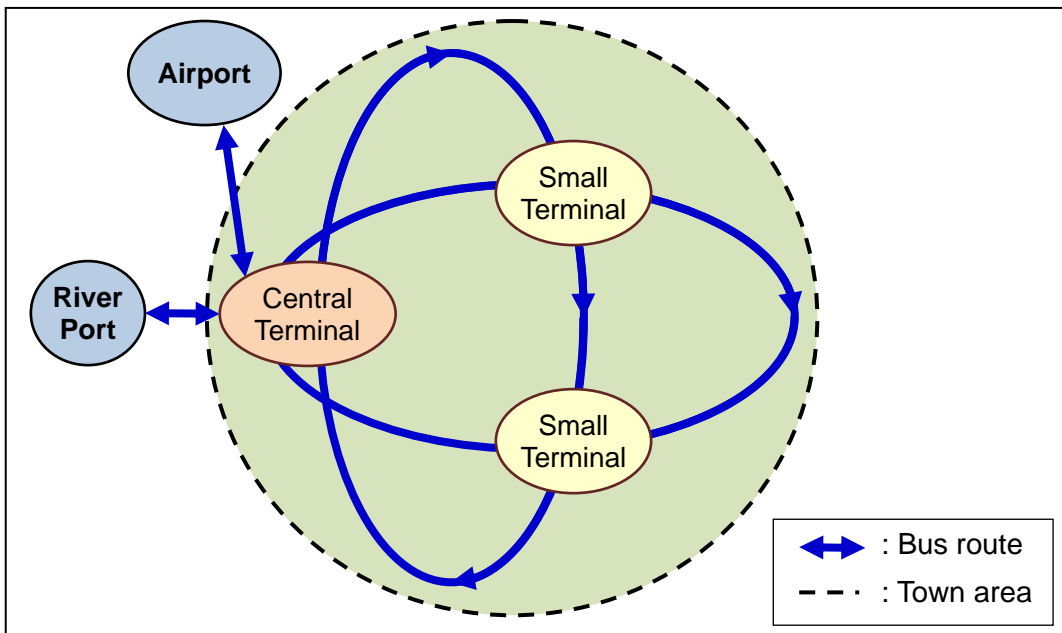
**Bus Terminal**

The public transport terminal is a connection point for each transport mode. A Central public transport terminal is proposed around Moulete Square and two small public transport terminals are proposed along the ring road.



Source: JICA Project Team

**Figure 7.10-2 Conceptual Bus Network**



Source: JICA Project Team

**Figure 7.10-3 Conceptual Bus Network in Malakal Town**

**Table 7.10-1 Plan of Public Transport Terminal**

Location	Central of the Town	Ring road
Taxi Space (vehicles)	40	15
Mini Bus Space (vehicles)	5	1
Large Bus Space (vehicles)	5	-
Area (m <sup>2</sup> )	5,000	2,000

Source: JICA Project Team

## **(2) CD**

Public transport business operators in Malakal Town are individual proprietors who register with the Public Land & Air Transport Trade Union Cooperation. The means of land transportation in Malakal Town are bus, taxi or walking. Though the existing town area in Malakal Town is not very large, travel by vehicles will be more important when the town area becomes larger.

Public transport to provide a service in a broader area will be necessary. However, the provision of public transport services is rather difficult for the private operators in the areas where transport demand density is too small to make attractive profits.

In this regard intervention by the administrative body can be justified by the use of governmental subsidization to the private sector to provide the services.

Presently no administrative organ has managed public transport in Malakal Town. Thus a department which is in charge of public transport management should be established to oversee the public transport facilities, route delineation and measures for the transport of the poor.

### Road Transport

The following regulations/guidelines need to be developed. Traffic Rules/Regulations, the Guideline of Environmental and Social Consideration, Regulations Regarding Importing Equipment and Materials for Road Construction, Standards of Inspections, Road Traffic Control Manual, etc.

## **7.11 TRAFFIC MANAGEMENT PLAN**

The number of traffic fatalities was 8 persons from March to April 2012, it is estimated that 15.7 fatalities per 100 thousand population in a year. This is a low rate compared with 34.4 fatalities in Kenya, 35.0 fatalities in Ethiopia, and 24.7 fatalities in Uganda, but target is to reduce number of traffic fatalities closer to zero.

Enforcement of road transport safety regulations has been designated as one of the tasks of the Road Transport Safety Department of MoPI&RD, but there is no person in MoPI&RD who is in charge or enforcement of road transportation safety regulations. The traffic police are in charge of road traffic control. But road traffic control equipment is insufficient. Traffic safety equipment such as roundabouts, traffic light signals, traffic signs, lane markings, guard rails, sidewalks, crosswalks, median strips are very few or almost non-existent in Malakal Town.

### **7.11.1 Traffic Facility**

#### Roundabout

The roundabout is one of the traffic control systems used at intersections. The full capacity of roundabout design is always larger than that of a signal intersection designs at a mini-junction. Roundabouts shall be introduced to the intersection where total traffic volume of crossing arterial

roads is less than 20,000 pcu/day.

#### Traffic Light Signal

The traffic signal intersection is adopted globally. The full capacity of signal intersection designs is larger than that of roundabout design at a large-junction. Traffic light signals shall be introduced to the intersection where total traffic volume of crossing arterial roads exceeds 20,000 pcu/day.

#### Traffic Sign

The traffic sign is one of traffic control equipment. It is effective for road safety. International Traffic Signs based on Vienna Convention 1968 serve as a reference for traffic sign.

#### Traffic Management Technique

Enforcement of road transport safety regulations was decided to be one of tasks of the Road Transport Safety Department of MoPI&RD. But there is no person in MoPI&RD who is in charge or enforcement of road transport safety regulations. There is a requirement for someone to be trained about traffic management techniques.

### **7.11.2 Traffic Safety Education**

#### Traffic Safety Education

Traffic safety education is an effective measure for improving traffic safety. It is necessary to implement a wide range of subjects, for instance, teaching safety regulations in schools and provision of learning campaigns for the general public and drivers.

#### Traffic Safety Management Organization

The traffic police are in charge of road traffic control, but there is no government body or department for traffic safety. A department, within the traffic police force that is in charge of traffic safety is necessary.

### **7.11.3 Traffic Enforcement Equipment**

#### Police Cars

The traffic police needs police cars for traffic control. The traffic police have only two pickups and three motorbikes presently. Hence it is difficult for traffic police to conduct road traffic control. Traffic police should have more vehicles for traffic control.

#### Telecommunications Equipment

The traffic police do not have radios. They contact each other by using their own telephones. Telecommunications equipment for traffic police are necessary to have good communication system among themselves.

## 7.12 ROAD TRANSPORT SECTOR PROJECTS

### 7.12.1 Detailed Description of the Projects

Major projects for the Road Network Development are summarized below.

#### 1. Community Road Construction Project (LBT) (RT-1)

Project Type	Road improvement
Executing Agency	MoPI&RD
Schedule	Urgent
Project Purpose	To improve living environment of community residential area.
Project Description	<ul style="list-style-type: none"> <li>• Improvement of 6km community roads by LBT</li> <li>• Supply of small equipment</li> </ul>

#### 2. Malakal Town Secondary Arterial Road Improvement Project (RT-2)

Project Type	Road improvement
Executing Agency	MoPI&RD
Schedule	Short term
Project Purpose	<p>To improve secondary roads (Local Streets &amp; Distributors) as paved road network with MBT.</p> <p>To link with township and major roads</p> <p>To ensure road maintenance</p> <p>To ensure all-season trafficability with improvement of water drainage system</p> <p>To secure the all-weather roads together with drainage system improvements.</p>
Project Description	<ul style="list-style-type: none"> <li>• Improvement of 18km local and distributor roads by MBT</li> <li>• Supply of medium-size equipment</li> <li>• Rehabilitation and maintenance of links</li> </ul>

#### 3. Malakal Town Arterial Road Improvement Project (RT-3)

Project Type	Road improvement and development
Executing Agency	MoPI&RD
Schedule	Medium term
Project Purpose	<p>To improve the arterial road (Collectors &amp; Arterials) network</p> <p>To develop the new town street network</p> <p>To enhance the function of road networks (capacity, development of roads in suburbs and exurb, linkage)</p> <p>To categorize the road system</p>
Project Description	<ul style="list-style-type: none"> <li>• Improvement and provide of the primary road network (Collector &amp; Arterial) 45km</li> <li>• Supply of large equipment</li> <li>• Linkage with outer national and state roads</li> <li>• Provision of NMT lanes according to the categorized traffic for safety</li> <li>• Expansion of road network to serve the area spread in the east of existing Malakal Town where most returnees and residents are expected to settle or live</li> </ul>

#### 4. Road Maintenance and Management Project (RT-4)

Project Type	Technical cooperation
Executing Agency	MoPI&RD
Schedule	Medium term
Project Purpose	To improve road maintenance and management skills
Project Description	<p>Road maintenance skills are learned</p> <p>Equipment for road maintenance and management is provided</p>

Major project for the public transport are summarized below.

#### 5. Public Transport Management Project (RT-5)

Project Type	Technical Cooperation
Executing Agency	MoPI&RD
Schedule	Middle term
Project Purpose	To provide fair and equal public transport services, establish a public transport management department and conduct technical training for public transport management department officers.
Project Description	<ul style="list-style-type: none"> <li>• Establish a public transport management department</li> <li>• Management technique of public transport service is learned</li> <li>• Bus route which meet passenger needs and reasonable bus fare will be planned</li> </ul>

#### 6. Malakal Town Bus Terminal and Bus Stop Facilities Construction Project (RT-6)

Project Type	Facility improvement
Schedule	Long term
Project Purpose	The movement between into and out of the centre will increase with the development of Malakal Town. To ensure the safety and smooth traffic, the construction of the facility to connect each traffic mode.
Project Description	<ul style="list-style-type: none"> <li>• Construction of traffic terminal</li> <li>• Construction of bus bay and taxi bay</li> </ul>

Major project for the traffic management are summarized below.

#### 7. Traffic Management Project (RT-7)

Project Type	Technical cooperation
Executing Agency	MoPI&RD, Traffic Police
Schedule	Middle term
Project Purpose	Enhance traffic management capability from infrastructure development and traffic management.
Project Description	<ul style="list-style-type: none"> <li>• Techniques of road traffic safety measures are learned</li> <li>• Traffic facility construction manual and Traffic control manual are prepared</li> <li>• Traffic safety measure is carried out by traffic safety responsible organization</li> <li>• Proper traffic control and proper traffic enforcement is carried out</li> </ul> <p style="text-align: center;">&lt; Proposed facility/machinery &gt;</p> <ul style="list-style-type: none"> <li>• Police car</li> <li>• Traffic sign</li> </ul>

#### 8. Intersection and Traffic Facility Improvement Project

Project Type	Facility improvement
Schedule	Middle term
Project Purpose	Keep traffic safety at intersection and road section
Project Description	<ul style="list-style-type: none"> <li>• Construction of roundabout</li> <li>• Construction of sidewalk</li> <li>• Construction of crosswalk</li> </ul>

#### 9. Malakal Town Traffic Safety Management Project (RT-9)

Project Type	Technical cooperation
Executing Agency	MoPI&RD, Traffic Police
Schedule	Long term
Project Purpose	traffic safety education is carried out
Project Description	<ul style="list-style-type: none"> <li>• Road traffic safety education manual is prepared</li> <li>• Traffic safety education is carried out for students, drivers, and traffic offenders</li> <li>• Implementation of traffic safety campaign</li> </ul>

## **7.13 OPERATION AND MANAGEMENT PLAN**

### **7.13.1 Issues for Operation and Management**

The Directorate of Roads and Transport is in charge of management of road maintenance in UNS. However, in fact, MoPI&RD has no equipment and no system for road maintenance. MoPI&RD will strengthen the capacity of the Directorate of Roads and Transport and reconstruct the system of road maintenance to address the Malakal Internal Roads Project. Even though MoPI&RD will also provide the Directorate with some earth moving equipment which enables it to undertake road maintenance, MoPI&RD has no budget to implement practical maintenance works.

It is hard to make a data base for road maintenance of Malakal Internal Roads in the present situation because it is under construction. However, it is a priority for roads maintenance management that MoPI&RD will construct the data base before anything else. First, the lists of roads for maintenance shall be formed from an inventory survey and MoPI&RD shall decide whether it shall perform road maintenance by itself or by contractors. On the other hand, the improvement project of community roads will initiate community activity so that long term communities are expected to operate and manage the maintenance of their roads.

In any case, it is important to reconstruct and strengthen the road sector and the system for operation and management of the roads as shown below;

- (i) To construct data base of roads and use the data base
- (ii) To acquire the practical equipment for road maintenance gradually and maintain the equipment.
- (iii) Capacity building of human resources for computerizing, operation, maintenance of equipment and improve the skill and knowledge of the road maintenance technologies.

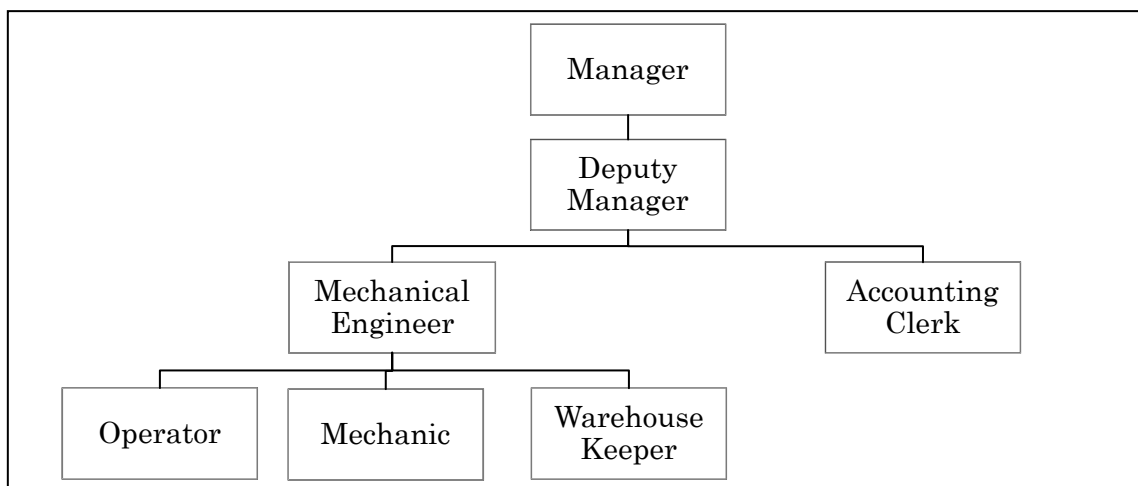
It is expected to have the particular finances for the roads section so that MoPI&RD can manage the operation and maintenance throughout the year.

### **7.13.2 Organization**

#### **(1) Organization Chart**

The organization chart of the Operation and Maintenance section (hereinafter called O&M section) is shown below. O&M sections shall be organized under Directorate of Roads and Transport, Department of Roads and Bridges.

When the O&M section is established, the staff of the Road Engineer Section and Mechanical Section under the Department of Roads and Bridges shall be assigned to work as engineers, operators, mechanics and warehouse keepers of O&M section.



Source: JICA Project Team

**Figure 7.13-1 Organization of Operation and Maintenance Sector**

## (2) Roles of Each Personnel

Roles of each personnel are shown in **Table 7.13-1**.

**Table 7.13-1 Roles of Personnel**

Personnel	Roles
Manager	<ul style="list-style-type: none"> <li>• Approve fuel procurement</li> <li>• Approve replacement of spare parts</li> <li>• Approve utilization of equipment by other party</li> <li>• Manage O&amp;M section</li> </ul>
Deputy Manager	<ul style="list-style-type: none"> <li>• Assist Manager</li> <li>• Work as deputy for Manager</li> <li>• Manage attendance record of the staff</li> <li>• Manage work schedule</li> </ul>
Mechanical or Roads Engineer	<ul style="list-style-type: none"> <li>• Receive and check daily and pre-operation checklist from the operator</li> <li>• Request fuel procurement to the manager</li> <li>• Request replacement of spare parts through the manager</li> <li>• Arrange repair works when the equipment is breakdown</li> <li>• File the record of all O&amp;M with working report</li> </ul>
Operators	<ul style="list-style-type: none"> <li>• Conduct daily and pre-operation check</li> <li>• Operate the equipment</li> </ul>
Mechanics	<ul style="list-style-type: none"> <li>• Repair and maintain the equipment</li> <li>• Order spare parts and consumable items</li> </ul>
Warehouse Keepers	<ul style="list-style-type: none"> <li>• Parts inventory control</li> <li>• Request to purchase spare parts and consumables</li> </ul>
Accounting Clerk	<ul style="list-style-type: none"> <li>• Collect the usage fee</li> </ul>

Source: JICA Project Team

## (3) Warehouse

Small equipment, spare parts, necessary tools, and consumables shall be stored in the warehouse properly. The warehouse keeper shall record the incoming and outgoing materials in a log book. The State Ministry's workshop in MoPI&RD office yard shall be utilized for the warehouse. When the capacity of the State Ministry's workshop is not enough for equipment, the State Ministry should establish proper warehouse in MoPI&RD office yard or other proper yard.



#### (4) Check-ups

The operator shall conduct daily check-ups and pre-operation check-ups whenever equipment shall be used in accordance with the check lists. Whenever a defect is found, the operator shall immediately report to the mechanical engineer in charge who shall take action.

### 7.13.3 Operation and Maintenance Cost Estimates

#### (1) Operation, Maintenance and Repair Costs

The annual budget shall be provided by MoPI&RD for all expenses of equipment usage such as operation, maintenance and repair costs. The required amount of budget shall be assumed based on the estimated operational days which will be given for reference by applying annual standard operation days prescribed in Japanese estimation standard such as “Estimation Standard for Civil Engineering work 2011”, Ministry of Land, Infrastructure, Transport and Tourism (MLIT), the Government of Japan(GOJ). In the calculation, the depreciation cost is excluded, but prevailing price of fuel is used.

##### Operation Cost

This is presented in **Table 7.13-2**.

**Table 7.13-2 Operation Cost per Day**

(Unit: SSP)

Items	Spec	Unit	Litre	Unit cost	Fuel Cost	Operator (day)	Total	Remarks
C.Roller	diesel	litre	65.8	20	1,316	-	1,316	*assume 6.6h for daily operation
C.Ramer	gasoline	litre	23.1	20	462	-	462	
C.Plate	gasoline	litre	8.1	20	162	-	162	
S.Excavator	diesel	litre	27.7	20	554	35	589	
S.Generator	diesel	litre	29.1	20	582	-	582	
E.Pump	gasoline	litre	6.9	20	138	-	138	
Depreciation				0	0	0	0	

Source: JICA Project Team

**Table 7.13-3 Annual Operation Cost**

(Unit: SSP)

Item	Unit Cost (per day)	Annual Standard Operation Days	Annual Operation Cost
Compaction Roller	1,316	80	105,280
Compaction Ramer	462	80	36,960
Compaction Plate	162	80	12,960
Small Excavator	589	100	58,900
Small Generator	582	110	64,020
Water Pump	0	100	0
Engine Pump (50mm)	138	100	13,800

Source: JICA Project Team

##### Annual Maintenance and Repair Cost

Annual maintenance and repair cost for the equipment is shown below.

Maintenance and repair costs per year = Basic value x Rate of maintenance and repair cost/ Standard years of service. The basic value of the equipment refers to “Estimation for Depreciation Cost of Construction Equipment 2010” by MLIT, which is generally used for the calculation of equipment expenses in Japan.

**Table 7.13-4 Annual Maintenance and Repair Cost**

(SSP1 = JPY 26,544)

Items	Basic Value (JP¥)	Standard Year of Service	Maintenance and Repair Cost Rate (%)	Annual Maintenance and Repair Cost	
				(JP¥)	(SSP)
Compaction Roller (0.8-1.1ton, hand guide )	1,100,000	13	30	25,384	956
Compaction Ramer (60kg)	182,000	6	40	12,133	457
Compaction Plate (40kg)	129,000	6	40	8,600	324
Small Excavator (0.08m <sup>3</sup> , 21kw, 0.8t )	4,500,000	9	40	200,000	7,535
Small Generator (17-20kva)	1,440,000	10	40	57,600	2,170
Water Pump (50mm, 0.8kw)	43,000	10.5	125	5,119	193
Engine Pump (50mm)	15,000	8.5	65	1,147	43

Source: JICA Project Team

#### Total Cost for O &M Section

Table 7.13-5 shows estimated total annual cost for O&M. The total cost is South Sudan Pounds (SSP) 691,199. The annual cost of O&M for the equipment is 656,199 or 95% of the total. The annual staff salary is SSP33,000. SSP2,000 for improvement of the workshop is the expense only for first year.

**Table 7.13-5 Total Annual Cost**

(Unit: SSP)

Items	Unit	Annual Operation Cost	Annual Maintenance, Cost	Unit Cost	No.	Total
Compaction Roller (0.8-1.1t, hand guide)	year	105,280	956	106,236	2	212,472
Compaction Ramer (60kg)	year	36,960	457	37,417	4	149,668
Compaction Plate (40kg)	year	12,960	324	13,284	4	53,136
Small Excavator (0.08m <sup>3</sup> , 21kw, 0.8t lift)	year	58,900	7,535	66,435	1	66,435
Small Generator (17-20kva)	year	64,020	2,170	66,190	2	132,380
Water Pump (50mm, 0.8kw)	year	0	193	193	3	579
Engine Pump (50mm)	year	13,800	43	13,843	3	41,529
Operator	month	-	-	1,000	12	12,000
Mechanic	month	-	-	1,000	12	12,000
Warehouse keeper	month	-	-	750	12	9,000
Improvement of workshop	unit	-	-	2,000	1	2,000
<b>Total</b>						691,199

\*Total annual cost includes improvement of workshop for the 1<sup>st</sup> year.

Source: JICA Project Team

## (2) Utilization of the Equipment by Other Parties

When the equipment are not in use for road works and other tasks by MoPI&RD, they can be

used for other purposes with the written approval of the manager for contractors working or such as the training with Vocational Training Centre.

#### **7.14 IDENTIFIED CD NEEDS FOR ROAD TRANSPORT SECTOR**

The Road Transport Sector CD needs identified for the proposed projects are presented in **Table 7.14-1**. The following training was provided in the course of the Project for capacity development of the MoPI&RD and other departments: 1) Geographic Information System (GIS) training/AutoCAD Training; 2) English documentation training/Information Technology(IT) skill training; 3) Accounting training; and 4) Project Management Training. (See the detail in **Chapter 15**.)

**Table 7.14-1 Capacity Development Logframe (Road Transport Sector)**

(As of August 2012)

Area	CD items	Individual	Organization	Institution	Target	Urgent Project	Technical Cooperation	Training in OECD countries	Training in neighboring countries	WS/Training in South Sudan
Road Transport	Road Plan and Design	Design	To organize road planning division To allocate engineers to the division To allocate budget	To establish mid-term and long-term road development plans for Malakal Town (UNS) To establish an annual plan for road development To set up standards of road construction To establish traffic rules/regulations To allocate budget	Public officers	✓	✓	✓		✓
	Baseline survey	Population and traffic census Estimation and analysis of the increment of population and traffic growth Soil survey/analysis Investigation of buried structure	To allocate engineers		Public officers		✓	✓	Uganda Tanzania	✓
	Environmental and social consideration	Implementation methods for environmental and social consideration	To organize environmental and social consideration division To allocate human resources (or contract-out) To coordinate stakeholders' interests	To revise the guideline of environmental and social consideration	Public officers		✓	✓	Uganda Tanzania	✓
	Procurement	Procurement system Market survey Trading procedure Logistics measures	To organize procurement division To allocate human resources	To set up regulations regarding importing equipment and materials for road construction To set up the regulation regarding preferential tax treatment for public works	Public officers				Uganda Tanzania	✓
	Construction order			To regulate the contract form	Public officers				Uganda Tanzania	✓
	Supervision of construction	Project management method Monitoring method Progress inspection Taking over inspection Defect and deficiency inspection Final inspection	To organize the division of supervision To allocate engineers	To set up the standards of defect and deficiency inspection To set up the standards of progress inspection	Public officers	✓	✓	✓	Uganda Tanzania	✓
	Plan of O&M and the implementation	Planning method Project management method Quality control (monitoring) measure	To organize the division of O&M To allocate engineers To allocate budget	To make an annual O&M plan To allocate budget	Public officers	✓	✓	✓	Uganda Tanzania	✓
	Equipment for O&M	Daily and periodical maintenance of equipment Management method of equipment and appurtenances	To organize the division of management of O&M equipment To allocate human resources (management staff and engineers) To allocate budget	To establish the management system of O&M equipment To make an annual maintenance plan of the equipment To make a budget plan and allocate it	Public officers		✓	✓	Uganda Tanzania	✓
	Staffs' capacity building system	Training needs assessment Planning the trainings Training evaluation method	To organize the division of human resource development and trainings To allocate human resources To establish performance evaluation To manage the budget	To establish a manual of capacity building of engineers To set up mid-term and long term capacity building plan To set up an annual capacity building plan To establish a performance evaluation system (as the outcome of trainings) To allocate the budget	Public officers	✓	✓	✓	Uganda Tanzania	✓
	Management of public transportation	Planning method of public Transport Survey method	To organize the division of public transport management To allocate human resources To allocate budget		Public officers		✓	✓	Uganda Tanzania	✓
Road traffic control	Road traffic control method	To organize the division of road traffic control in MoPI&RD To organize the division of road traffic control in the Traffic Police To allocate human resources To allocate budget	To set up a road traffic control manual To set up a traffic control manual	Public officers		✓	✓	Uganda Tanzania	✓	

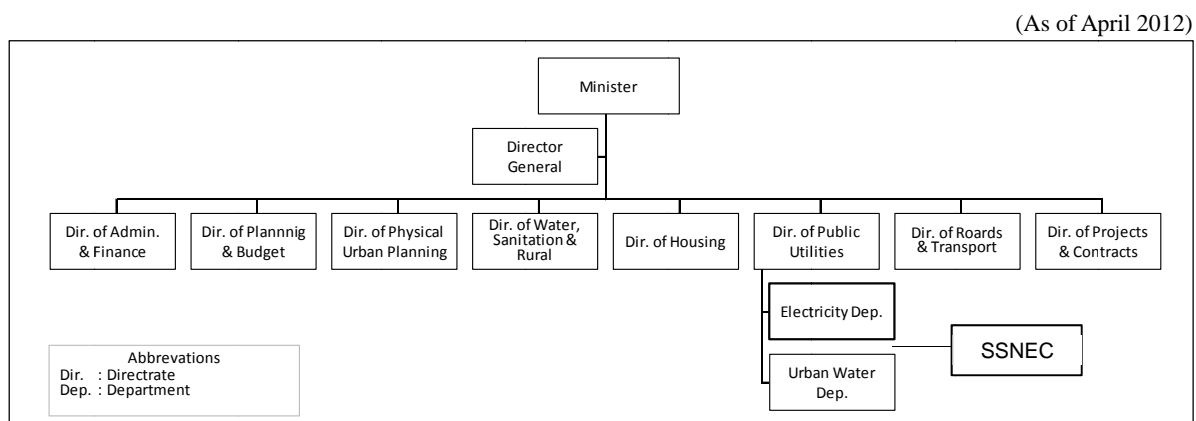
Source: JICA Project Team

## CHAPTER 8 ENERGY

In this chapter, the following perspectives regarding the Energy Sector are presented and analysed; 1) The Institutional Framework, 2) Policies and Strategies, 3) Financial Resources, 4) The Operation and Maintenance System, 5) Facilities and Staffing, 6) the Findings from Relevant Survey(s), 7) Programmes and Projects, and 8) Needs and Issues. And then in section 9) development plans are formulated based on the present situation, needs and issues, and in 10) projects are proposed from technical point of view.

### 8.1 INSTITUTIONAL FRAMEWORK

The Electric facility in Malakal Town is operated by the South Sudan National Electricity Corporation (SSNEC) under the State Ministry of Physical Infrastructure and Rural Development of the Upper Nile State (UNS), (MoPI&RD) and the relevant authority of Republic of South Sudan (ROSS) is the Ministry of Electricity. The organization chart of MoPI&RD in relation to the energy sector is shown in **Figure 8.1-1**.



Source: "Policy Framework 2011", Ministry of Finance, Trade and Economic Planning, UNS

**Figure 8.1-1 Organizational Structure of The Directorate of Public Utilities, MoPI&RD**

### 8.2 POLICIES AND STRATEGY

The Ministry of Electricity of the central government is planning to solve the electricity issues of Malakal. As a temporary solution, the ministry has purchased three generators and started installation work.

### 8.3 FINANCIAL RESOURCES

"Annual electricity collection of sales department" was the only information able to be obtained from the department of electricity in MoPI&RD. According to this document, operational income for the year 2011 was SSP (South Sudan Pond)1,068,408. The operation income was transferred to the state government (80%) and electricity corporations (20%).

## **8.4 OPERATION AND MAINTENANCE SYSTEM**

According to the household survey, electricity is not only provided by the SSNEC under MoPI&RD but also by private power generators and community based power services, etc. However, the majority of households which use electricity (about one half) are provided by the SSNEC.

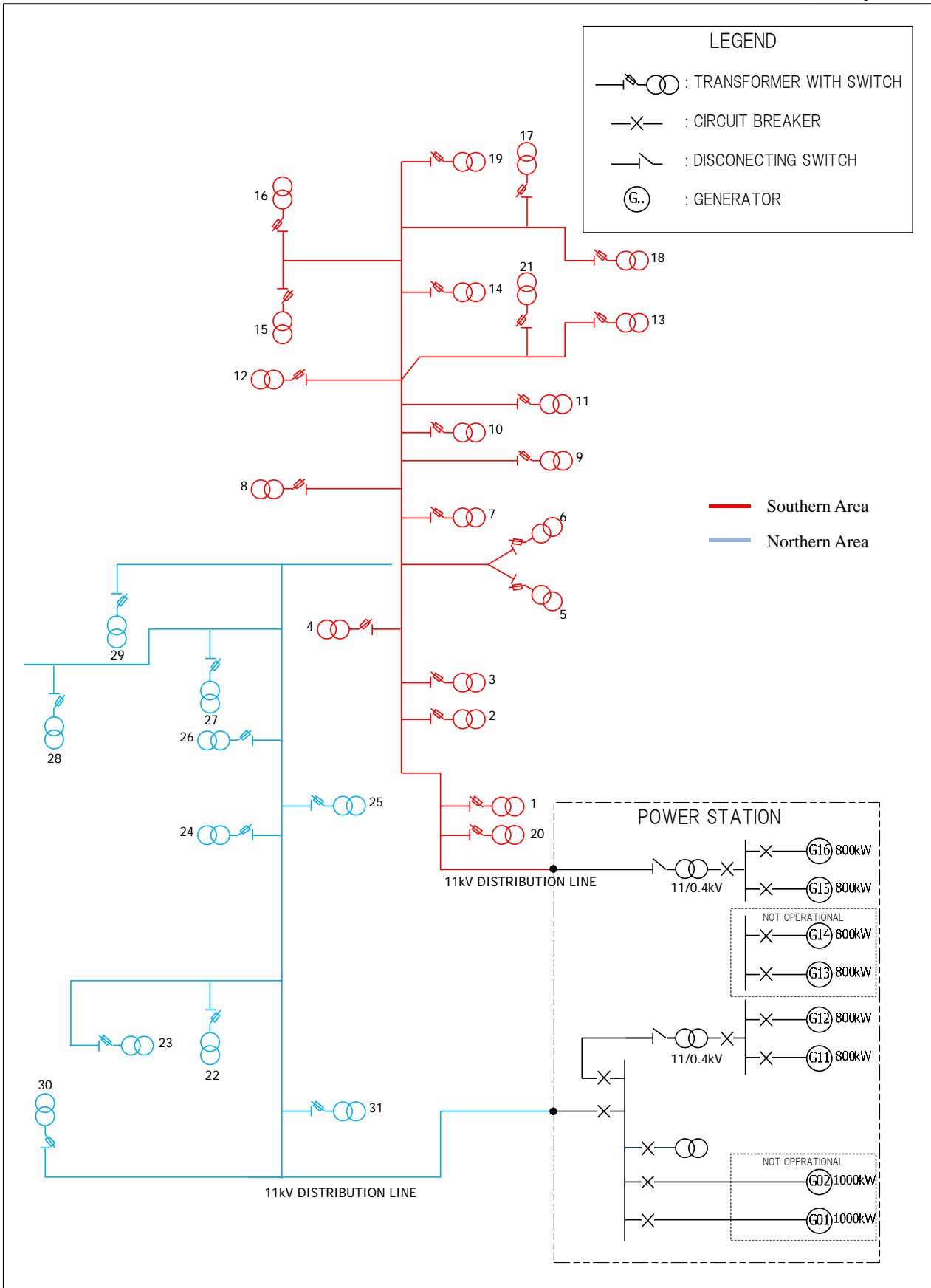
### **8.4.1 Power Generation of SSNEC**

**Figure 8.4-1** shows outline of existing power supply system in Malakal Town in UNS. The main facilities are as follows;

- (i) Two units of 1,000kW Diesel Engine Generator (DEG) are probably not operational, because of fuel shortage.
- (ii) Six units of 800kW DEG are available, of which two are out of order, but these are only used during night-time because of the limited fuel oil supply.

**Photo 8.4-1** shows the diesel generators of the existing power supply system in Malakal Town.

(As of April 2012)



Source: JICA Project Team

**Figure 8.4-1 Existing Electricity Network in Malakal Town**



1,000kW DEG



800kW DEG

Source: JICA Project Team

**Photo 8.4-1 Exiting Diesel Generators in Malakal Town**

The available capacity of the power station at present is limited to four Megavolts Amperes (MVA) in total and the DEGs are of the high speed type. Generating facilities only operate during the night time (7 pm. to 5 am.) because supply of fuel oil is insufficient. During the day times, consumers such as offices and shops operate their own generators.

**Table 8.4-1 Status of Present Generating Plants at Malakal Power Station**

(As of April 2012)

Unit No. (assumed)	Year Manufactured	Rated Output (kW)	Available Capacity (kW)	Current Status	Expected Decommissioning Year
G01	China/2000	1,000	0	Not operational/No fuel	2009
G02	China/2000	1,000	0	Not operational/No fuel	2009
G11	CPL/2006	800	800	Operational	
G12	CPL/2006	800	800	Operational	
G13	CPL/2006	800	0	Not operational: Radiator damaged	2009
G14	CPL/2006	800	0	Not operational: Breaker damaged	2009
G15	CPL/2006	800	800	Operational	
G16	CPL/2006	800	800	Operational	
G21	CPL/200*	(1,500)	0	Under installation	
G22	CPL/200*	(1,500)	0	Under installation	
G23	CPL/200*	(2,000)	0	Under installation	
Total			3,200		

Note: CPL: Caterpillar Corporation, USA

Source: UNS and JICA Project Team

#### 8.4.2 Distribution Network of SSEC

The high voltage distribution system is an 11kV network in Malakal Town with the following facilities:

- (i) Northern area: 11kV network length is approximately 7km with ten units of distribution transformers. The current peak load from Malakal Power Station is 1,000kVA (kilovolt-



amperes).

- (ii) Southern area: An 11kV (kilovolt) network with a length of approximately 8km with 21 units of distribution transformers. The current peak load from Malakal Power Station is 2,000kVA.
- (iii) The total transformer capacity in Malakal Town is 6,500kVA.



11kV Distribution Line



11kV & low voltage (LV) Line

Source: JICA Project Team

**Photo 8.4-2 Electricity Distribution Lines in Malakal Town**

**Table 8.4-2 List of Existing Distribution Transformer**

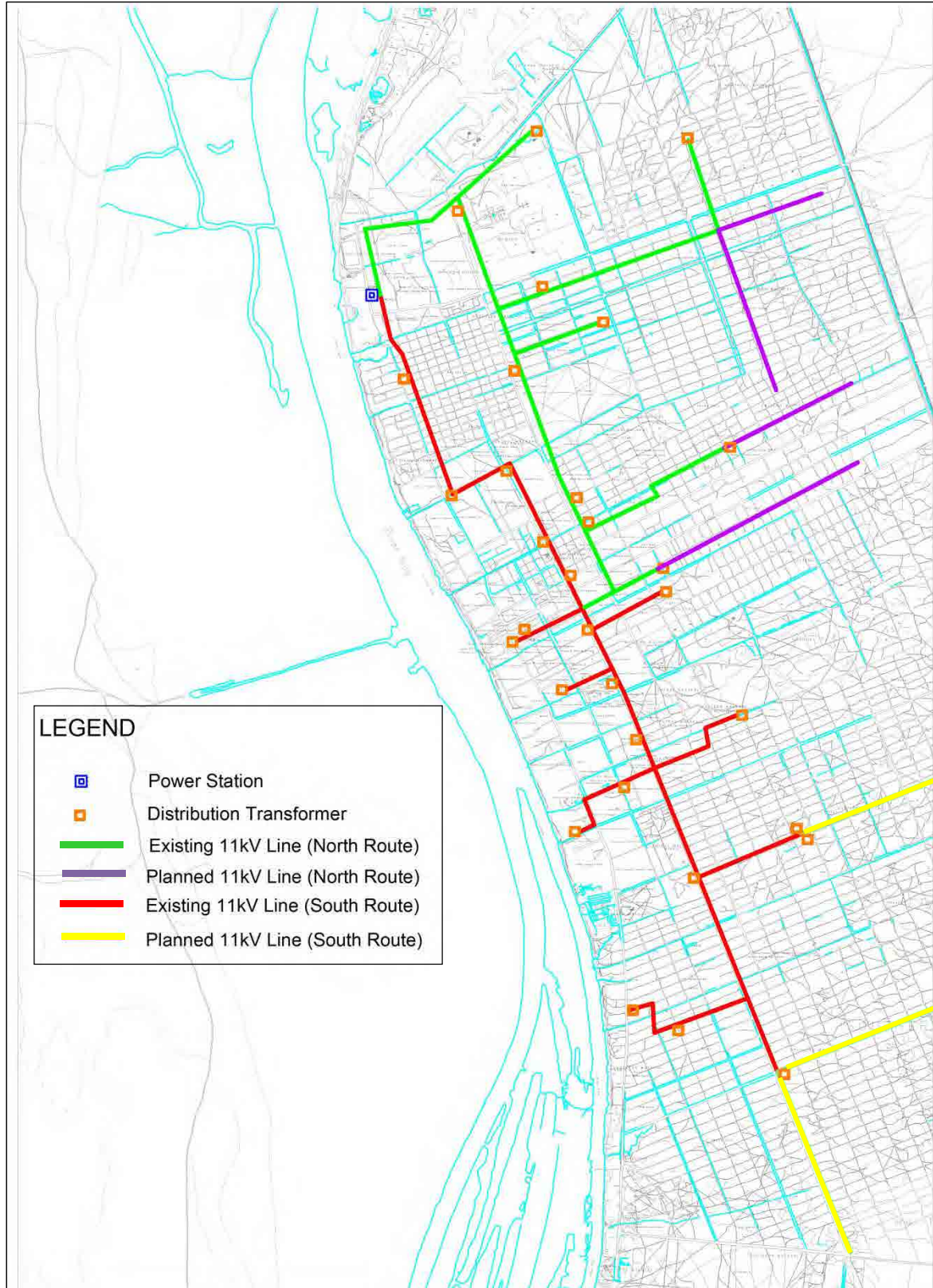
(As of April 2012)

Transformer No.	Capacity (kVA)	Remarks	Transformer No.	Capacity (kVA)	Remarks
Southern Route: 4,500kVA(21 sets)			17	200	Domestic
1	200	Domestic	18	200	Hotel(NPH)
2	200	Domestic	19	200	Domestic
3	200	Domestic	20	200	Police
4	200	Stadium	21	200	Domestic
5	200	Domestic			
6	200	Hospital	Northern Route: 2,000kVA(10 sets)		
7	200	Domestic	22	200	Domestic
8	200	TV Station	23	200	Domestic
9	200	Domestic	24	200	Domestic
10	200	Domestic	25	200	Stadium
11	200	Hotel (SSH)	26	200	Domestic
12	200	Domestic	27	200	Domestic
13	500	Water T-Plant	28	200	Domestic
14	200	Domestic	29	200	Domestic
15	200	Domestic	30	200	Air Port
16	200	Domestic	31	200	University

Note: Locations of the transformers in the table as shown in Figure 8.4-1.

Source: JICA Project Team

(As of April 2012)



Source: JICA Project Team

**Figure 8.4-2 Power Facilities**

Low voltage facilities in Malakal Town are as follows:

- (i) Total consumers (as of the end of March, 2012) are 5,785 households including government facilities.
- (ii) Street lighting facilities is approximately 400 units of 250 watts (W) type

## 8.5 FACILITIES AND STAFFING

The main generating facilities managed by the government are as follows;

- (i) Two units of 1,000kW Diesel Engine Generator (DEG) are probably not operational, because of fuel shortage.
- (ii) Six units of 800kW DEG are available, of which two are out of order. These only operate during the night because of limited fuel oil supply. See the above section for the facilities.

The generators are only operated during the night (7 pm. to 5 am) due to insufficient fuel. There is a shortage of engineers and staff for distribution facilities and the sales department, which causes limited coverage of electricity supply.

## 8.6 FINDINGS FROM RELEVANT SURVEY(S)

### 8.6.1 Household Survey Results

The household survey conducted as a part of Town Profile Survey provides information regarding the energy condition.

#### (1) Source of Energy

**Table 8.6-1** shows providers of electric power source:

**Table 8.6-1 Provider of Electric Power Service**

(As of January 2013)

Provider of Electric Power Service	Number	%
Administrative power generation services	77	49.4%
Private power generator	57	36.5%
Community based power generation services	13	8.3%
Others	5	3.2%
Private company services	4	2.6%
Total	156	100.0%

Source: Town Profile Survey by JICA Project Team

Less than one third of all the interviewed households are actually using electricity (156 against 492). Nearly half of those using electricity depend on the power company, while about 37% depend on privately owned generators.

## (2) Expenditure

Households depending on private power generators are paying more than those receiving power from the power organization. 88% of households using private power generators pay more than SSP50 per month, while 82% households depending on the power supply organization for supply pay less than SSP50 per month.

**Table 8.6-2 Expenditure on Electricity**

(As of January 2013)

Expenditure on Power (SSP/month)	Private company Service	Private power generator	Administrative power generation services	Community-based power generation Service	Other
~ 20	4	4	10	1	3
~ 30	37	1	0	0	0
~ 40	3	0	49	0	0
~ 50	0	3	25	0	4
More than 50	1	61	18	1	50
Total	45	69	102	2	57

Source: Town Profile Survey by JICA Project Team

**Table 8.6-3 Expenditure on Other Fuel**

(As of January 2013)

Range	Wood/Wood Fuel	Kerosene	Electricity Battery	Other Means
~20 SSP a month	8	0	57	5
~30 SSP a month	1	0	0	1
~40 SSP a month	6	0	3	2
~50 SSP a month	17	3	1	2
more than 50 SSP a month	275	13	5	22
Total	307	16	66	32

Source: Town Profile Survey by JICA Project Team

## (3) Residents' Opinion of the Energy Service

Forty-six percent of those surveyed were dissatisfied with the current energy situation while 16% were satisfied. In response to the question about energy as a whole, two thirds of the households answered that the high cost of energy is a problem. The next greatest issues were the instability of energy and then the non-availability of electricity.

**Table 8.6-4 Issues with Energy**

(As of January 2013)

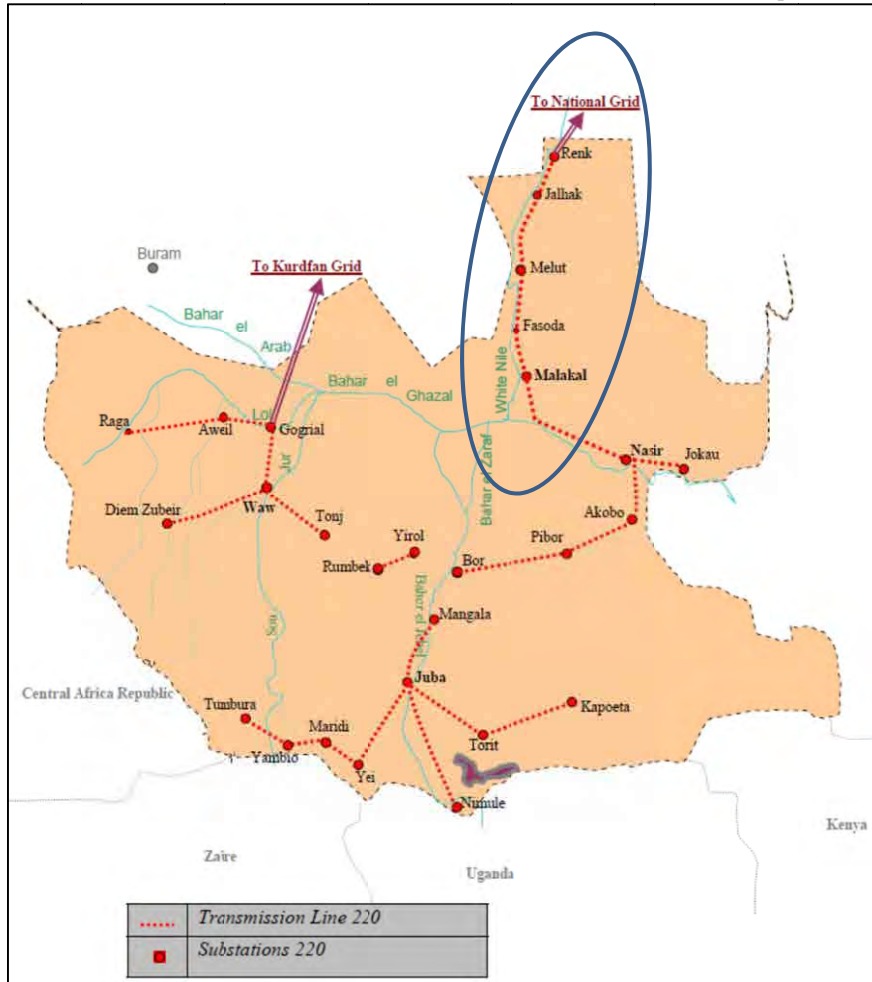
Issues with Energy	Number	%
Energy cost is too high for livelihood	320	65.0
Energy source is unstable	192	39.0
Electricity services is not available	85	17.3
Electricity supply services fee is too much for livelihood	111	22.6
Others	3	0.6
Total sample number	492	100.0

Note: Town Profile Survey by JICA Project Team

## 8.7 PROGRAMMES AND PROJECTS

Three generators procured by government of Southern Sudan will be installed in the Malakal power station which is located in the northern area of the town. Construction of a 220kV transmission line and substations from Renk near border of UNS has been suspended.

(As of April 2012)



Source: "NEC Development Plan", Network Planning Directorate, SSNEC

**Figure 8.7-1 Transmission Plan of Southern Sudan 2010 – 2014**

## 8.8 NEEDS AND ISSUES OF THE SECTOR

### 8.8.1 General Issues

The area where grid power is provided is limited, according to the findings in the household survey. The areas lacking electricity service are located in the southern and eastern area of Malakal Town, areas where housing development is underway.

There is a shortage of engineers and staff for the distribution facilities and staff for the sales department.

There are high speed type DEGs operating although medium or low speed type DEGs are required.



Some distribution transformers are aging with more than 20 years of usage.

11kV and low voltage distribution network covers limited area.

The followings issues are also identified.

- Reinforcement of power generator capacity especially medium or low speed type DEG.
- Expansion of distribution network for both 11kV and LV system to eastern and southern Malakal Town and areas in the east of the Ring Road.
- Utilization of solar power generation.
- System improvement of tariff collection.
- Operation and maintenance of power plants and networks.

### 8.8.2 Urgent Issues

#### (1) Energy cost is too high for households.

1. The energy supply is unstable due to unreliable or restricted logistics.
2. There is a fuel oil shortage in DEG operation, therefore operation of DEG has to be limited to only during night time (7 pm to 5 am, 10 hours maximum). All consumers in Malakal have their own generators with fuel that is not economical.
3. Engineers and staff who can operate and maintain diesel DEGs and manage the power station are lacking.
4. The capacity of power generation is also insufficient. Three DEGs are under installation now.
5. Spare parts for annual maintenance of existing diesel engine generators are also insufficient.



Own Generators in Market

Source: JICA Project Team



←Left  
New DEG



Right →  
Old DEG with  
No-spare parts

Own Generators in Water Treatment Plant

#### Photo 8.8-1 Privately Owned Generators

- The followings are also observed as urgent issues. Reinforcement of maintenance work of the existing diesel engine generator (DEG).
- Reinforcement of operation and maintenance work of DEGs and management of power station.

### **8.8.3 Consideration for the Comprehensive Plan**

#### **(1) Relation to the Social Economic Infrastructure Development**

In line with the future population forecast and a city area formation, the Comprehensive Plan should cover the new development district located on the east side of the Ring Road for 2022.

#### **(2) Cooperation Work with Other Sectors**

The development of a power supply requires the infrastructure of other sectors. On roads, it is necessary to secure some spaces for electrical poles and distribution transformers. Maintenance of the power distribution facilities also requires well-conditioned roads to maintain access throughout the year, including roads in the new development area in the east of Ring Road. The fuel for the generators is transported from Juba by the River Nile. The maintenance of the port facility and improvement of cargo handling capacity is, therefore, necessary.

#### **(3) Application to the Comprehensive Plan**

The transportation of fuel for the generators is conducted through the Nile River. This basic transportation pattern will not be greatly changed before 2022 due to economic and road conditions. Moreover, the instability of fuel procurement may also continue due to the political instability against the neighbouring countries and the oil price, even if the port and fuel storage are improved. Accordingly the introduction of eco-friendly solar energy is recommended.

In addition, improvement of the power network shall include a plan for a new power station corresponding to the forecasted electricity demand, so that the network maintains flexibility and capacity of power supply.

#### Energy

The capacity development(CD) areas for the power sub-sector are: 1) basic data collection and future prediction for planning, 2) designing and construction of facilities, 3) Operation and Maintenance (O&M) of facilities, 4) theft prevention patrol and tariff collection. Especially regarding 1), the operational staff have to study the basic data collection (max power output, power use, Gross Domestic Products(GDP) growth rate, electrification rate, estimation of load rate of each transformers and electricity cables, power flow analysis, and short-circuit capacity calculation), to analyse them, and to predict future electricity demands.

## **8.9 ENERGY SECTOR DEVELOPMENT PLAN**

### **8.9.1 Objectives of Energy Sector**

To secure the needed power supply capacity for 2022, the capacity of generation facilities and service networks should be improved by 2018. The target coverage of power distribution for households will be 35% in 2022 for Malakal Town against 28% of the current coverage,

including the new development areas.

According to Electricity Section under Public Utilities Department in the MoPI&RD, the vision of the Ministry is to provide sufficient, efficient, and reliable infrastructure (roads, water, electricity, markets, etc.) and systems of vital service delivery, progressive economic development and high living standards of the citizens. It should be respected in the Comprehensive Plan.

Essentially the electric power generation system in Malakal Town is dependant on DEG. However, it is difficult to secure stable electricity generation due to fuel shortages. Therefore, supporting/substitutive system for DEG is necessary. Utilization of solar energy is recommended for the supporting/substitutive system.

#### **(1) Electricity Infrastructure Provision as a Profitable Business**

Electricity supply is eagerly requested by the residents in Malakal Town. According to the household survey results as a part of Town Profiling Survey, the power supply is the second most important requirement following the water supply for improving items for living conditions. Accordingly, it is categorized as one of urgent requirements for development.

However, the power supply service should be provided on a basis of profitable business. To achieve such a purpose, the management ability shall be improved as an independent business.

#### **(2) Service through Local Power Supply System**

Although national power supply grid is planned, it is taking a long time for Malakal Town to be integrated with the national grid. Therefore, the local power supply system shall be improved by 2022 to cover Malakal Town.

#### **(3) Securing Substitutive Energy**

The current situation of depending on only diesel oil for generation is not stable, due to the instability of transport and the cost of the fuel. A pilot project utilizing substitutive energy resource shall be introduced to enhance the self-supportive system. Such a pilot project shall be initiated by the public agency (utilizing public facilities).

#### **(4) Capacity Development (C)D**

Training and capacity development is needed in the following areas: Technical Standards and Design Criteria of Facilities, the Inspection Guideline/Manuals, Annual Inspection Plan, the Tariff Collection System, etc.

### **8.9.2 Power Demand Forecast**



The result of the demand survey by the JICA Project Team, following basic data were confirmed.

Population:	153,000 (2012)	241,000 (2022)
Total household:	20,400 (2012)	32,100 (2022)
Electrified household:	5,739 (2012)	11,235 (2022) (=32,100 x 35%)

(Current electrified rate: 28%, it is not low, compared with other African countries).

**Table 8.9-1** and **Table 8.9-2** show the estimated power demand.

**Table 8.9-1 Estimated Power Demand under Existing Situation as of April, 2012**

Consumer Category	kVA	No. of Consumer	kVA/Unit
Domestic	3,600	5,739 Houses	0.6kVA/House
Small Commercial	600	1 lot	600kVA/lot
Government	1,700	1 lot	1,700kVA/ lot
<b>Total</b>	<b>5,900</b>		

Source: JICA Project Team

**Table 8.9-2 Power Demand Forecast**

Consumer Category	Unit Rate	Present	Estimated
		2012	2022
Domestic ( ) indicates the number of household connected.	0.6kVA/H	3,600kVA (5,739)	6,741kVA (11,235)
Small Commercial	600kVA	600kVA	977kVA
Government	1700kVA	1,700kVA	1,700kVA
<b>Total</b>		<b>5,900kVA</b>	<b>9,418kVA</b>

Source: JICA Project Team

Accordingly, the estimated peak demand is approximately 9MVA in 2022.

### 8.9.3 Energy Sector Plan

#### (1) Source of Power

The types of power generation to be considered as candidates are “thermal power” and “substitutive solar power”, which are described below.

##### Thermal Power

The thermal power generation is the only system currently used in UNS. The introduced type is a DEG system. Other thermal systems such as the conventional type (boiler and steam turbine), gas turbine and combined cycle power plants have not been introduced. Steam turbines and gas turbines should be operated under high rotation speed, high temperature and high pressure, and require advanced technology for operating and maintaining the machinery. It is, therefore, difficult to introduce it quickly to UNS. It will take a long period for engineering staff in UNS to familiarize themselves with such systems. The DEG is the only type of thermal power plant, which can be applicable to UNS at present. Accordingly, it is recommended that DEG be adopted for the Comprehensive Plan.

Heavy fuel oil DEG system, which operates in low-speed (less than 150 rpm) or middle-speed

(less than 750 rpm), will be suitable for the base and middle load power plants. However, the package type DEG, which operates in high-speed (less than 1,500 rpm at prime condition), will be suitable for peaking plants. According to those characteristics, the candidates of thermal power plants are planned.

### Solar Power Generating System

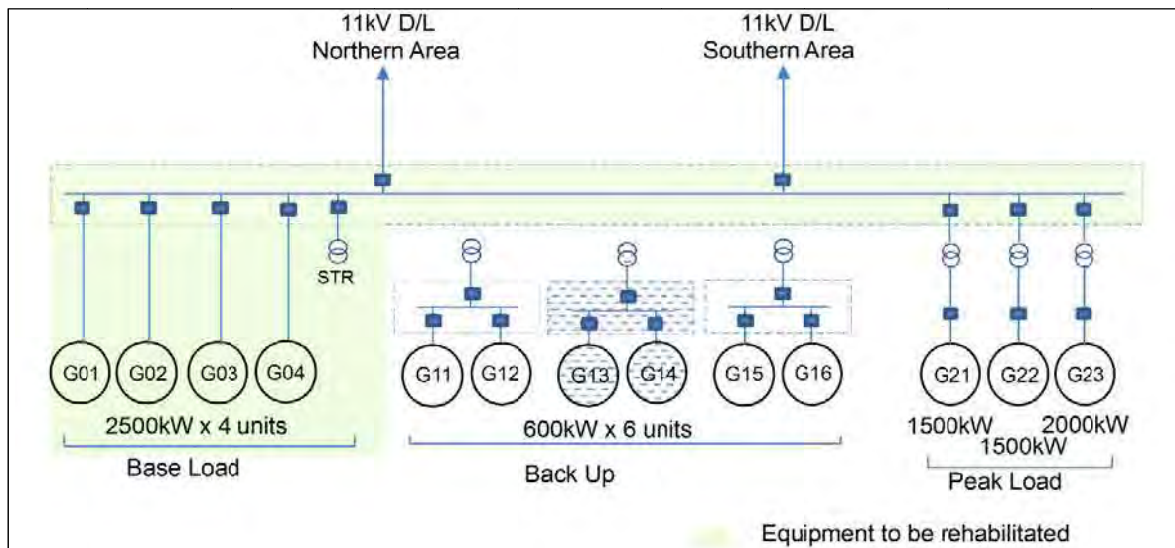
The solar system can be utilized in and around Malakal Town. It is an eco-friendly system. It is worth introducing the solar power generating system for specific purposes. It is recommended starting from a pilot project. In Juba, solar power street lights have been already introduced. It will be worthwhile to install street lights by solar energy in Malakal Town.

## (2) Power Generation Plan

It is necessary for EC-Malakal to secure the enough fuel for the generator and consumable spare part of the existing DEG Malakal Town, so that the existing generators are capable for scheduled operation. Nevertheless, additional generators are necessary to meet the future power demand for 2022.

The following generation systems are proposed for Malakal power station:

- Main generators: four (4) sets of 2,500kW for base load. Three (3) DEGs for operation and one (1) for standby.
- Existing three (3) generators (5,000kW): to be utilized for peak load.
- Existing six (6) generators (3600kW): to be utilized for back up.



Source: JICA Project Team

**Figure 8.9-1 Key Single Line Diagram of Planned Malakal DEG Power Station**

## (3) 11kV Distribution Network Plan

Malakal Town was electrified in the era of the Republic of Sudan. Most of residents living in the electrified area have some electrical equipment in their houses. However, the power supply

condition is not sufficient for the residents and the main reason is the unstable operation of power generation from the Malakal Power station.

The 11kV distribution network is relatively well maintained. However, it should be expanded to cover the new urban development area in the east of Ring Road. The location of poles and transformers in the planned development area shall be decided in detail after a detailed road construction plan is produced.

#### **(4) Tariff of Electricity**

Current tariff income is not sufficient for activities on operation and maintenance. On the other hand, customers do not have enough willingness and capacity to pay higher tariff due to insufficient power distribution services and low financial capability. A period until 2022 is a time to develop awareness of people on convenience and effectiveness of electric power. To do so, the current tariff rate is recommended to be continued until enough development of liability and stable power supply are realized.

- Domestic Consumer: SSP0.5/kWh
- Small Commercial: SSP0.7/kWh
- Government: SSP0.8/kWh

### **8.10 ENERGY SECTOR PROJECT**

#### **(1) Rehabilitation of Power Station (EN-1)**

Objectives: To prepare DEGs for sufficient capacities

Location: The existing power station in the north western area of Malakal Town.

The project consists of the following components:

- DEGs: 2.5MW (2,500kW) x 4 sets, medium speed, continuous operation mode.
- Power house for the above DEGs.
- Fuel storage tanks (600m<sup>3</sup> x 2 sets) and fuel unloading system.
- Mechanical and electrical auxiliary system.
- OJT for operation and maintenance.

The number of staff members in the generation department is insufficient. Although the Malakal power station is currently operated in the night time only, it should be operated for 24 hours in 2022. Accordingly, necessary staff members should be added to operate and maintain the new DEGs sets (2.5MW x 4 sets).

#### **(2) Expansion of 11kV Distribution Network (EN-2)**

Objectives: To expand covering area of electricity service

Location of the Project: Northern and southern area of Malakal Town

The project consists of the following components:

- Distribution poles
- Pole fitting materials
- Aluminium conductor
- Distribution transformers

### **(3) Solar Power Pilot Project (EN-3)**

Objectives: To alleviate the burden on the DEG.  
To prepare substitutive power source.

Location: Streets of Malakal Town

Project components :

Installation of street lights with solar energy in Malakal Town



Source: JICA Project Team

**Photo 8.10-1 Solar Power Lighting**

## **8.11 IDENTIFIED CD NEEDS FOR ENERGY SECTOR**

Identified CD needs for Energy Sector related to the proposed projects are presented in **Table 8.11-1**. Following trainings were provided in the course of the Project for capacity development of the MoPI&RD and other departments: 1) GIS training/AutoCAD Training; 2) English documentation training/IT skill training; 3) Accounting training; and 4) Project Management Training. (See the detail in **Chapter 15**.)

**Table 8.11-1 Capacity Development Logframe (Energy Sector)**

(As of August 2012)

Area	CD items	Individual	Organization	Institution	Target	Urgent Project	Technical Cooperation	Training in OECD countries	Training in neighboring countries	WS/Training in South Sudan
Energy	Plan and design of facilities for generation and distribution	Basic data collection for future prediction: maximum power output and power use, GDP growth rate, electrification rate, etc.. Estimation of load rate of each transformer and electricity cable Power flow analysis short-circuit capacity calculation Making policies Statistics Feasibility of used materials and equipment	To organize the planning division To allocate human resources To enhance coordination with other sectors	To establish state power sector development plan based on the national strategy and the estimation of socio-economic development of UNS To establish the power sector development plan within Malakal city To plan and allocate budget needed to implement the plans To strengthen the collaboration between MoPI&RD and NEC	MoPI&RD Malakal City Council NEC		✓	✓		
	Construction, extension and rehabilitation of facilities	Design Construction supervision Inspection	To organize the division of construction supervision To organize the training system of engineers	To establish technical standards and design criteria	MoPI&RD Malakal City Council NEC			✓		
	O&M of facilities and equipment	Operation Method Daily inspection Periodical inspection Management of consumables Making, revising and management of reports (plant register, diagram of distribution system, operation report, maintenance report) Making power generation plan Fuel management	To organize the division of O&M To allocate human resources To manage allocated budget To make a training plan	To establish the inspection guideline/manuals To make an annual inspection plan	NEC		✓	✓		✓
	Tariff collection	People's awareness raising about tariff Community mobilization Theft prevention patrol	To organize the division of tariff collection To allocate human resources To train tariff collectors To set up tariff rates	To develop the tariff collection system (including the introduction of tariff meters)	NEC			✓		

Source: JICA Project Team

## **CHAPTER 9 SEWAGE AND SANITATION**

In this chapter, the following perspectives regarding the Sewage and Sanitation Sector are presented and analysed; 1) Institutional Framework, 2) Policies and Strategies, 3) Financial Resources, 4) The Operation and Maintenance System, 5) Facilities and Staffing, 6) Findings from Relevant Survey(s), 7) Programmes and Projects, and 8) Needs and Issues. And then in section 9) development plans are formulated based on the present situation, needs and issues, and in 10) projects are proposed from a technical point of view.

### **9.1 INSTITUTIONAL FRAMEWORK**

Sanitation is one of the most serious issues in local areas including Malakal Town, where more than 80% of residents are obliged to have open defecation. The Ministry of Water Resources and Irrigation (MOWRI), Republic of South Sudan (ROSS), which has a funding channel with foreign donors, plays a central role in development of sanitation infrastructures, formulation of legal and institutional framework for sanitation improvement, and promotion of hygiene campaigns to local citizens.

In addition, Director of Community & Public Health of the Ministry of Health (MOH), ROSS, plays a central role, especially for planning public health. The roles of Director of Community & Public Health of MOH are as follows;

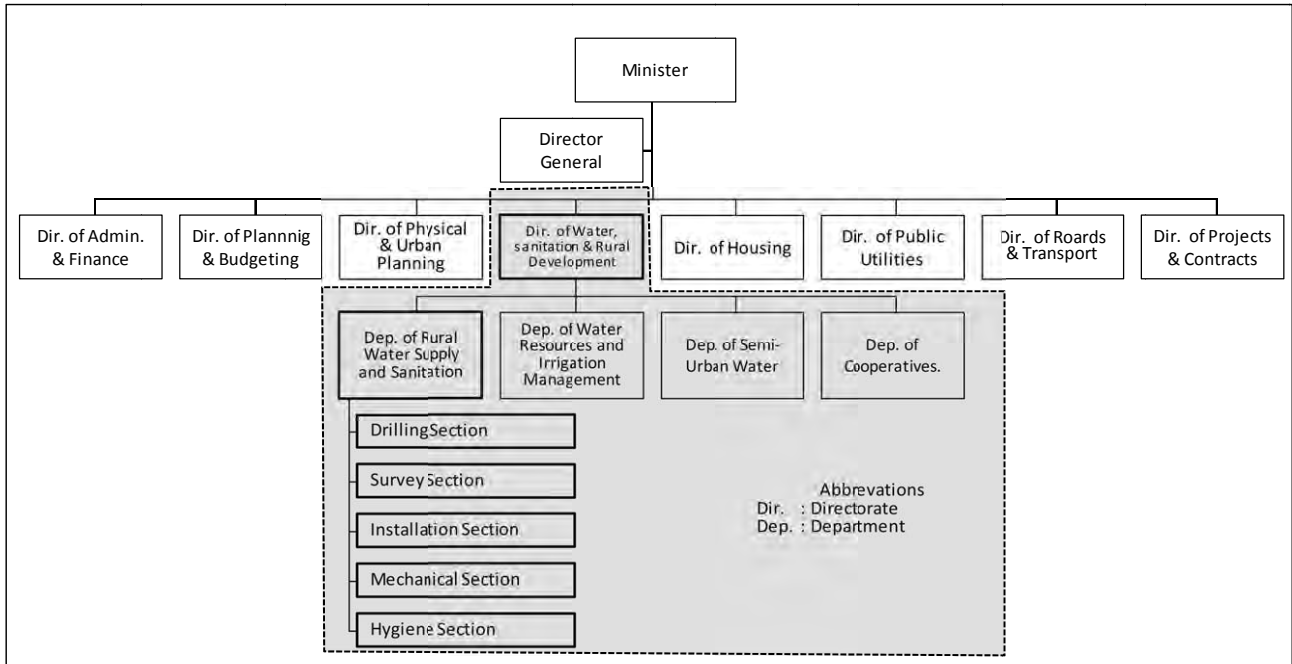
- (i) Management of all aspects of public health and sanitation including planning and budget allocation.
- (ii) Emergency response to infectious disease.
- (iii) Monitoring infectious disease or endemic disease.
- (iv) Hygiene promotion for improvement of sanitary condition.

Although the central government is responsible for the allocation of a budget to the UNS (Upper Nile State), it has not been disbursed to UNS. Currently, the budget allocation for UNS is made within the budget of the state. UNS is financially less reliant on the central government at the present time.

The Directorate of Water Sanitation and Rural Development (DWSRD) in State Ministry of Physical Planning and Rural Development, UNS (MoPI\$RD) is in charge of providing sanitation services to the residents in UNS. The organization chart of DWSRD is shown in **Figure 9.1-1**.

The roles of DWSRD are as follows;

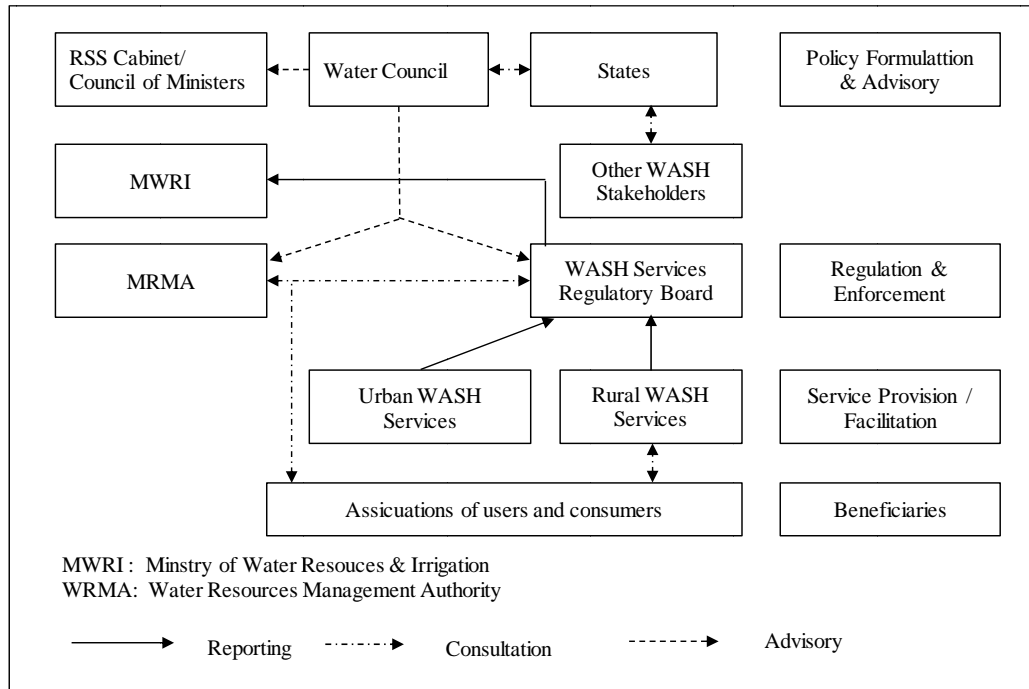
- (i) Management of all aspects of water supply and sanitation matters.
- (ii) Assistance in policy development and leading the implementation of water projects in the State.
- (iii) Assessment and updating of water sector infrastructure development needs.
- (iv) Assistance in support activities in coordination with other county support teams.



Source: MoPI&RD, UNS

**Figure 9.1-1 Organization Structure of DWSRD in MoPI&RD**

It is important to clarify the responsibilities of relevant agencies for a set of works including budget allocation, proposal, advisory, approval and supervision. The institutional framework of related agencies in the sanitation field in ROSS as proposed by MOWRI is shown in **Figure 9.1-2**.



Source: Rural WASH-sector Action Planning Workshop, Juba, 23-25 May 2012

**Figure 9.1-2 Institutional Framework of Related Agencies in Sanitation Field in ROSS**

## 9.2 POLICIES AND STRATEGIES

The Policies of Rural Water Supply and Sanitation (RWSS) and Urban Water Supply and Sanitation (UWSS) described in the Water Policy 2007 are shown below;

### Policy of RWSS

The overall goal of RWSS policy is to improve access to safe water supply and sanitation facilities and to promote hygiene education for all people living in rural areas of ROSS.

### Policy of UWSS

The overall goal of UWSS policy is to ensure efficient development and management of UWSS services on a sustainable and equitable basis.

According to the Millennium Development Goals (MDGs), the number of people who do not have access to improved sanitation facilities to be decreased by half by 2015 as ratified in the world in 2000. Following Millennium Development Goals (MDGs), the central government announced South Sudan Development Plan 2011 – 2013 (SSDP) and set targets for coverage of sanitation facility in urban and rural area as shown in **Table 9.2-1**.

**Table 9.2-1 Coverage of Improved Sanitation Facility (Target Value)**

Year	2010	2013
Urban Area (%)	36.8	42
Rural Area (%)	9.3	15

Source: South Sudan Development Plan 2011 – 2013

Following theSSDP, MOWRI supports state governments and local municipalities in the planning and construction of sanitation facilities in communities and schools, enhancing the capacities of related staff, formulating institutional framework and promoting hygiene campaign etc.

Meanwhile, the NGOs directly support local organizations such as the state governments, city councils and communities which are faced with serious sanitation issues.

## 9.3 FINANCIAL RESOURCES

The budget of UNS government (on the basis of 2011/12 budget) for water and sanitation sector is shown in **Table 9.3-1**.

**Table 9.3-1 Budget for Water and Sanitation in UNS (2011/12)**

	Staff Number	Budget (South Sudan Pounds:SSP)			
		Salaries	Operating	Capital	Total
MoPI&RD	655	3,394,657	470,864	20,730,630	24,596,151
Dir. Water Sanitation & Rural Development	159 (24% of total MoPI&RD staff)	598,115	67,266	0	665,381 (2.7% of MoPI&RD budget)

Source: MoPI&RD, UNS

Most of the budget in UNS is allocated to road sector in this fiscal year and only some US\$3 million (equivalent to approximately 3% of all state budgets) is allocated to water and sanitation



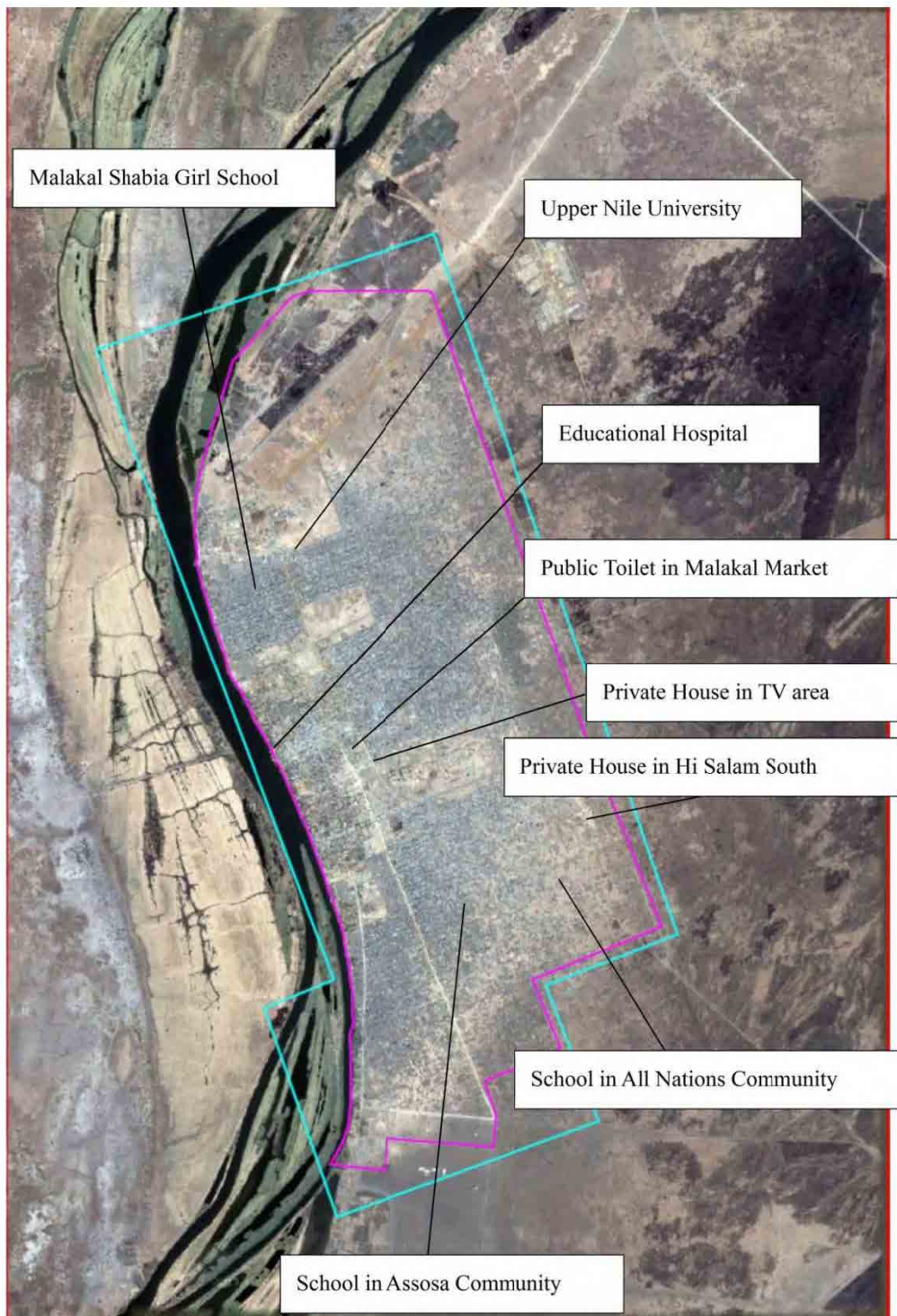
sector. The table above shows that UNS cannot cope with the serious sanitation issues in the project area using only its allocated budget.

## **9.4 OPERATION AND MAINTENANCE SYSTEM**

The JICA Project Team visited public toilets and sanitation facilities in households, schools and hospitals to verify the current sanitary condition in Malakal Town. The location of surveyed facilities is shown in **Figure 9.4-1**. Based on the survey results, the current sanitary conditions in Malakal Town are summarized below.

### **9.4.1 Outline of Sanitation Facilities**

Most people do not have any appropriate toilets and they make open defecation. Piped water is not supplied in most parts of the town. There is no sewerage system because there is too little amount of discharged wastewater to operate it. Sludge is withdrawn from public toilet by vacuum truck and is transported and discharged into dump site approximately 5km away from town.



Source: JICA Project Team

**Figure 9.4-1** Locations Surveyed on Sanitary Condition in Malakal Town

#### 9.4.2 Sanitation Facilities of Household

Household and sanitation facilities surveyed are shown in **Photo 9.4-1**.



Household (Standard class) in El Salam South



Household (relatively high class) in Hai Television area  
(Photo shows private toilet)

Source: JICA Project Team

### Photo 9.4-1 Condition of Household and Sanitation Facilities Surveyed

Sanitary conditions of general household are as follows.

- More than 30% of household do not have appropriate toilets and they make open defecation.
- There are very few pour flush toilets and pit latrines which don't use water are widely adopted.
- Households with own toilets use water bought from donkey carts for washing toilet.
- Pits for sludge have a very simple structure made of earth bricks. Sludge is withdrawn by vacuum truck once in several months. The charge is approximately SSP500 for one time.

### 9.4.3 Sanitation Facilities in School

The condition of surveyed toilets at primary or secondary schools is shown in **Photo 9.4-2**.



Primary School Toilet in All Nation



Primary School Toilet in Assossa



Secondary School Toilet in Shabia Girl Nation



Inside Toilet in Shabia Girl Nation

Source: JICA Project Team

### Photo 9.4-2 Condition of Surveyed School Toilets

Condition of school toilets is discussed below:

- Most of primary or secondary schools have toilets funded by development partners; however some schools don't have any toilets.
- The number of toilets installed is not enough and doesn't meet the demand of all students.
- There are few pour flush toilets and pit latrines not using water are widely used.
- Water is bought from donkey cart at a cost of SSP2 per 20 litres. United Nations Children's Fund (UNICEF) or ARC (NGO) grants disinfectants for washing hands and drinking.
- Toilets are donated by UNICEF in 40 schools.

#### **9.4.4 Public Toilets**

Public toilets surveyed are shown in **Photo 9.4-3**.



Public Toilets at Malakal Market



Public Toilets at Tarawa Market

Source: JICA Project Team

#### **Photo 9.4-3 Public Toilets**

The conditions of public toilet are described below;

Public toilets in Malakal Town are currently operated and maintained by Makal County Office. Public toilets are donated by CARE (NGO). Two toilets were installed at each site of Malakal Market, Terawa Market, Dengershufu Market and Malakia Market in 2009. Public toilets operating at present are one toilet in Malakal Market, one toilet in Terawa Market and one toilet in Dengershufu Market. Public toilets in Malakia Market were removed for road construction. One public toilet has 4 seats. All toilets adopt pit latrine which doesn't use water. Pit for sludge has a very simple structure of fabricated bricks with the dimension of  $\phi 2.4\text{m} \times 5\text{m}$  height. Construction cost for public toilets at one site is approximately US\$15,000 (as of 2009 price index).

Financial balance of public toilets per one site and per one month is shown in **Table 9.4-1**. The table means that public toilets can be financially managed only if saving accounts are kept with transparency.



**Table 9.4-1 Financial Balance of Public Toilet (Per One Site and Per One Month)**

(As of October 2013)

		Planned Condition	Current Condition
Information From		CARE Office	Malakal County Office*
Income	User Charge	SSP1/time×100time/day× 30days=SSP3,000	SSP2/time×100times/day or more× 30days=SSP6,000 or more
	Sub Total	SSP3,000	SSP6,000 or more
Expense	Salary for Labour	2 person×SSP10/day× 30days=SSP600	2 persons×SSP10/day 30days=SSP600
	Costs for Withdrawing Sludge	SSP500/time× 1time/month=SSP500	SSP350/time×1time/month=SSP350
	Sub Total	SSP1,100	SSP950
Balance		SSP1,900	SSP5,050 or more

Note: \* Information is based on the verbal answer by the person in charge of county office because financial record is not submitted.

Source: JICA Project Team

According to MoH and related person in CARE, they considered that SSP1 or SSP2 for one time as user fee is not so expensive and most of people in town have willing to pay.

#### Sanitation Facilities at Major Institutions



Upper Nile University

(Photo shows septic tank in the University)

Source: JICA Project Team



Teaching Hospital

(Photo shows toilet in the hospital)

**Photo 9.4-4 Sanitation Facilities in Major Institutions**

#### **9.4.5 Sanitation Facilities in Main Institutions**

Major institutions such as universities or hospitals have own water purification plants and many toilets have showers. Pour flush toilets are adopted, but approximately half of the toilets cannot be used because of lack of management. Institutions do not have any wastewater treatment facilities to collect and treat all wastewater generated from the facilities. However some pits to store wastewater are provided near the facilities. Wastewater stored in pits is regularly withdrawn by worker hired by the institution and transported to and discharged into dump site away from the town.

#### **9.4.6 Condition of Vacuum Truck**

Vacuum truck operated by self-owned business is shown in **Photo 9.4-5**.



Source: JICA Project Team

**Photo 9.4-5 Vacuum Truck for Withdrawing Sludge**

Big institutions such as universities or hospitals and large private hotels in town own vacuum trucks for their own use and sludge generated is withdrawn and discharged into dump sites designated by Malakal Town. Sludge generated from household or public toilets are assigned to individual companies registered in Malakal Town for withdrawal and disposal at a cost of SSP250 per 4m<sup>3</sup> of sludge. Four individual companies are registered in Malakal Town at present.

### **9.5 FACILITIES AND STAFFING**

Facilities for disposal of human waste, such as a night-soil treatment plant, are not available in Malakal at the time of the surveys. As described earlier, only some main facilities store wastewater which is regularly withdrawn by a worker hired by the institution and transported to and discharged into dump site away from the town.

### **9.6 FINDINGS FROM RELEVANT SURVEY(S)**

#### **9.6.1 Household Survey Results**

The household survey conducted as a part of Town Profile Survey inquired about the condition of toilet.

##### **(1) Toilet Type**

89% of households do not use public toilets. Most toilets are of the non-flush type. The highest proportion type is a private toilet in the yard at 61%, followed by open defecation at 30%. Use of the public toilets or house toilet is limited. Treatment methods for on-site toilets are septic tank (44.8%) and on-site vault only (31.1%) followed by on-site vault and soak.

**Table 9.6-1 Use of Public Toilet**

(As of January 2013)

Use of Public Toilet	Number	%
Yes	18	11.3%
No	141	88.7%
Total	159	100.0%

Source: Town Profile Survey, JICA Project Team

**Table 9.6-2 Type of Toilet Used and Flush/Non-flush Type**

(As of January 2013)

Type of Toilet	Use or not			Flush/non-flush		
	Use	Not use	Total	Flush	Non-flush	Total
(In number)						
Public Toilet	18	141	159	6	79	85
Private toilet in the yard	257	45	302	18	118	136
Private toilet in the house	18	118	136	5	74	79
Open defecation	128	96	224	-	-	-

Source: Town Profile Survey, JICA Project Team

**Table 9.6-3 Treatment Method for On-site Toilet**

(As of January 2013)

Treatment Method for On-site Toilet	Number	%
On-site septic tank	173	44.8%
On site vault only	120	31.1%
On site vault and soak	46	11.9%
Off-site connection with sewer pipe	47	12.2%
Total	386	100.0%

Source: Town Profile Survey, JICA Project Team

## (2) Removing Sludge

The median of the expenditure of household is in the range from SSP20 to 30.

**Table 9.6-4 Frequency of Removing Sludge**

(As of January 2013)

Frequency of Removing Sludge	Number	%
Less than once	45	14.4%
Once a year	40	12.8%
Twice a year	100	32.1%
Three times a year	94	30.1%
Four times a year	26	8.3%
More than four times a year	7	2.2%
Total	312	100.0%

Source: Town Profile Survey, JICA Project Team

**Table 9.6-5 Expenditure on Sludge Removal**

(As of January 2013)

Expenditure on Sludge Removal	Number	%
No money spent	30	11.9%
Up to SSP10 a month	9	3.6%
Up to SSP20 a month	39	15.5%
Up to SSP30 a month	62	24.6%
Up to SSP40 a month	46	18.3%
More than SSP40 a month	66	26.2%
Total	252	100.0%

Source: Town Profile Survey, JICA Project Team

### (3) Residents' Opinion on Toilet

Those dissatisfied with the present sanitation condition account for 48%, while those satisfied are 6%. "Neutral" could mean something like "acceptable" or "are able to manage". It does not necessarily mean no need for improvement. As for the issues which households feel are water shortage for flush toilet and long distance to the toilet.

**Table 9.6-6 Issues with Toilet**

(As of August 2012)

Problem with Toilet	Number	%
The distance between house and toilet is too far	45	9.2%
Available water volume for flush toilet is too little and unstable	66	13.5%
Total sample number	490	-

Source: Town Profile Survey, JICA Project Team

## 9.7 PROGRAMMES AND PROJECTS

As described in **Section 9.3**, it is difficult to implement projects in water and sanitation sector in UNS with the state budget alone. Hence, projects implemented by local governments in UNS in the water and sanitation sector need to be supported by central government including MOWRI together with foreign development partners.

The projects regarding urban and rural sanitation implemented by the state government with the support of the central government are shown in **Table 9.7-1**.

The central government plans to invest approximately US\$440 million for urban sanitation in local cities and approximately US\$280 million for rural sanitation, with construction of sanitation facilities, public awareness, and hygiene promotion etc. during 2011 to 2013. Projects described in **Table 9.7-1** are for towns or communities in ROSS including Malakal Town.

Unfortunately, personnel in the MoPI&RD are not provided with detailed information of on-going projects being implemented by central government except for a part of projects such as Feasibility Study (FS) for sludge treatment facilities using oxidation ponds. Apart from projects budgeted by central government, several NGOs also support the sanitation sector in UNS and Malakal Town.

The main activities of NGOs and international organizations in Malakal Town are shown below;

#### CARE SOUTH SUDAN

Construct public toilets and conduct hygiene education at schools in Malakal Town. Approximately EUR 1 to 2 million annually for sanitation sector of Malakal Town.

#### UNICEF

Construct school toilets and promote hygiene education in Malakal Town. Approximately US\$12 million annually for sanitation sector of the whole ROSS (including budget for local authorities through central government). Other NGOs such as Red Cross Society, World Vision, PACT and Oxfam also support the sanitation sector in Malakal Town.



**Table 9.7-1 Projects Regarding Urban and Rural Sanitation Conducted by Local Government with Support of the Central Government**

Projects	Organization Executed	2011 – 2013 Budget (SSP)
<b>1. Sector of Urban Sanitation</b>		
Carrying out feasibility studies for the construction of oxidation ponds, landfill sites	MDTF*1, MOWRI, States	1,050,000
Needs assessment and capacity building for urban sanitation cadres at ROSS and State level	MOWRI, States	2,500,000
Scaling up of sanitation activities in the state capitals and other major towns (construction of oxidation ponds, landfill sites, provision of vacuum tankers etc.)	MOWRI, States	80,000,000
Establishment of a legal, institutional and regulatory framework for urban sanitation, incl. consultation with States for sanitation management	MOWRI, States	4,500,000
Establishment of management structures and supply chains for operation and maintenance of sanitation facilities	MOWRI, States	450,000
<b>Total</b>		<b>88,500,000</b>
<b>2. Sector of Rural Sanitation</b>		
Construction of public latrines in 10 towns to be managed by women and youth groups	MOWRI, States	450,000
Construct 200 institutional latrines in health centres, and schools	MDTF, UNICEF, BSF*2, MOWRI, States	5,373,000
Construct 3,689 household latrines	BSF, MOWRI, States	4,165,000
Training of WASH committees and hygiene promotion in communities and schools.	MDTF, BSF, UNICEF, GIZ*3, MOWRI, States	3,507,000
Scaling up improved sanitation through participatory approaches	MOWRI, States	35,000,000
Construct 200 institutional/public latrines	MOWRI, States	7,200,000
Training of WASH committees and hygiene promotion in communities and schools	MOWRI, States	1,800,000
<b>Total</b>		<b>57,495,000</b>

\*1 Multi-Donor Trust Fund, \*2 Basic Services Fund, \*3 Gesellschaft Fur Internationale Zusammenarbeit  
Source: South Sudan Development Plan 2011 – 2013

## 9.8 NEEDS AND ISSUES

Issues of the sewage and sanitation sector are shown in **Table 9.8-1**.

**Table 9.8-1 Issues on Sewage and Sanitation Sector**

(As of August 2012)

Issues
70 to 90% of people in Malakal Town are doing open defecation. Cholera, typhoid, shigella, infectious hepatitis etc. are widespread because excrement containing pathogen are not treated appropriately.
Sludge or excrements in the toilet are not treated appropriately.
Public toilets are not operated and managed properly.

Source: Town Profile Survey, JICA Project Team

### 9.8.1 General Issues

Issues of the sewer sector in Malakal Town are as follows:

- (i) Reduction of open defecation to minimize water born epidemics
- (ii) Appropriate treatment of sludge and excrements of the toilet
- (iii) Proper operation and management of public toilets

## **9.8.2 Considerations for the Comprehensive Plan**

### **(1) Relationship to the Social Economic Infrastructure Development**

Target area for sanitation facilities plan shall be decided in consideration of urban expansion. The sanitation facility plan shall cover the new urban development area to be developed by 2022 to the east of the Ring Road. Discussions on the construction of a sludge treatment facility shall be made together for other urban facilities, land use, etc. Hopefully, consensus can be established among the stakeholders to avoid residents' conflicts.

### **(2) Cooperation with Other Sectors**

Development of sanitation facilities has a close relation with water supply since the water is necessary for hand washing and flushing toilets. In addition, poor road conditions cause difficulties for sludge transport by vacuum trucks. Therefore, the construction of sludge treatment facilities shall be geared to the schedule of road construction and water supply systems.

### **(3) Application to the Comprehensive Plan**

A committee shall be established in each community so that public toilets can be operated and maintained appropriately in a self-supportive manner. Hygiene education activities shall be conducted to improve the public awareness for problem of open sludge dumping. Sludge treatment facilities shall be constructed at a site, where little impact is expected on the surrounding environment and people. In the mentioned background, the sewer project shall be conducted to develop the capacity for planning, design, and operation of facilities and the promotion of public hygiene awareness.

## **9.9 SEWAGE AND SANITATION SECTOR DEVELOPMENT PLAN**

### **9.9.1 Objectives of the Sewage and Sanitation Sector**

The targets for the engineering design of sanitation facilities by 2022 is shown below:

- (i) Improved sanitation facilities such as the ventilated improved pit (VIP) latrine and pour flush (PF) toilets will be installed to cover of 90% or more population in Malakal Town.
- (ii) Toilets which meet the demand of all students, will be installed in schools.
- (iii) Public toilets will be promoted in Malakal Town. The public toilets and toilets in institutions such as schools will cover 40% or more population in Malakal Town.
- (iv) Water supply development to achieve the water treatment capacity of 11,000m<sup>3</sup>/day is scheduled to be completed in 2017. VIP latrines will therefore be installed before 2018. After 2018, PF toilets will be widely spread. VIP latrines will continue to be, installed in the area to the east of the Ring Road, where the piped water supply will not be provided before 2022.

- (v) A unit of PF toilets will be installed with a specific tank. Chemicals for disinfection will be added into the septic tanks to kill infectious bacteria so effluents of the septic tanks can be discharged into drains until completion of the sewerage system. This allowed it to be removed from residential spaces promptly.
- (vi) Sludge generated in public toilets and/or private toilets will be withdrawn by vacuum trucks and transported to a sludge treatment site. At least, one sludge treatment plant will be constructed near Malakal Town although two sludge treatment plants are desirable for emergency cases.
- (vii) Hand washing water will be provided at all public toilets so that users make their hands clean. In addition, to reduce the cost of water use, storage tanks will be also installed to allow the use of rainwater as service water.

### **9.9.2 Strategy for Sewage and Sanitation Sector**

The following strategies should be taken in order to prevent the spread of infectious disease and improvement of sanitary condition:

- (i) Basically, on-site sanitation such as septic tank will be adopted as the treatment of human wastes. The construction cost of an off-site sanitation system such as sewerage is too high in consideration of the present budgetary conditions of UNS Malakal Town.
- (ii) Public toilets will be widely adopted to increase the coverage of sanitation facilities so that a lot of people can use hygienically cleaned toilets at lower cost.
- (iii) A capacity development project will be conducted for public sanitation and hygiene educations to promote appropriate removal/treatment of night soil which is generated by VIP latrine and PF toilet.
- (iv) A capacity development project will be conducted for waste water treatment, and O&M together with construction of sanitation facilities.

The following points should be considered for sewerage system improvement in the next master plan stage targeting “after 2022”:

- (i) Land acquisition for sewage treatment site

The site for sewage treatment shall be selected at a place where all of collected sewage can be transported by gravity or fewer numbers of pumps. In addition, a site shall be selected at a place having no land issues that lead to complaints from local people.

- (ii) Method of sewage transportation

The topography of Malakal city and the surrounding area is flat. Therefore it is difficult to transport the sewage by natural gravity. A pumped system should be considered. Efficient electricity supply would be required in parallel to the sewerage development.

- (iii) Cost recovery

The willingness to pay for each household for sewerage wastewater treatment should be surveyed.

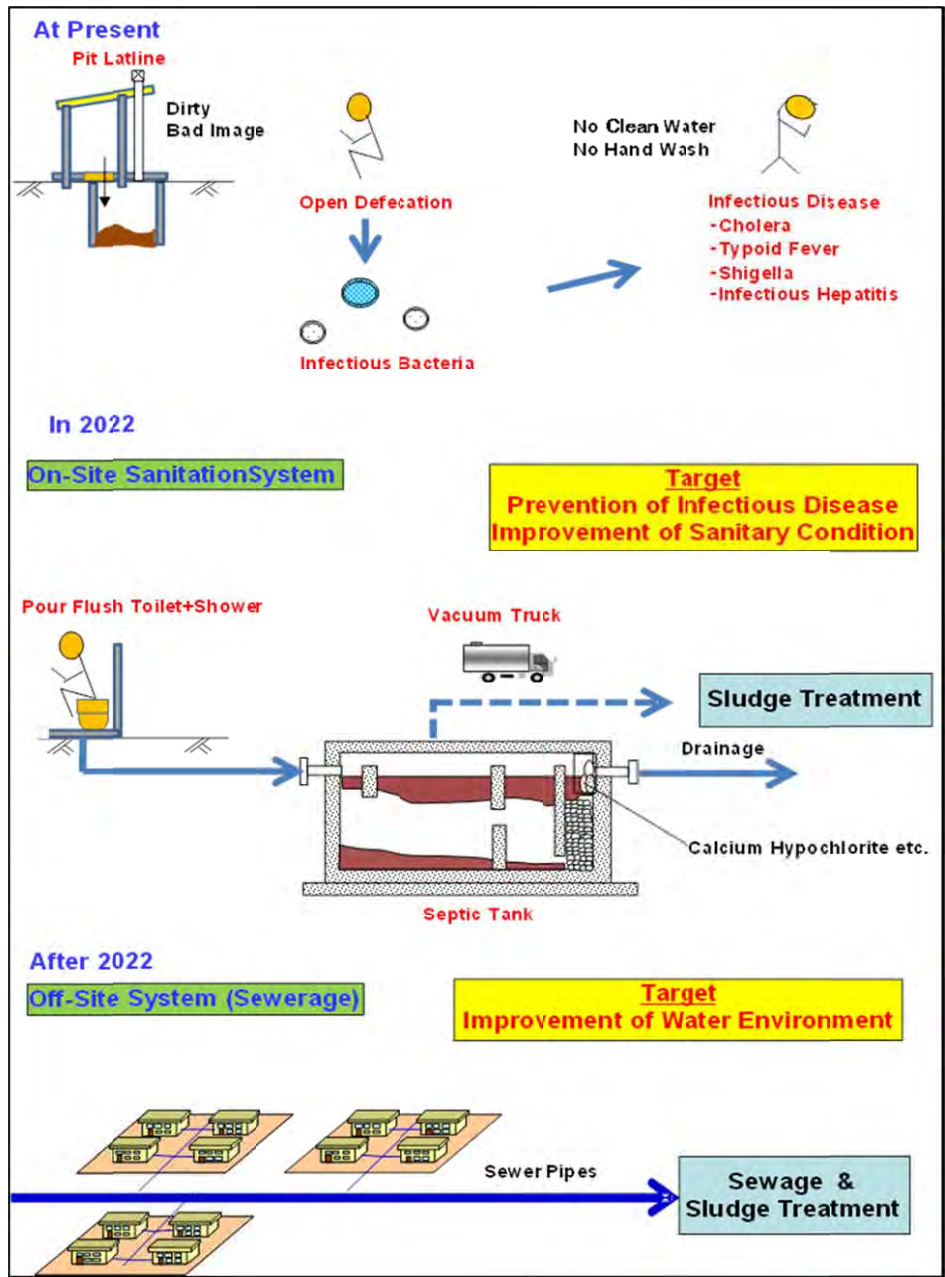
In addition, the financial sustainability for independent operation shall be confirmed before the sewerage introduction. It is required that the collected tariffs cover the O&M cost such as electricity and fuel.

(iv) Capacity Development(CD)

Training and capacity development is needed in the following areas: An Annual Plan for Construction of Public Toilet, Operation & Maintenance (O&M) System of Public Toilets, etc.

**9.9.3 Sewer Development Plan**

Schematic concept of the Comprehensive Plan for sewage and sanitation is shown in **Figure 9.9-1**.



Source: JICA Project Team

**Figure 9.9-1 Schematic Concept of Comprehensive Plan for Sewage and Sanitation**

The following components are to be provided and managed by administrative agencies to achieve the above mentioned targets by 2022:

- (i) Public toilets.
- (ii) Vacuum trucks for withdrawing sludge from toilets in households and public toilets.
- (iii) Sludge treatment facilities, which appropriately treat the collected sludge.

The required number and specifications of public toilets, vacuum trucks, and sludge treatment facilities incorporated in the comprehensive plan for 2022 are shown below.

**(1) Public Toilet**

The target population to be covered by toilets is 90% by 2022. Toward 2022, installation of a toilet in private houses should be promoted. The target for private toilets is 50% coverage by 2022 among the 90%. The remaining 40% should be covered by public toilets. The precondition to calculate the required number of public toilet is shown in **Table 9.9-1**.

**Table 9.9-1 Precondition**

(As of October 2013)

Item	Conditions	Remarks
Coverage ratio of private toilet and public toilet in 2022	50 and 40% respectively	-
Number of seats for 1 public toilet	4 seats	-
Number of use of 1 seat per 1 day	50 times /seat/ day	5 times per hour per 1 seat or less on average at the 12 hours operation

Source: JICA Project Team

The coverage ratios and population covered by private and public toilets are shown in **Table 9.9-2** and followings are the key points:

- (i) Connection of a house water service may be necessary for a PF toilet, because it requires more water than VIP latrines for toilet flushing. According to the plan for connection of water supply, 5% of houses will be covered by PF toilets.
- (ii) In the other 45% of houses will be, therefore, installed VIP latrines.
- (iii) Public toilets to be developed before 2018 should be VIP latrines type because it is before the water supply development. Therefore, it means that the half of the planned public toilets (20%) is VIP latrines type.
- (iv) Dissemination of PF type for public toilets should be accelerated in 2018 or later because of the developed water supply system. The other half (20%) of public toilets will be, therefore, in PF type.

The public toilets should be developed by administrative agencies and/or institutions such as schools. The necessary number of the public toilets to be developed has been calculated, based on the precondition described in **Table 9.9-1** and **Table 9.9-2** as shown below.

Required number of VIP latrine type public toilets:

$$48,200 \text{ pop.} / (4 \text{ seats/toilet} \times 50 \text{ times /seat/ day}) = 241 \text{ toilets}$$

Required number of PF type public toilets:

$$48,200 \text{ pop.} / (4 \text{ seats/toilet} \times 50 \text{ times /seat/ day}) = 241 \text{ toilets}$$

The required number of public toilets by 2022 is 482 toilets (4 seats type) in total. O&M system should be also established along each toilet construction. Furthermore, it is recommended installing the half of public toilets in institutions such as schools to serve children and students.

**Table 9.9-2 Population by Type of Toilet**

(As of October 2013)

Location	Type of Toilet <sup>1</sup>	2008		2022	
		Coverage Ratio (%)	Population (Pop.)	Coverage Ratio (%)	Population (Pop.)
Private House	VIP	10	11,453	45	108,450
	PF	0	0	5	12,050
Public Toilet	VIP	10	11,453	20	48,200
	PF	0	0	20	48,200
Total		20	22,906	90	216,900 <sup>2</sup>

Note: 1: VIP and PF mean ventilated improved pit (VIP) latrine and pour flush (PF) toilets, respectively.

2: 90% of forecast population in 2022

Source: JICA Project Team

## (2) Vacuum Truck

Vacuum trucks should collect the sludge from both private and public toilets. The preconditions to calculate the required number of vacuum trucks is show in **Table 9.9-3**. Contracting-out to local companies is one of options for procurement and O&M of the vacuum trucks.

**Table 9.9-3 Precondition for Calculating Required Number of Vacuum Trucks**

(As of October 2013)

Items	Condition	Remarks
Total population in 2022	241,000pop.	Based on the prediction
Coverage ratio of VIP toilets in 2022	65% <sup>*1</sup>	Target value of comprehensive plan in 2022
Coverage ratio of PF toilets in 2022	25% <sup>*1</sup>	Target value of comprehensive plan in 2022
Sludge generation per capita for VIP toilets	0.5l/capita/day <sup>*2</sup>	It may be less than those of from PF toilet because soaking out is expected.
Sludge generation per capita for PF toilets	1l/capita/day <sup>*2</sup>	
Number of trip to sludge treatment site per 1 day	2 times/day	Based on site survey
Volume of vacuum truck	4m <sup>3</sup>	Based on site survey

\*1 Coverage ratio includes both private toilet and public toilets.

\*2 "Guideline for Low-Cost Sewerage System in Developing Countries", August 2004, Infrastructure Development Institute-Japan

Source: JICA Project Team

Based on the precondition described in **Table 9.9-3**, the generated / collected sludge volume and required number of vacuum trucks are calculated as shown below;

$$\text{Sludge volume generated from VIP toilets: } 241,000\text{pop.} \times 65\% \times 0.0005\text{m}^3/\text{pers./day} = 79\text{m}^3/\text{day}$$

$$\text{Sludge volume generated from PF toilets: } 241,000\text{pop.} \times 25\% \times 0.001\text{m}^3/\text{pers./day} = 61\text{m}^3/\text{day}$$

$$\text{Total generated volume: } 79\text{m}^3/\text{day} + 61\text{m}^3/\text{day} = 140\text{m}^3/\text{day}$$

$$\text{Required number of vacuum truck: } 140\text{m}^3/\text{day} / 2 \text{ times/day} / 4\text{m}^3/\text{truck} = 18 \text{ trucks}$$

### (3) Sludge Treatment Facilities

Sludge treatment facilities should be constructed to treat sludge collected from toilets in private houses and public toilets. The oxidation pond process, which reduces the fecal bacteria with little operating power, will be adopted as the sludge treatment facilities. A schematic flow sheet of sludge treatment facilities is shown in **Figure 9.9-2**. 140m<sup>3</sup>/day is the necessary capacity for treatment. An outline specification and general layout for sludge treatment facilities are shown in **Figure 9.9-3** and **Table 9.9-4**.

**Table 9.9-4 Outline of Sludge Treatment Facilities (Capacity 140m<sup>3</sup>/day)**

(As of October 2013)

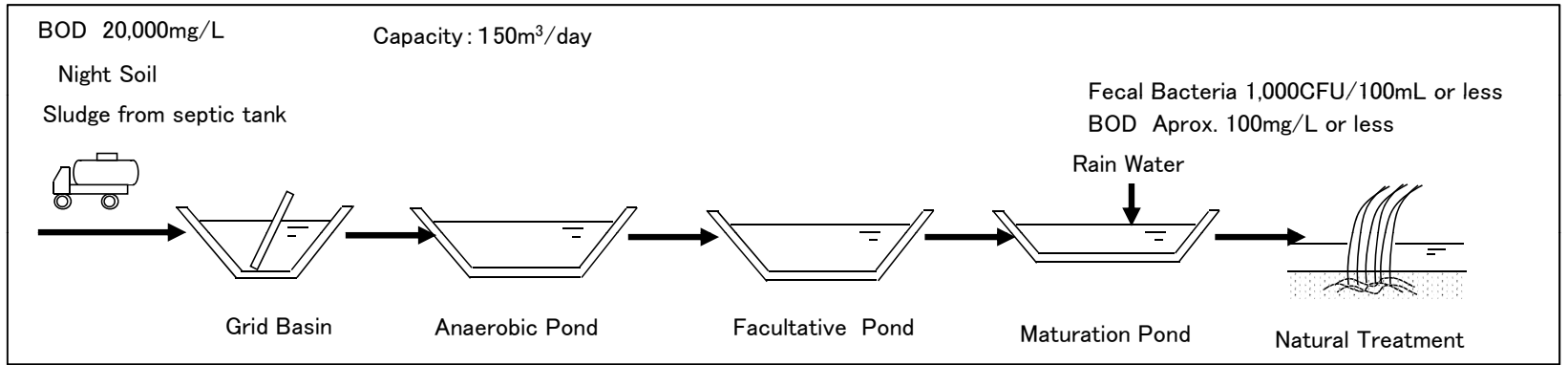
Pond / Tank	Specifications	Volume (m <sup>3</sup> )	RT (day)
Grid Basin (Screen Chamber)	5m×5m×1.5mH×2basin	75	0.5
Anaerobic Pond	32m×32m×1.5mH×2basin	3,070	21.9
Facultative Pond	32m×32m×1.5mH×2basin	3,070	21.9
1 <sup>st</sup> Maturation Pond	32m×32m×1.0mH×2basin	2,040	14.6
2 <sup>nd</sup> Maturation Pond	32m×32m×1.0mH×2basin	2,040	14.6
3 <sup>rd</sup> Maturation Pond	32m×32m×1.0mH×2basin	2,040	14.6
4 <sup>th</sup> Maturation Pond	32m×32m×1.0mH×2basin	2,040	14.6
Total			102.7
Pond / Tank	10mW×10mL×1mH×1 Pond	100	

Note: 1: RT: Retention time

Source: JICA Project Team

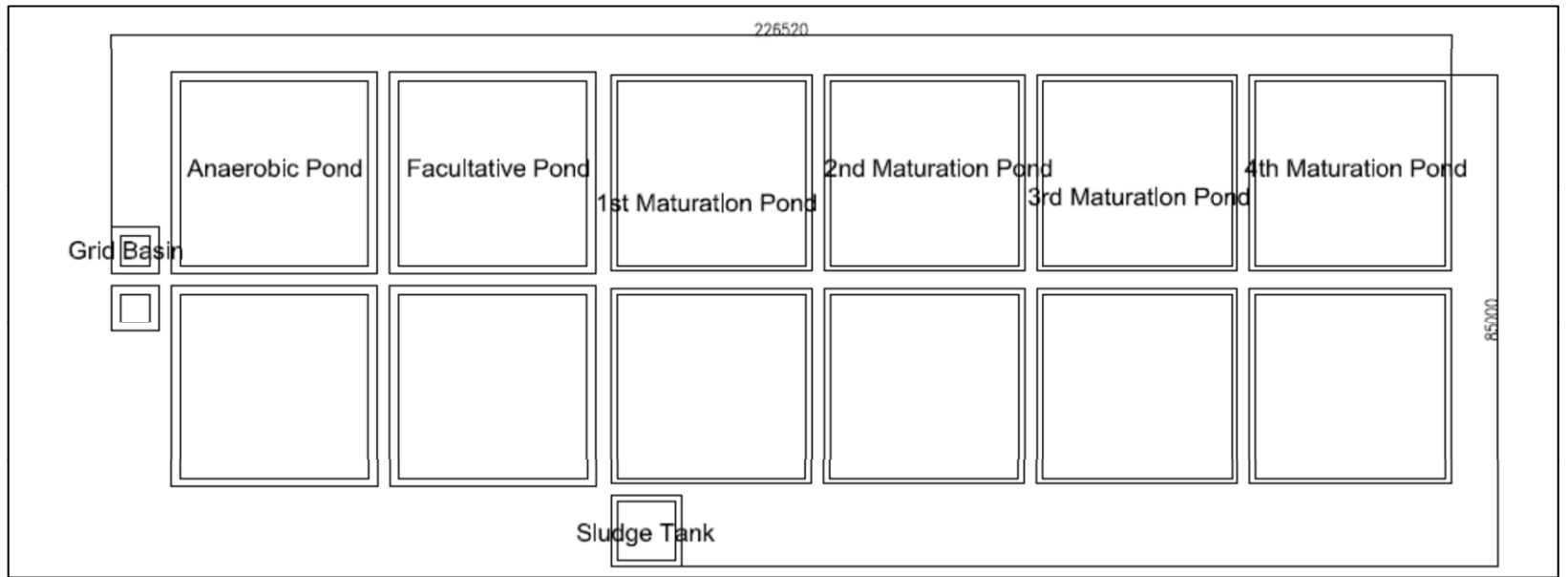
The location of the sludge treatment facilities is not decided at present. Land of approximately 2.5ha (250m x 100m) should be acquired near the Nile River or swamp to construct as these are easier points to discharge the treated water.

Following the development of private and public toilets as well as procurement of vacuum trucks, the collected volume of sludge will be increased. This increase will start earlier than the completion of the sludge treatment facilities. It is recommended, therefore, to construct a temporary anaerobic pond during the construction of the permanent sludge treatment facilities. It should be installed separately from the permanent treatment line, however it is recommended to be located in the same yard. 50m<sup>3</sup> of capacity may be required for the temporary anaerobic pond. However, it should be decided according to progress of the toilets improvement and the procurement of vacuum trucks.



Source: JICA Project Team

**Figure 9.9-2 Schematic Flow Sheet of Sludge Treatment Facilities**



Source: JICA Project Team

**Figure 9.9-3 General Layout of Sludge Treatment Facilities**



## **9.10 SEWAGE AND SANITATION SECTOR PROJECT**

### **9.10.1 Proposed Projects**

The following are proposed to be undertaken by 2022.

- (i) Community Sanitary System and Public Toilet Installation (SS-1)
- (ii) Construction of Sludge Treatment Facilities (SS-2)
- (iii) Technical Project for Toilet Operation and Maintenance (SS-3)
- (iv) Project for Improving Sanitary Environment in Malakal Town (SS-4)

Deployment of public health workers in public health centres, holding community health meeting, immunization and preventive health care, etc., 2014 – 2020

- (v) Public Toilet Operation and Maintenance Project (SS-5)

Hygiene education, establishment of community public toilet maintenance committee, accounting capability development, etc., 2018 – 2022

### **9.10.2 Details of the Projects**

#### **(1) Community Sanitary System and Public Toilet Installation Project (SS-1)**

Although some of public toilets and school toilets have been funded by NGOs, the number of toilets is insufficient and many of the toilets are not operated and managed appropriately. Following measures are necessary to improve the living standards and hygiene condition of residents:

- Construction of 482 public toilets, including public toilet in institution such as schools (241 in VIP latrine type and 241 in PF type). Rehabilitation work for some of the toilets installed in 2008 among 482 public toilets is included.
- Provision of 18 vacuum trucks.

482 public toilets, including ones to be constructed in institutions, will be provided by 2022 in Malakal Town. In order to keep the proper maintenance of public toilets, public toilet committees shall be separately established by each of the communities, as well as water committees for public taps. It will be exclusive for each public toilet and different from the aforementioned “Responsible Agency for Public Sanitation Service in Malakal Town”.

The committees shall be directed/monitored by the aforementioned public health management section, regarding tariff collection and O&M. Each committee shall have the members shown in **Table 9.10-1**. However, in case of public toilets in the institution the staffing and employment are recommended to be managed by the institution.

**Table 9.10-1 Proposed Member of Public Toilet Committee**

Position	Role
Committee Member (Chairperson)	• Management / supervision for overall service
Committee Member (Finance)	• Management of collected tariff and finance for O&M as well as cash book
Committee Employee (Care-Taker: O&M and tariff collecting)	• Daily works for collection of tariff • Daily works for maintenance of public toilet

Source: JICA Project Team

**(a) Responsible Agency for Public Sanitation Service in Malakal Town**

Assuming that all staff members are directly employed by Malakal Town Council, the wage will be estimated at SSP39,000 per month as shown in **Table 9.10-2**. The cost of “Public Health Management” and “Accounting” sections are recommended to be borne by the general budget for public employees. The cost for “O&M of Sludge Treatment” is recommended, however, to be borne by collected tariff since it is a good candidate to be privatized after proper introduction of the sludge management system.

The running cost has been calculated for SSP234 thousand per month including the cost of “O&M of sludge Treatment” as shown in **Table 9.10-3**. The mentioned running cost is converted to a unit cost for SSP56 per m<sup>3</sup> as follows:

Cost per month:	SSP233,875/month
Volume of generated sludge:	140m <sup>3</sup> /day x 30days = 4,200m <sup>3</sup> /month
Unit cost for sludge management:	SSP233,875 / 4,200m <sup>3</sup> = SSP56/m <sup>3</sup>

**Table 9.10-2 Estimated Wage for Responsible Agency for Public Sanitation**

(As of October 2013)

Section	Number	Unit Cost	Cost per month
		SSP/month	SSP/month
Public Health Management	2	3,000	6,000
O&M of Sludge Treatment			
O&M of Sludge Treatment Facilities	2	1,500	3,000
O&M of vacuum truck	18	1,500	27,000
Accounting	1	3,000	3,000
Total	23		39,000

Source: JICA Project Team

**Table 9.10-3 Estimated Running Cost for Sludge Management**

(As of October 2013)

Item	Cost per Month
	SSP/month
1. Vacuum Truck	
a. Fuel Cost	
18trucks×5l/day ×30 days×SSP10/l=SSP27,000	27,000
b. Depreciation and Maintenance Cost (Initial Cost ×5% per year)	
SSP750,000 ×18 trucks ×5% ×1/12=SSP56,250	56,250
2. Sludge Treatment Facilities	
a. Deprecation and Maintenance Cost (Initial Cost ×10% per year)	
SSP14,475,000 ×10% ×1/12=SSP120,625	120,625
3. Wage for O&M of Sludge Treatment	
a. O&M of Sludge Treatment Facilities	3,000
b. O&M of vacuum truck	27,000
Total	233,875

Source: JICA Project Team

## (b) Public Toilet Committee

For the private toilets, daily management such as cleaning and flushing will be conducted by each owner of houses/toilets. However, communal management will be required for the public toilets. The management cost for O&M should be borne by users (residents in community) through the public toilet committee. Necessary cost for one location (4 seats) is estimated at SSP1,132 (VIP latrine) and SSP1,616 (PF toilet) per month. The cost includes the wage of Care-Taker although ones for leading members (Chairperson and Finance) are excluded. In this comprehensive plan, voluntary works are expected for leading members.

**Table 9.10-4 Estimated Running Cost for One Location of Public Toilet (VIP Latrine)**

(As of October 2013)

Item	Cost per Month
	SSP/month
1. Wage for Labour 1 Persons × SSP20/day ×30 days=SSP600	600
2. Cost for Washing Hand and Cleaning (Water Tariff) SSP1/day (equivalent to 0.3m <sup>3</sup> )×30 days = SSP30	30
3. Cost for Withdrawing Sludge (tariff of vacuum truck) 0.005m <sup>3</sup> /person/day ×200 times/day×30 days ×SSP56/m <sup>3</sup> <sup>1</sup>	168
4. Maintenance Cost (Construction Cost ×5% per annually) SSP80,000 ×5% ×1/12=SSP334	334
Total	1,132

Note 1: “200 persons” is an assumption for one location of public toilet.

Source: JICA Project Team

**Table 9.10-5 Estimated Running Cost for One Location of Public Toilet (PT Latrine)**

(As of October 2013)

Item	Cost per Month
	SSP/month
1. Wage for Labour 1 Persons × SSP20/day ×30 days=SSP600	600
2. Cost for Flushing Water (Water Tariff) SSP5/day (equivalent to 1.2m <sup>3</sup> )×30 days = SSP180	180
3. Cost for Withdrawing Sludge (tariff of vacuum truck) 0.001m <sup>3</sup> /person/day ×200 times/day×30 days ×SSP56/m <sup>3</sup> <sup>1</sup>	336
4. Maintenance Cost (Construction Cost ×5% per annually) SSP120,000 ×5% ×1/12=SSP500	500
Total	1,616

Note 1: “200 persons” is an assumption for one location of public toilet.

Source: JICA Project Team

The estimated costs, which are 1,132 SSP/month for VIP latrines and 1,616 SSP/month for PF toilets, will be converted into the unit cost per time as follows.

They are 0.18 SSP/time for VIP latrine use and 0.27 SSP/time for PF toilet use, respectively.

<VIP Latrine>

Average cost per month: 1,132 SSP/month for one location (4 seats)

Number of users: 200 persons/day (200 times use /day)

Converted to unit cost: 1,132SSP/ 30days/ 200 times

$$= 0.18 \text{ SSP/time}$$

<PF Toilet>

Average cost per month: 1,616 SSP/month for one location (4 seats)

Number of users: 200 persons/day (200 times use /day)

Converted to unit cost: 1,616SSP /30days /200 times

$$= 0.27 \text{ SSP/time}$$

### (c) Public Toilet

For the people, who are not able to have private toilets, the public toilets will be provided. Even if they use the public toilet, unit cost for sludge management is the same as that for private toilet. Moreover, they should bear the maintenance cost as well as depreciation cost, although the contribution to the construction investment is not necessary. It is found that it difficult to collect the tariff against toilet use at a high enough level to cover O&M. The unit cost for SSP0.18/time for VIP latrine use or SSP0.27/time for PF toilet use is too high to secure the people's willingness to pay.

In this background, it is recommended collecting SSP0.1/time for toilet use as the tariff for public toilet. In case of SSP0.1/time for the tariff, the income of public toilet will be SSP600 per month.

Income of public toilet (SSP/month) = SSP0.1/time x 200 time/day x 30 days

$$= \text{SSP600/month}$$

It is enough to cover the cost for care takers, which will be necessary for communities. The other cost such as water and sludge management cost should be subsidized from the general budget of the city council.

## (2) Construction of Sludge Treatment Facilities Project (SS-2)

The following measures are necessary to treat collected sludge appropriately:

- Construction of sludge treatment facilities with a capacity of 140m<sup>3</sup>/day.
- Construction of temporary anaerobic pond with 50m<sup>3</sup> of capacity.

### (a) Sludge Management

As aforementioned, the cost of sludge management is SSP56/m<sup>3</sup> for collection and treatment including O&M of vacuum trucks. The cost should be borne by owners of private toilets and public toilet committees. Moreover, it should be a base of tariff for sludge management. Under the following assumptions, an average tariff will be SSP8.4/family/month at the minimum.

Average unit generation of sludge (m<sup>3</sup>/person/day):

$$= ((65\% \times 0.0005 \text{ m}^3/\text{person/day} + 25\% \times 0.001 \text{ m}^3/\text{person/day})) / 90\%$$

$$= 0.00064 \text{ m}^3/\text{person/day}$$

Average tariff (base): SSP56/m<sup>3</sup>

Average unit generation of sludge:  $0.00064\text{m}^3/\text{person}/\text{day}$

Number of people in a household: 7.8 persons in one household

Converted to monthly tariff:  $0.00064\text{m}^3/\text{person}/\text{day} \times 7.8\text{persons} \times 30\text{days} \times \text{SSP}56/\text{m}^3$   
 $= 8.4 \text{ SSP}/\text{month}$

According to town profile survey, 29% of households have SSP1,000/family/month or more for the family income. More than 50% of households have SSP500/family/month or more as well. SSP8.4/month is approximately 1.7% of family income for the case of SSP500/family/month. It will be less than 1% for the case of SSP1,000/family/month. This price is supposed to be within a possible payable range for approximately 50% of people (on the higher income side). In other words, the half of population has capability to order a vacuum truck for their private toilets. Assuming the private toilet users are classified in the higher income side, they are judged to have the ability to afford sludge management as well as vacuum trucks.

### **(3) Technical Project for Toilet Operation and Maintenance (SS-3)**

Following measures are to improve the management capacity of the community sanitation system, public toilets and sludge collection:

- Establishment of responsible agency for public sanitation service in Malakal Town.
- Establishment of public toilet committees.
- Acceleration of toilet improvement/installation for private houses.

This project is similar to the operation and management improvement project in the water supply sector.

Malakal County Office is the responsible agency for monitoring public toilets to maintain their sustainability at present. The organization is, however, fragile and the accounts are not managed appropriately. It is one of the reasons why public toilets in Malakal Town are not maintained appropriately.

Meanwhile, Malakal Town is a responsible agency for registering private companies of vacuum trucks for Malakal Town. Accordingly, the two agencies play key roles for the public sanitation service in Malakal Town.

It is, therefore, recommended that an administratively and financially independent organization be established in Malakal Town Council to manage the whole public sanitation service. The recommended organization is shown in **Table 9.10-6**. The number of staff members and the cost for employees are proposed as shown in **Table 9.10-7**. As for the section for “O&M of Sludge Treatment, out-sourcing is one of the options for efficient management, especially for O&M of vacuum trucks.

### **(4) Project for Improving Sanitary Environment in Malakal Town (SS-4)**

Deployment of public health workers in public health centres, holding community health meeting,

immunization and preventive health care, etc.

**(5) Public Toilet Operation and Maintenance Project (SS-5)**

Hygiene education, establishment of community public toilet maintenance committee, accounting capability development, etc.

**Table 9.10-6 Proposed Organization in Malakal Town**

Section	Role
Public Health Management	<ul style="list-style-type: none"> <li>• Promote the toilets for private houses</li> <li>• Construction of public toilets and sludge treatment facilities.</li> <li>• Provision of vacuum trucks</li> <li>• Monitor the treatment of sludge</li> <li>• Monitor and support the public toilets</li> <li>• Monitor the sludge collection (operation of vacuum truck)</li> <li>• Register and monitor the companies of sludge collection (vacuum truck), if privatized.</li> <li>• Communicate with the central government or development partners regarding public sanitation service</li> </ul>
O&M of Sludge Treatment	<ul style="list-style-type: none"> <li>• Operate and maintain the sludge treatment facilities</li> <li>• Operate and maintain vacuum truck</li> </ul>
Accounting	<ul style="list-style-type: none"> <li>• Manage the income and expense for public toilets</li> <li>• Manage the income and expense for O&amp;M of sludge treatment facilities including vacuum truck</li> </ul>

Source: JICA Project Team

**Table 9.10-7 Staffing Plan for Operation and Maintenance for Malakal Town**

Section	Number of Staff Members
Public Health Management	2
O&M of Sludge Treatment	
O&M of Sludge Treatment Facilities	2
O&M of vacuum truck	18
Accounting	1
Total	23

Source: JICA Project Team

**9.11 IDENTIFIED CAPACITY DEVELOPMENT NEEDS FOR SEWAGE AND SANITATION SECTOR**

Identified capacity development (CD) needs for Sewage and Sanitation Sector related to the proposed projects are presented in **Table 9.11-1**.

A self-help O&M system is the most important CD area: The Comprehensive Plan comes up with building public toilets in both market area and residential area, and the rehabilitation of treatment facilities. The most important CD area in public toilet project is to train the staff and beneficiaries so as to activate a self-help O&M system. Staff are needed to develop either engineering skills or community development skills. Regarding the rehabilitation of treatment facilities project, staff are needed for training about the O&M of the facility.

As to the organizational level, it is recommended to establish a division of O&M for sanitation facilities and a division of sanitation facility tariff collection.

The following training are to be provided to the staff of the relevant departments including MoH under the Project for capacity development: 1) English documentation training/Information

Technology (IT) skill training; 3) Accounting training; and 4) Project Management Training. (See the detail in **Chapter 15**.)

**Table 9.11-1 Capacity Development Logframe (Sewage and Sanitation Sector)**

(As of August 2012)

Area	CD items	Individual	Organization	Institution	Target	Urgent Project	Technical Cooperation	Training in OECD countries	Training in neighboring countries	WS/Training in South Sudan
Sewage and Sanitation	Planning	Planning an annual action plan Monitoring the annual action plan Evaluation of the annual action plan Coordination among other organizations	Each stakeholder should a) organize the implementation structure in alignment with a plan b) allocate human resources c) manage allocated budget d) enhance the coordination among stakeholders	To establish mid-term and long-term sanitation sector development plans for Melaka Town To establish an annual plan in alignment with the plans To clarify the work (responsibility) demarcation among stakeholders (Malakal City Council, MWRI, SMoRI&RD, SMoH) To plan and allocate budget	MWRI SMoPI&RD SMoH Malakal City Council		✓	✓		✓
	Construction of sanitation facilities (public toilet, sludge treatment facilities, etc.)	Design Procurement Construction Supervision			Malakal City Council		✓	✓		✓
	O&M of public toilets	People's awareness (participation) raising on O&M of public toilets Maintenance (fixing) of facilities Supervision and monitoring of facility operation Prompt response to any accidents Budget planning Making policies	To organize a division of O&M of sanitation facilities To allocate human resources To develop the system to supervise/manage the activities conducted by contractors To manage allocated budget	To establish the O&M system of public toilets To clarify the work (responsibility) demarcation among stakeholders (Malakal City Council, MWRI, SMoRI&RD, SMoH) To establish an annual O&M plan To plan and allocate budget	MWRI SMoPI&RD SMoH Malakal City Council		✓	✓		✓
	Tariff collection system	People's awareness raising/educational activities Enhancement of community participation Tariff collection Budget management	To establish the system of tariff collection To establish the fine/penalty system	To review and reform the tariff system	Malakal City Council		✓	✓		✓
	O&M of sludge treatment facility	Repair/fixing skills of the facility Supervision and monitoring of facility operation Prompt response to any accidents Planning and allocation of budget Making policies	To organize a division of O&M of sanitation facilities To allocate human resources To develop the system to supervise/manage the activities conducted by contractors To manage allocated budget	To establish the O&M system of sludge treatment facility To clarify the work (responsibility) demarcation among stakeholders (Malakal City Council, MWRI, SMoRI&RD, SMoH) To establish an annual O&M plan To plan and allocate budget	Malakal City Council		✓	✓		✓

Source: JICA Project Team



## CHAPTER 10 STORM WATER DRAINAGE

In this chapter, the following perspectives regarding the Storm Water Drainage Sector are presented and analysed; 1) Institutional Framework, 2) Policies and Strategies, 3) Financial Resources, 4) The Operation and Maintenance System, 5) Facilities and Staffing, 6) Findings from Relevant Survey(s), 7) Programmes and Projects, and 8) Needs and Issues. And then in section, 9) development plans are formulated based on the present situation, needs and issues, and in 10) projects are proposed from a technical point of view.

### 10.1 INSTITUTIONAL FRAMEWORK

Most of the storm water facilities in Malakal Town are located at the roadside and are under the administration of State Ministry of Physical Planning and Rural Development, UNS (MoPI&RD). Cleaning of drainage facilities is sometimes implemented by Malakal Council as a part of town cleaning.

According to the document “Structure and Job Descriptions 2012, MoPI&RD”, the MoPI&RD has core directorates which are further sub-divided into departments. The planning, construction and maintenance of the storm water facilities belongs to the Roads and Bridges Department (RBD), under Directorate of Roads and Transport.

### 10.2 POLICIES AND STRATEGIES

In the South Sudan Development Plan 2011 – 2013 (SSDP) issued by the central government of Republic of South Sudan (ROSS) in August 2011, the following is stated as an economic development pillar objective for the infrastructure sector.

“To maintain, rehabilitate, provide and operate infrastructure to enhance poverty reduction, economic growth and service delivery in a sustainable manner.”

**Table 10.2-1** shows the targets of roads and road transport development pursued in the SSDP.

**Table 10.2-1 Target of Road Improvement**

Development Outcome Objective	Outcome Indicator	Target for 2013
Improved interstate, trunk and feeder roads routinely maintained on sustainable basis and road safety to enhance economic growth	Length of asphalted trunk road network under construction/completed Baseline: 0km	752km
	Length of constructed engineered roads Baseline: 363km of interstate and feeder roads constructed to engineered roads standard in 2010	2,000km
	Length of roads under maintenance with safety provision Baseline: 1750km of roads is under maintenance and safety provision.	4,500km

Source: South Sudan Development Plan 2011 – 2013, August 2011

According to the Policy Framework published on 10<sup>th</sup> September 2011 by MoPI&RD, the following policy objectives are stated for MoPI&RD in the road sector.

- (i) To construct roads to connect the state’s capital with the county capitals.
- (ii) To construct Malakal Internal Roads.
- (iii) To strengthen the capacity of the Directorate of Roads and Transport through staff recruitment & training.
- (iv) To provide the Directorate with some earth moving equipment so as to enable it to undertake urgent road maintenance, and carry out construction and annual grading of rural roads.

According to the interview with Roads and Bridges Department of MoPI&RD, their general strategy is as follows.

“To plan and implement the projects and maintain the facilities themselves after enhancing their abilities.”

In conclusion, policies and strategy, particularly for the storm water drainage sector do not exist in either MoPI&RD or ROSS. However through the rapid improvement of the road network as mentioned above, the roadside ditches which compose the drainage network of the town will be also improved.

### 10.3 FINANCIAL RESOURCES

**Table 10.3-1** shows the 2011/2012 budget estimates for MoPI&RD. Although the amount of capital for the Directorate of Roads and Transport is a large part of the total, this is due to the contracts for two large road projects implemented in Malakal Town. The allocation varies on a year by year basis according to the necessity and urgency for each directorate and the capital may be zero in some cases. Therefore, the total budget of MoPI&RD is regularly insufficient and it is necessary to ensure a stable budget.

**Table 10.3-1 2011/2012 Budget Estimates**

Agency	Number of Staff	2011/12 Budget (South Sudan Pounds: SSP)			
		Salaries	Operating	Capital	Total
MoPI&RD	655	3,394,657	470,864	20,730,630	24,596,151
Directorate of Roads and Transport	123 (19%)	523,815 (15%)	67,266 (14%)	15,944,845 (77%)	16,535,926 (67%)

Source: MoPI&RD, UNS

### 10.4 OPERATION AND MAINTENANCE SYSTEM

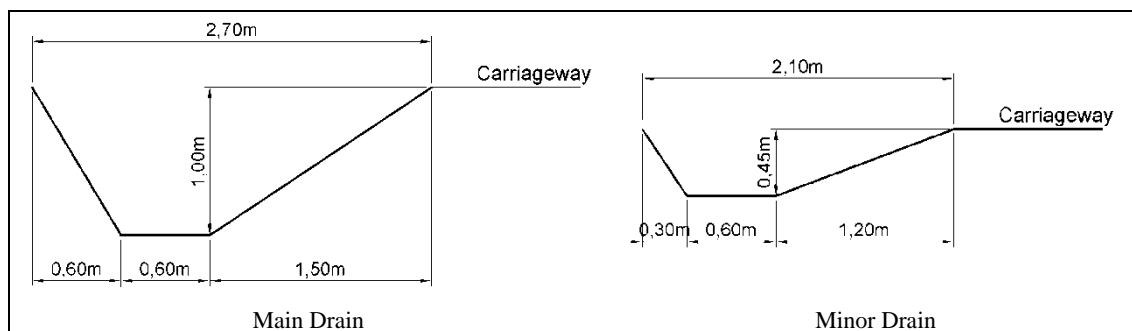
The storm water facilities are under the administration of the MoPI&RD. The Roads and Bridges Department (RBD), under Directorate of Roads and Transport is responsible for maintenance of the facilities together with planning and construction. However currently, the only maintenance of the storm water facilities is an occasion cleaning carried out by Malakal Council.

### 10.5 FACILITIES AND STAFFING

#### 10.5.1 Present Condition of Storm Water Drainage Facilities

Most existing storm water drainage facilities in Malakal Town are located along the roads, while

only a few of them are separated from roads. All of them are ditches without lining. According to the RBD of MoPI&RD, there are two types of ditch drain as shown in **Figure 10.5-1**.



Source: Result of interview survey to MoPI&RD by JICA Project Team

**Figure 10.5-1 Standard Cross Section**

As shown in **Figure 10.5-1**, the main drains flow east to west into the Nile River. There are 16 main drains in Malakal Town, either located along the roads or separate. The minor drains are side ditches which are constructed on both sides of all roads except where main drains exist.

The diagram shows typical cross sections which MoPI&RD intends to standardize, however not all existing drains conform to these shapes and sizes.

The storm water is generally collected by main drains through the network of minor drains and finally discharged into the Nile River. **Table 10.5-1** shows the list of existing culverts installed under the Shilluk Avenue that is main road running north and south along the Nile River. These culverts are final ones located just before 16 main drains outflow into the Nile River.

**Table 10.5-1 Existing Culverts under Shilluk Avenue**

(As of June 2012)

No	Location	Culvert			Remark
		Type	Size (m)	Num.	
1	Airport (veterinary)	Box	1.0 x 1.0	1	Under construction by Sinohydro
2	Hai El Saha, Thorat Malakia (Atillo Bridge), South of State Zoo	Box	1.0 x 1.0	1	Under construction by Sinohydro
3	Thorat Makakia (Jebriel Bridge)	Box	1.0 x 1.0	1	Under construction by Sinohydro
4	Egyptian Irrigation (North)	Slab Bridge	W = 1.0	1	Slab t = 20cm
5	Egyptian Irrigation (South)	Slab Bridge	W = 1.0	1	Slab t = 20cm
6	Ministry of Finance (South)	Box	1.5 x 1.5	1	
7	Presbyterian Church (South)	Box	1.0 x 0.4	1	Original Height =2m?*
8	MoPI&RD (North)	Box	0.9 x 0.4	1	
9	Police + Prison Headquarters.	Pipe	D = 1.0	1	
10	Education (South)	Pipe	D = 1.0	2	
11	State Garden (South)	Pipe	D = 0.7	1	
12	Amum	Pipe	D = 1.0	2	
13	Bum Neighbourhood (North)	Pipe	D = 1.0	1	
14	Jenub	Pipe	D = 1.0	1	
15	Dengershufu (South)	Pipe	D = 1.0	2	
16	Jonglei (South)	Pipe	D=1.0	1	

\*: Exact height was not measured due to sedimentation in the culvert. The height was estimated based on the interview to accompanying engineer from MoPI&RD.

Source: JICA Project Team

In order to improve the drainage situation in the town, a trunk drain (bottom width 2m, top width 6m, depth 2.5m) was constructed a few years ago along the Ring Road located on the east edge of the existing Malakal Town. However, since it is not connected to other drains, it is not working well. Moreover, a section at the south end does not continue towards the river and water between the crest and south end is stagnant.

(As of June 2012)



Main Drains



Culverts under Shilluk Avenue.6

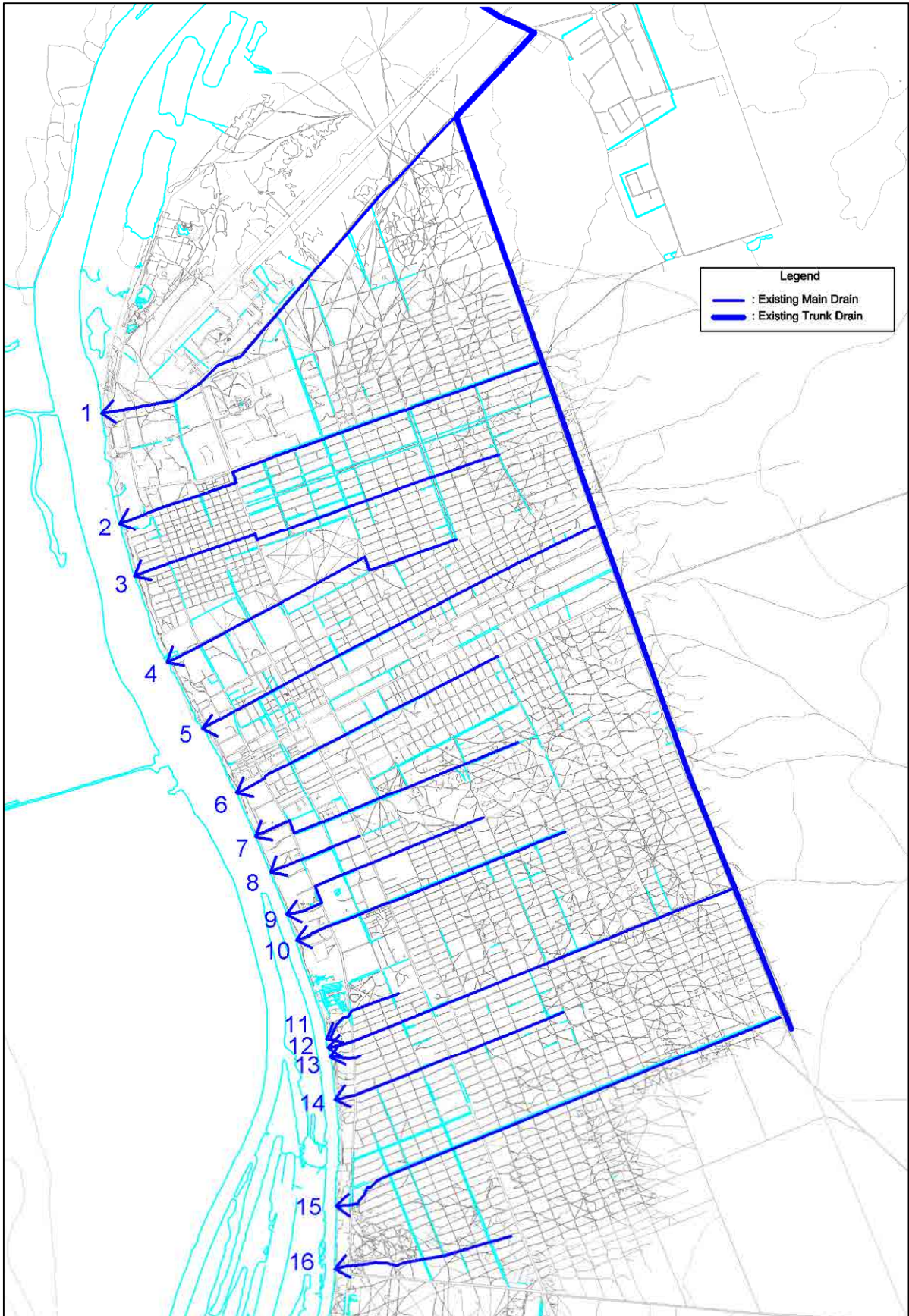


West End of Main Drains

Source: JICA Project Team

**Photo 10.5-1 Site Pictures of Existing Main Drains**





Source: JICA Project Team

**Figure 10.5-2 Existing Drainage Network**

## 10.6 FINDINGS FROM RELEVANT SURVEY(S)

### 10.6.1 Rainfall

According to the daily rainfall data for last 10 years provided by the Meteorological Service in Malakal Airport, the mean annual rainfall for the last 10 years is 736mm, and the monthly rainfall is concentrated in the rainy season which is from April to October as shown in **Figure 10.6-1**. On the other hand, the dry season from November to March has hardly any rainfall. The annual maximum daily rainfalls were recorded between June and August, and the maximum for last 10 years was 88.2mm per day.

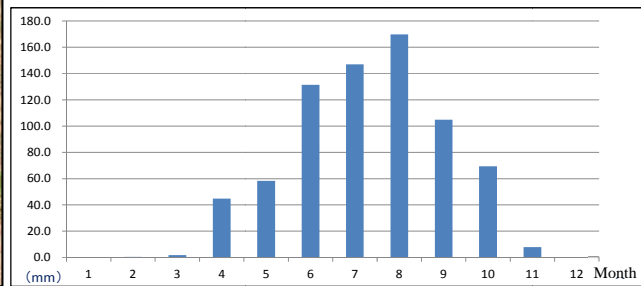
The rainfall intensity of such short duration requires drainage planning. As a result of the analysis, the following rainfall intensity shall be applied.

Rainfall Intensity (Return period: 5 years, Concentration time: 30 minutes): 45 mm/hour



Source: JICA Project Team

**Photo 10.6-1 Rain Gauge**



Source: Meteorological service in Malakal Airport

**Figure 10.6-1 Monthly Mean Rainfall**

### 10.6.2 Water Level of the Nile River

The water level of the Nile River is recorded everyday by the Egyptian Irrigation Office in Malakal Town. According to their data, minimum and maximum water levels for recorded periods are shown in **Table 10.6-1**.

Since the ground level of Malakal Town is approximately 392m, it is higher than the maximum water level for the last 100 years (389.592m for 1905 – 2012). This confirms that the Nile River (White Nile River) has never overflowed to Malakal Town situated on the east bank. Moreover, the fact that there is a few meters difference between high water levels of the river and ground level of the town means main drains can have an appropriate gradient towards the river, despite the town being almost flat.



Source: JICA Project Team

**Photo 10.6-2 Water Gauge**

**Table 10.6-1 Water Level of the Nile River**

Period	Min.	Max.
1905 – 1997	384.412m	389.592m
1999 – 2007	385.792m	388.192m
Sep 2009 – Jun 2012	385.572m	387.992m

Source: Egyptian Irrigation Office in Malakal Town

### 10.6.3 Flood Situation

When the rainy season arrives in Malakal, heavy rains of many hours duration occasionally occur. In such cases, many areas in the town are flooded. In particular, the roads covered by the black cotton soil become slippery, sticky and heavy, are soon rendered impassable. At the same time, the drainage network quickly fills with water, but the water is discharged rapidly into the river and water levels return to normal within several hours. However, because not all the existing drains have a constant fall toward the river, some of the water collected cannot be discharged completely, and remains stagnant in the drainage system.

The water collected in the residential areas and in some lots is drained into main drain through small trenches dug by residents. As described in the Road Transportation Sector, the most of the main roads in town are under construction by Sinohydro and Kano. However, some drainage construction work has been left unfinished, and results in more flooding than before the construction commenced.



Main Road in front of MoPI&RD



Community Road



Main Road under construction



Bus Terminal

Source: JICA Project Team

**Photo 10.6-3 Site Picture after Heavy Rain**



## 10.7 PROGRAMMES AND PROJECTS

Two projects funded by ROSS for the storm water drainage sector as part of roads construction projects are on-going as shown in **Table 10.7-1**. There is no project donated by foreign countries. Through these two projects, most of main roads in Malakal Town will be dramatically improved with asphalt pavement and side ditch.

**Table 10.7-1 Ongoing Projects**

(As of June 2012)

Client	Contractor	Target Road	Total Length	Pavement	Side Ditch
MoPI&RD	Sinohydro	3 east-west main roads 6 north-south main roads	Approx. 38km	Asphalt	U-shape 0.6m×0.6m
MoPI&RD	Kano	3 east-west main roads	Approx. 15km	Asphalt	Under design
		Rink Road	Approx. 8km	Asphalt	Under design

Source: MoPI&RD, UNS

## 10.8 NEEDS AND ISSUES

Through the site survey and interviews with MoPI&RD's staff, the issues of the storm water drainage sector have been found to be as follows.

### 10.8.1 General Issues

To resolve the serious issues of water stagnations in Malakal Town, the following are raised as urgent issues.

- (i) Drains should be designed and constructed based on the present and accurate topographic inclination.
- (ii) Drains should be systematically designed and implemented.
- (iii) The drainage system should be improved in conjunction with the road network improvement.

To secure the drainage network in Malakal Town over the long term, the following are raised as general issues.

- (i) Data of drainage facilities shall be prepared by MoPI&RD.
- (ii) Drainage budget shall be secured.
- (iii) Technical staff in charge of drainage system shall be fostered.
- (iv) Equipment including loaders and excavators shall be secured.

The institutional issues were identified as follows;

- (i) Inventory of drainage facilities is not prepared by the MoPI&RD.
- (ii) The annual budget for storm water drainage sector is unsteady. It is depends on the priorities among the other departments in the MoPI&RD.
- (iii) Although there are two on-going projects for road construction, the MoPI&RD is not supervising them sufficiently due to lack of staff with sufficient knowledge of drainage.

They rely on a consultant entrusted to the MoPI&RD on a contract basis as a supervisor and technical advisor for the MoPI&RD.

- (iv) Equipment is not enough in the MoPI&RD. Only one loader exists in RBD, and one excavator is in procurement. Moreover, transportation is not enough. Since there is only one pickup in RBD, it is difficult to visit the sites frequently.

### **10.8.2 Urgent Issues**

To minimize the frequent flooding in Malakal Town, the following current problems should be resolved as soon as possible.

- (i) Existing drains are excavated without any designs. Thus, there are some sagged sections where water is stagnant.
- (ii) Some culverts which should be installed in intersections are missing. Thus, collected water has nowhere to be drained.
- (iii) A South section of the trunk drain along the Ring Road is a dead end and not connected with the Nile River.
- (iv) The surfaces of all roads in town are covered by black cotton soil. They are easily eroded and flow to the drain. However, most of the main roads are now under reconstruction with asphalt pavement by Kano and Sinohydro, and this situation will be improved gradually.

### **10.8.3 Consideration for the Comprehensive Plan**

#### **(1) Relation to the Social Economic Infrastructure Development**

The targeted area for the drainage system shall cover the existing Malakal Town and the new development area located between the Ring Road and the Outer Ring Road. The open drainage system shall be applied and it shall be separated from sewerage system.

According to the estimated population growth and town development, the drainage system development in the new development area shall be incorporated with the development plan for 2022.

#### **(2) Cooperation Work with Other Sectors**

Since garbage is dumped into the open drains and it is obstructing the water flow, it is necessary to improve the waste management system. However, the drains can be managed by the periodic cleanings.

Only improving the drainage system will not be effective. It should be implemented in conjunction with the road improvements and land developments. Some main roads in the existing town are being improved by Kano and Sinohydro at present, but it will be necessary to check their drainage plans, and the pipe culvert system shall be reconsidered if they are not sufficient.

The drainage improvements in the new development area located in east of Ring Road shall be implemented together with road construction.

### **(3) Application to the Comprehensive Plan**

The storm water collected by the open drainage system shall be discharged into the Nile River (Co-existence with the Nile River).

The side drains of community roads shall be implemented by Labour Based Technology (LBT) method united with the Community Road Improvement Programme using LBT method (Self-supportive). As rainwater is precious as a water resource, it is recommended that some control of the discharge volume by storage and utilization as domestic water, gardening water, etc. is made.

In Malakal Town, the water supply system covers only 17,000 people as of 2011, and it is observed that a lot of women are carrying water from Nile River. The rainwater could be reused, especially for irrigation in eastern area of Ring Road (environmentally friendly and recycling). Parks has not been reserved so far. The park development is proposed in this comprehensive plan as a component of urban amenity. It will be possible to use the collected water at the parks.

Capacity Development (CD) areas of storm water drainage sub-sector are similar with the road and transport sub-sector, but the difference is about the maintenance of the constructed drainage system. In this regard, the MoPI&RD is needed to coordinate with Malakal City Council regarding the cleaning of drainage.

## **10.9 STORM WATER DRAINAGE SECTOR DEVELOPMENT PLAN**

### **10.9.1 Objectives of the Storm Water Drainage Sector**

The target to be achieved by 2022 is to complete the network of main drains in the urban area and its connection with Nile River. 19.7km of the trunk drain should be necessary for 2022, including the existing trunk drain for 8.8km.

#### Relieving Bottlenecks

The storm water drainage system should be developed, so that the traffic network and the state capital administrative functions are secured from storm water blockage all year. Securing the traffic network through improved drainage system is necessary for not only Malakal Town but also for wider areas of South Sudan. It secures the smooth transportation of commodities and contributes to development in wider areas.

The most urgent improvement to drainage in Malakal Town is to relieve bottlenecks in the drainage network, in particular stagnant main drains in Central Malakal. To improve systematically the drainage network and minimize water stagnations, gradients of the each drain should be re-examined based on the detail topographic surveys to formulate effective improvement plan.

### Intensive Improvement in Central Malakal

The commercial facilities and administrative agencies are concentrated in Central Malakal. Since the failure of the traffic network causes the paralysis of state capital functions, intensive improvements are required.

### Organizational Reformation

It is necessary to improve the drainage network by cooperating with the on-going main road improvement projects by Kano and Sinohydro. Therefore, experts for storm water drainage should be employed in MoPI&RD. Moreover, construction/maintenance equipment shall be provided in MoPI&RD, so that countermeasures can be undertaken by MoPI&RD in emergency cases. The self-supportive system shall be formulated in the medium term for drainage in community level.

## 10.9.2 Storm Water Drainage Sector Plan

### (1) Rainfall Intensity

Based on the daily rainfalls for the last 10 years (2002 – 2011), which are provided by Meteorological Services Section in Malakal Airport, the maximum daily rainfalls according to several return periods were calculated as shown in **Table 10.9-1**.

**Table 10.9-1 Maximum Daily Rainfall 2002 – 2011**

Return Period (year)	10	5	3	2	1.01
Max. Daily Rainfall (mm)	88.0	80.8	74.4	68.1	51.1

Source: Meteorological service Section, Malakal Air port

The rainfall intensity is calculated by empiric formula as shown in **Table 10.9-2**. 45mm/hr (5 years, 30min) is used for the calculation of main drains, and 85mm/hr (3 years, 10min) is used for minor drains.

**Table 10.9-2 Rainfall Intensity**

Return Period	Daily Rainfall R <sub>24</sub> (mm)	Rainfall Duration		Rainfall Intensity I (mm/hr)
		t' (min)	t (hr)	
<b>3</b>	<b>74.4</b>	<b>10.0</b>	<b>0.167</b>	<b>85.053</b>
3	74.4	20.0	0.333	53.687
3	74.4	30.0	0.500	40.944
3	74.4	60.0	1.000	25.793
5	80.8	10.0	0.167	92.370
5	80.8	20.0	0.333	58.306
<b>5</b>	<b>80.8</b>	<b>30.0</b>	<b>0.500</b>	<b>44.466</b>
5	80.8	60.0	1.000	28.012
10	88.0	10.0	0.167	100.601
10	88.0	20.0	0.333	63.501
10	88.0	30.0	0.500	48.428
10	88.0	60.0	1.000	30.508

Source: JICA Project Team

**(2) Storm Water Drainage Plan in Present Malakal Town**

The **Table 10.9-3** and **Table 10.9-4** show calculations for discharges and sizes of drainage facilities. The first task of improvement to the drainage system is to reconstruct the existing main drains according to proper sizes, proper falls and proper materials.

The existing main drains in Malakal Town are arranged in parallel from east to west. Their intervals are approximately 400m, and their lengths are approximately 3km. All of them are linked to the Nile River at present. Among them, the east half drains shall be improved to be directed toward the trunk drain along the Ring Road. Therefore, the lengths of each main drain toward the Nile River and trunk drain respectively will be approximately 1.5km. Moreover, a variety of size shall be adopted according to required capacity (not to unify the size of drains). It is recommended to change the size at every 500m of length as shown in **Table 10.9-3**.

**Table 10.9-3 Main Drain (Open Trapezoidal Drain) for Present Malakal Town**

No.	Station	Length (m)	Gradient (%)	Discharge (m <sup>3</sup> /s)	Capacity of Drain			Judge
					Av. Width (m)	Depth (m)	Capacity (m <sup>3</sup> /s)	
1	0 ~ 500	500	0.20	1.000	1.40	1.20	1.316	OK
2	500 ~ 1,000	1,000	0.20	2.000	1.63	1.50	2.152	OK
3	1,000 ~ 1,500	1,500	0.20	3.000	1.85	1.80	3.250	OK

Note: Runoff Coefficient: 0.4  
 Rainfall Intensity: 45mm/h  
 Width of Catchment Area: 400m  
 Roughness Coefficient of Drain: 0.025  
 Effective Depth of Drain: 0.8

Source: JICA Project Team

**Table 10.9-4 Main Drain (Pipe Culvert) for Present Malakal Town**

No.	Station	Length (m)	Gradient (%)	Discharge (m <sup>3</sup> /s)	Capacity of Pipe			Capacity (m <sup>3</sup> /s)	Judge
					Diameter (m)	Sectional Area (m <sup>2</sup> )	Velocity (m/s)		
1	0 ~ 500	500	0.20	1.000	1.00	0.674	1.556	1.048	OK
2	500 ~ 1,000	1,000	0.20	2.000	1.30	1.138	1.853	2.110	OK
3	1,000 ~ 1,500	1,500	0.20	3.000	1.50	1.516	2.039	3.090	OK

Note: Runoff Coefficient: 0.4  
 Rainfall Intensity: 45mm/h  
 Width of Catchment Area: 400m  
 Roughness Coefficient of Pipe: 0.013  
 Effective Depth of Pipe: 0.8

Source: JICA Project Team

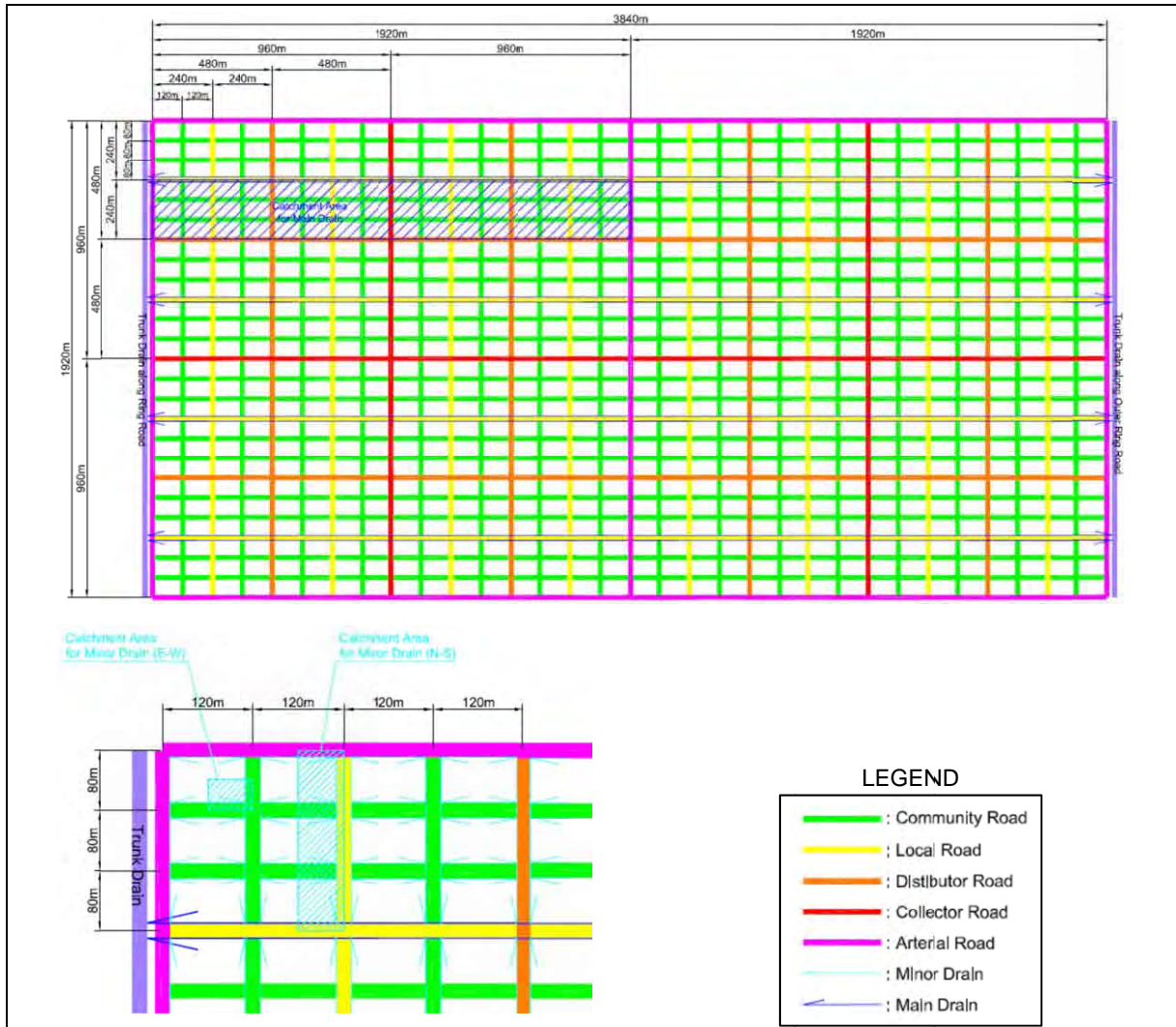
**(3) Storm Water Drainage Plan in New Urban Area**

The main drains in the new urban area shall be installed according to the following conditions;

- (i) The direction of main drains shall be from east to west.
- (ii) Collected water shall be discharged into the trunk drains along the Ring Road and Outer Ring Road.

(iii) The main drains shall be installed at both sides of local roads, which run from east to west at 480m intervals.

The general plan of the drainage system is shown in **Figure 10.9-1**. The calculations of discharges and sizes of drainage facilities are shown in **Table 10.9-5** and **Table 10.9-6**. **Table 10.9-6**, which is for culverts to be installed under intersections of roads, shows three (3) alternatives according to the vertical slope, size and number of pipes. To secure the cost efficiency and easiness of connections with the open trapezoidal drains, the alternative 3 is recommended.



Source: JICA Project Team

**Figure 10.9-1 General Plan of Drainage System in New Urban Area**

**Table 10.9-5 Main Drain (Open Trapezoidal Drain) for New Urban Area**

No.	Station	Length (m)	Vertical Slope (%)	Discharge (m <sup>3</sup> /s)	Capacity of Drain			Judgment
					Av. Width (m)	Depth (m)	Capacity (m <sup>3</sup> /s)	
1	0 ~ 480	480	0.10	0.720	1.30	0.70	0.929	OK
2	480 ~ 960	960	0.10	1.440	1.50	0.90	1.568	OK
3	960 ~ 1,440	1,440	0.10	2.160	1.70	1.10	2.415	OK
4	1,440 ~ 1,920	1,920	0.10	2.880	1.80	1.20	2.923	OK

Note: Runoff Coefficient: 0.5  
 Rainfall Intensity: 45mm/h  
 Width of Catchment Area: 240m  
 Roughness Coefficient of Pipe: 0.015  
 Effective Depth of Pipe: 1.0

Source: JICA Project Team

**Table 10.9-6 Main Drain (Pipe Culvert) for New Development Area**

Alternative	Station	Length (m)	Vertical Slope (%)	Discharge (m <sup>3</sup> /s)	Capacity of Pipe			Capacity (m <sup>3</sup> /s)	No of Pipes	Total Capacity (m <sup>3</sup> /s)	Judgment
					Dia-meter (m)	Section Area (m <sup>2</sup> )	Velo-city (m/s)				
1	0 ~ 480	480	0.10	0.720	0.80	0.431	0.948	0.409	2	0.817	OK
	480 ~ 960	960	0.10	1.440	1.00	0.674	1.100	0.741	2	1.482	OK
	960 ~ 1,440	1,440	0.10	2.160	1.20	0.970	1.242	1.205	2	2.410	OK
	1,440 ~ 1,920	1,920	0.10	2.880	1.30	1.138	1.311	1.492	2	2.984	OK
2	0 ~ 480	480	0.20	0.720	0.70	0.330	1.227	0.405	2	0.810	OK
	480 ~ 960	960	0.20	1.440	0.90	0.546	1.450	0.791	2	1.583	OK
	960 ~ 1,440	1,440	0.20	2.160	1.10	0.815	1.658	1.351	2	2.703	OK
	1,440 ~ 1,920	1,920	0.20	2.880	1.20	0.970	1.757	1.704	2	3.409	OK
3 【Recommended】	0 ~ 480	480	0.20	0.720	0.90	0.546	1.450	0.791	1	0.791	OK
	480 ~ 960	960	0.20	1.440	1.20	0.970	1.757	1.704	1	1.704	OK
	960 ~ 1,440	1,440	0.20	2.160	1.40	1.320	1.947	2.571	1	2.571	OK
	1,440 ~ 1,920	1,920	0.20	2.880	1.50	1.516	2.039	3.090	1	3.090	OK

Note: Runoff Coefficient: 0.5  
 Rainfall Intensity: 45mm/h  
 Width of Catchment Area: 240m  
 Roughness Coefficient of Pipe: 0.013  
 Effective Depth of Pipe: 0.8

Source: JICA Project Team

## 10.10 STORM WATER DRAINAGE SECTOR PROJECT

Based on the urgent issues described in **Section 10.9**, the following countermeasures will be required for the improvement of the storm water drainage systems.

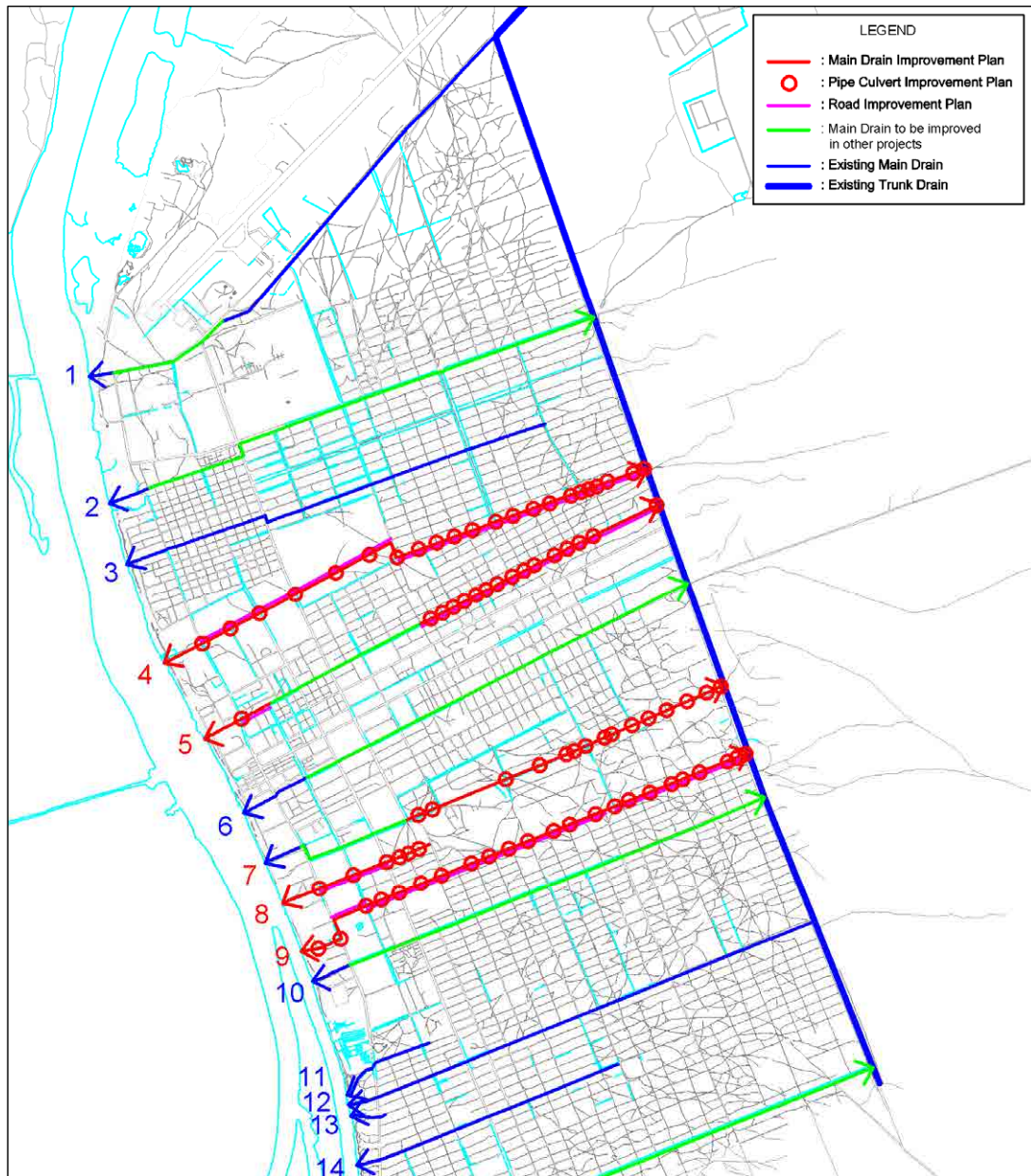
### (1) Reconstruction of Main Drains in Central Malakal (WD-1)

The main drains that have not been improved by Sinohydro and KANO in the road project should be improved. Among those main drains, the ones located in Central Malakal should be improved at first.



The length to be improved is approximately 11.6km. The locations of objective main drains are shown in **Figure 10.10-1**. This improvement work consists of the following components.

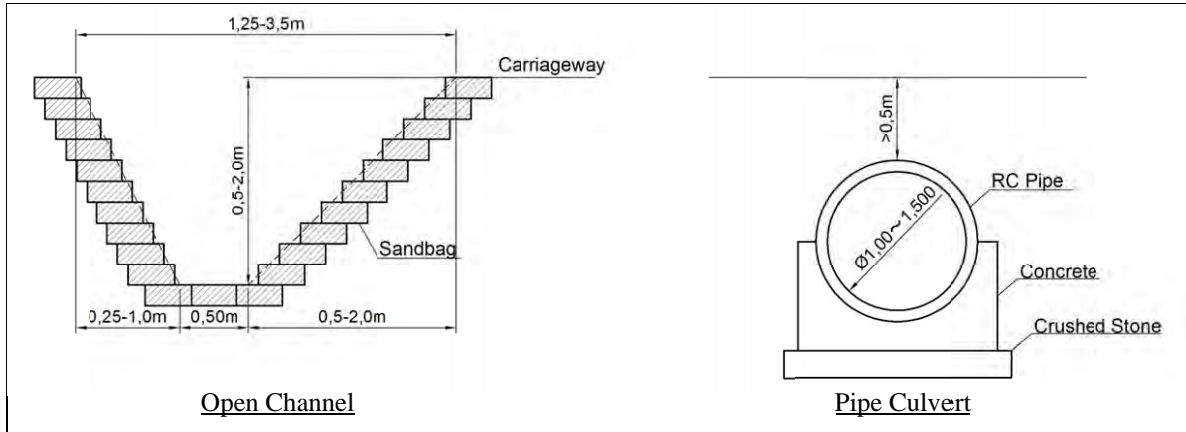
- (i) To reconstruct the existing main drains with a correct vertical slope (0.1 to 0.2%) toward the Nile River for the western side and toward the Trunk Drain for the eastern side.
- (ii) To line the channel with sandbags (See **Figure 10.10-2**).
- (iii) To install the RC (Reinforced-Concrete) pipe culverts under road intersections. (See **Figure 10.10-2**).



Source: JICA Project Team

**Figure 10.10-1 Reconstruction of Main Drains in Central Malakal (WD-1)**



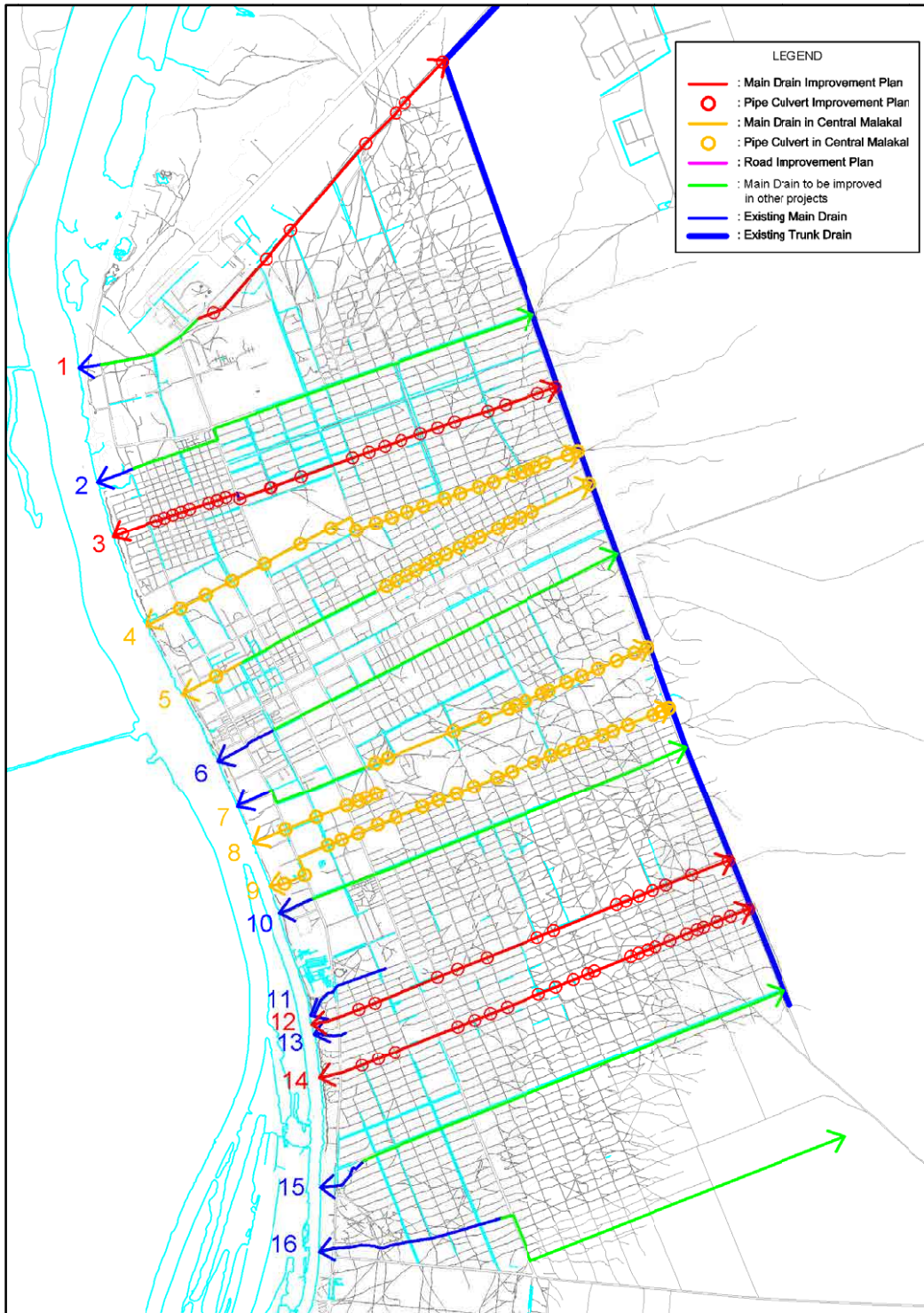


Source: JICA Project Team

**Figure 10.10-2 Typical Cross Section**

## (2) Reconstruction of Main Drains (WD-2)

The main drains outside Central Malakal should be improved following the above-mentioned plan (WD-1 reconstruction of main drains in Central Malakal). The length to be improved is approximately 11.8km. The locations of main drains to be reconstructed are shown in **Figure 10.10-3** for WD-2. The components of this work are same as WD-1 project.



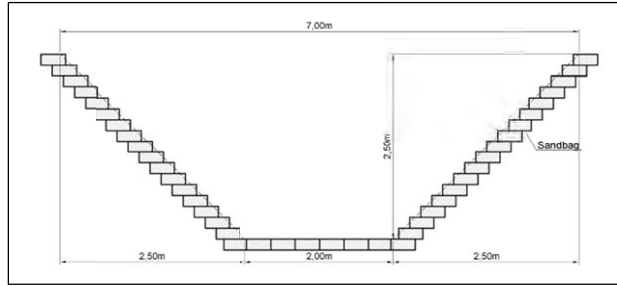
Source: JICA Project Team

**Figure 10.10-3 Reconstruction of Main Drains (WD-2)**

### **(3) Construction of Trunk Drain 1 (WD-3)**

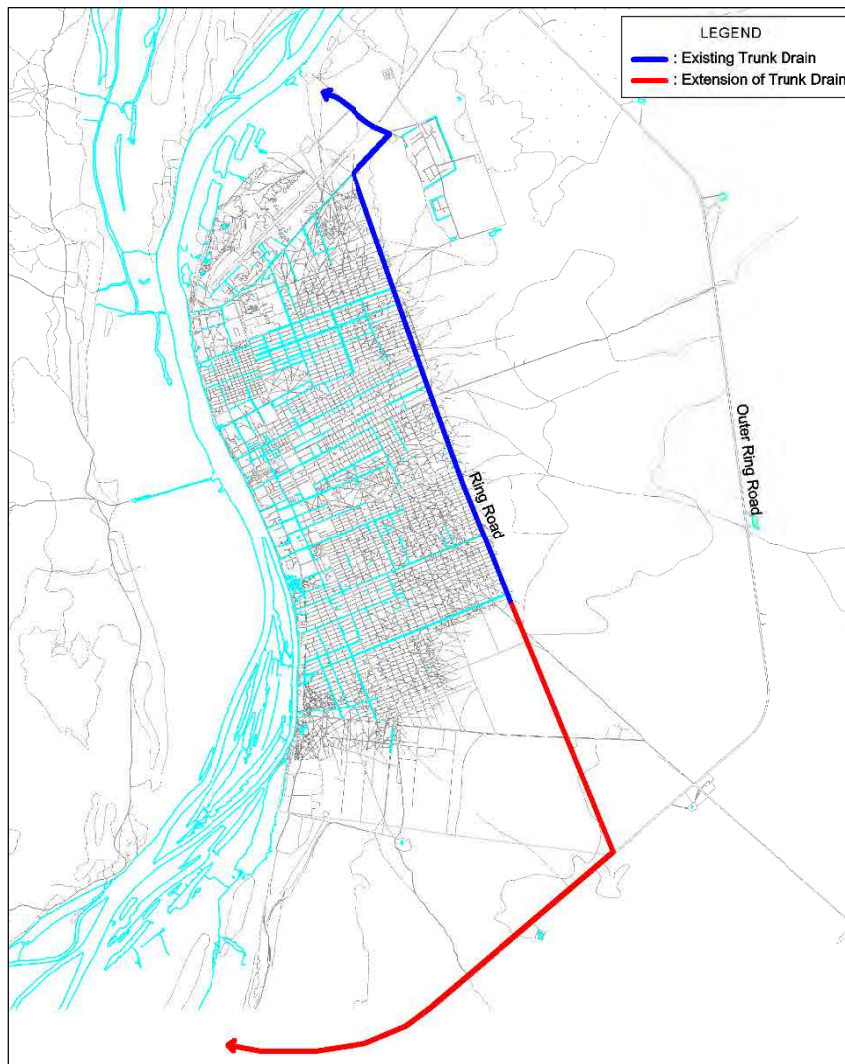
To discharge the water stagnated in south part of the trunk drain and to ensure the drainage for the new development area located between Ring Road and Outer Ring Road, it is necessary to extend the trunk drain toward south to link it to the Nile River along the Outer Ring Road.

The size of drain shall be same as the existing one as shown in **Figure 10.10-4**. The length to be constructed is approximately 10.9km. The location is shown in **Figure 10.10-5**.



Source: JICA Project Team

**Figure 10.10-4 Typical Cross Section**



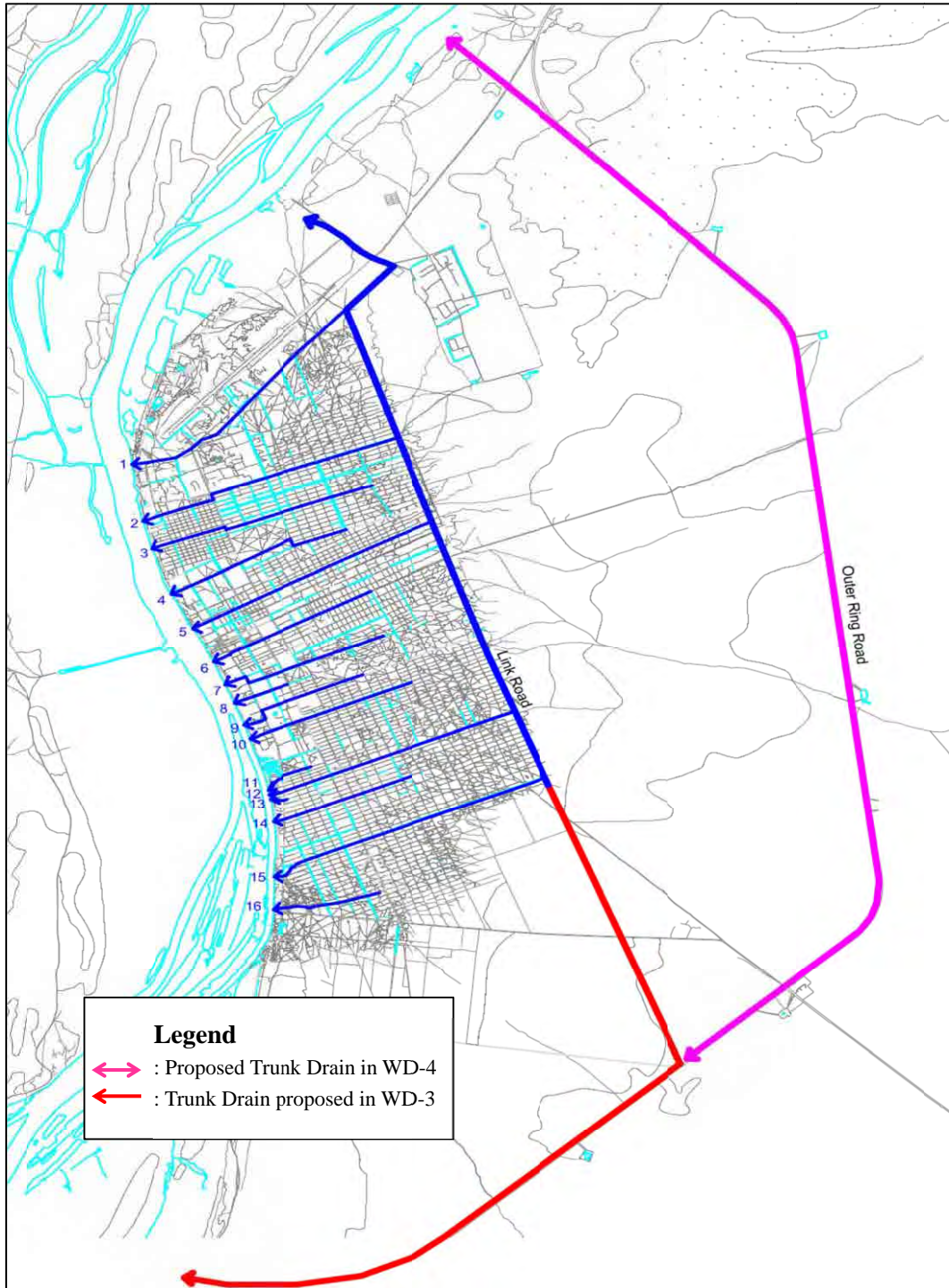
Source: JICA Project Team

**Figure 10.10-5 Construction of Trunk Drain 1 (WD-3)**



#### (4) Construction of Trunk Drain 2 (WD-4)

In parallel to works for the development of the area located between the Ring Road and the Outer Ring Road, it is necessary to install a trunk drain along Outer Ring Road. The size of drain shall be same as the Trunk Drain 1. The length to be constructed is approximately 16.5km. The location of Trunk Drain 2 is shown in **Figure 10.10-6**.



Source: JICA Project Team

**Figure 10.10-6 Construction of Trunk Drains 2 (WD-4)**

**(5) Construction of the Main Drain in New Urban Area (WD-5)**

The installation of a drainage system in the new development area shall be completed, coupled with construction of roads. At minimum, the main drainage network shall be constructed by 2022 along the roads for the basic infrastructure in the area. The length to be constructed is approximately 31km.

**(6) Capacity Development Project for Operation and Maintenance of Drains (WD-6)**

Operation and maintenance work shall be carried out regularly, to maintain the function of drainage system. Current maintenance is insufficient due to an absence of experts in the MoPI&RD and lack of manuals and budget. The operations, conducted currently are only small scale cleaning of the drains.

A technical staff specialized in the storm water drainage system shall be deployed in MoPI&RD to strengthen the operation and maintenance. Moreover, it is necessary to organize community based activities for cleaning the open drains. Since there is no manual and/or guideline for operation and maintenance in MoPI&RD, the creation of a manual should be required for operation and maintenance as well as for the management system.

In parallel with the above, the following technical training shall be executed to enhance the technical capabilities of MoPI&RD.

- A supervision method for the construction project in collaboration with road sector.
- The hydraulic design method of open channels and culverts.

In addition, the following equipment shall be procured for the operation and management of storm water drainage system.

- Engine pump and pickup with lifting device for emergency drain/discharge.
- Vehicles for staff transport between offices and sites.
- Excavator to clean the drains.

**10.11 IDENTIFIED CD NEEDS FOR ENERGY SECTOR**

Identified CD needs for Energy Sector related to the proposed projects are presented in **Table 10.11-1** by level and by scheme. Following trainings were provided with the staff of the MoPI&RD and other departments under the Project for capacity development: 1) Geographic Information System (GIS) training/AutoCAD Training; 2) English documentation training/Information Technology (IT) skill training; 3) Accounting training; and 4) Project Management Training. (See the detail in **Chapter 15.**)

**Table 10.11-1 Capacity Development Logframe (Storm Water Drainage Sector)**

(As of August 2012)

Area	CD items	Individual	Organization	Institution	Target	Urgent Project	Technical Cooperation	Training in OECD countries	Training in neighboring countries	WS/Training in South Sudan
Storm Water Drainage	Planning	Planning	To strengthen the capacity of planning and designing the storm water drainage development To allocate human resources To allocate budget To cooperate the division (department) of road development plan	To establish mid-term and long-term development plans of storm water drainage sector in Malakal town To clarify the work demarcation (responsibilities and budget allocation) among national, state, and city level To establish/revise related policies and/or system including budget allocation	Central Govt SMoPI&RD Malakal City		✓	✓		✓
	Design	Rainfall discharge formula Design of the section of sewage facilities	To strengthen the capacity of planning and designing the storm water drainage development To allocate human resources To allocate budget To cooperate the division (department) of road development plan	To develop a rainfall intensity formula of UNS To set up the standards in designing storm water drainage facilities and deciding the sections	SMoPI&RD		✓	✓		
	Construction supervision	Construction supervision as an orderer	To organize the division of construction supervision To allocate human resources To allocate budget	To develop a manual of construction supervision	SMoPI&RD		✓	✓		✓
	O&M	Method of annual action plan Monitoring methods in alignment with the guideline a) Daily : clean-up wastes/sludge b) Periodically : rehabilitation of storm water drainage	To organize the division of O&M To allocate human resources To allocate budget To coordinate Malakal City Council	To make an annual O&M plan To clarify the responsibilities of each stakeholder (MoPI&RD, UNS, Malakal City Council) To develop the monitoring guideline To plan and allocate budget	SMoPI&RD Malakal City Council		✓	✓		✓
	Management of equipment for O&M	Servicing O&M machines and equipment	To allocate service technicians To manage budget	To make an annual plan of O&M machines and equipment To plan and allocate budget	SMoPI&RD		✓	✓		✓

Source: JICA Project Team

## CHAPTER 11 SOLID WASTE MANAGEMENT

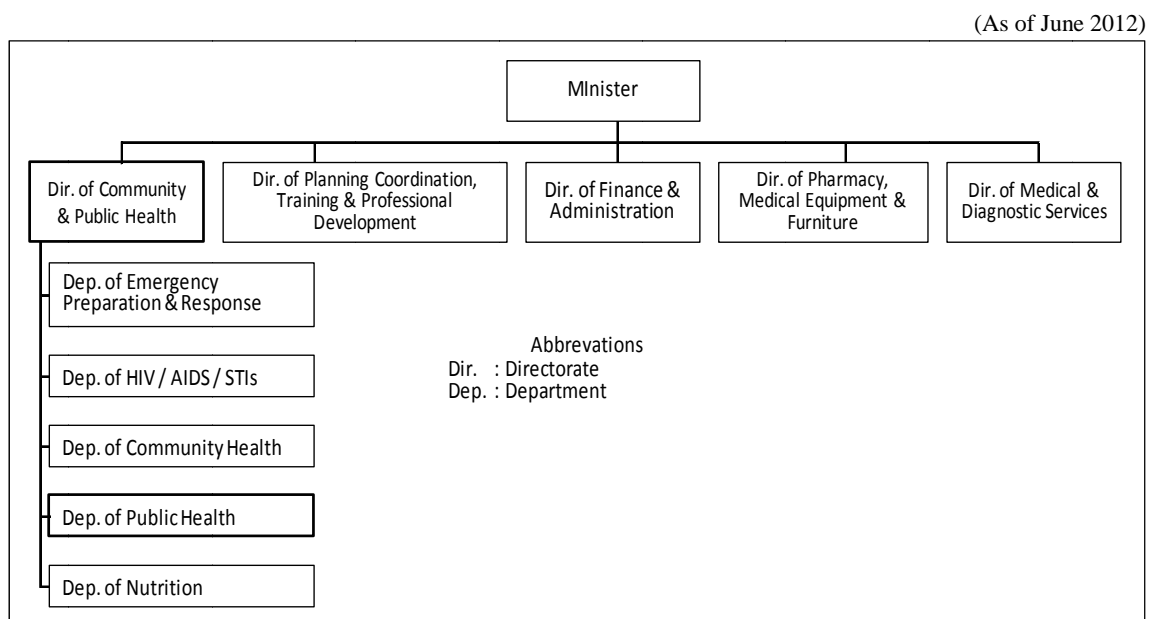
In this chapter, the following perspectives regarding the Solid Waste Management Sector are presented and analysed; 1) Institutional Framework, 2) Policies and Strategies, 3) Financial Resources, 4) the Operation and Maintenance System, 5) Facilities and Staffing, 6) Findings from Relevant Survey(s), 7) Programmes and Projects, and 8) Needs and Issues. And then in section, 9) development plans are formulated based on the present situation, needs and issues, and in 10) projects are proposed from technical point of view.

### 11.1 INSTITUTIONAL FRAMEWORK

As of June 2012, the government of Upper Nile State (UNS) is composed of 13 state ministries. One of the ministries, the State Ministry of Health (MoH), used to be the main agency handling solid waste management. The General Sanitation for Environmental Corporation Department (GSECD), which has responsibilities for solid waste collection, was under the State Ministry of Health. After Decree No.1/2012, related to a change of governmental policy about the administrative system, was implemented, the GSECD came under Malakal Council's responsibility.

The MoH still has a department for garbage and sewerage that handles of public health issues. The Ministry of Physical Planning and Rural Development, UNS (MoPI&RD) also has a role in the development of solid waste treatment and disposal facilities. Several agencies might be involved with individual responsibilities regarding solid waste management. Presently, the demarcation is unclear and the primary agency that should handle solid waste management is not definite.

Organization chart of the MoH is shown in **Figure 11.1-1**.



Source: Result of Interview Survey to Ministry of Health, UNS undertaken by JICA Project Team

**Figure 11.1-1 Organization of Chart of MoH, UNS**

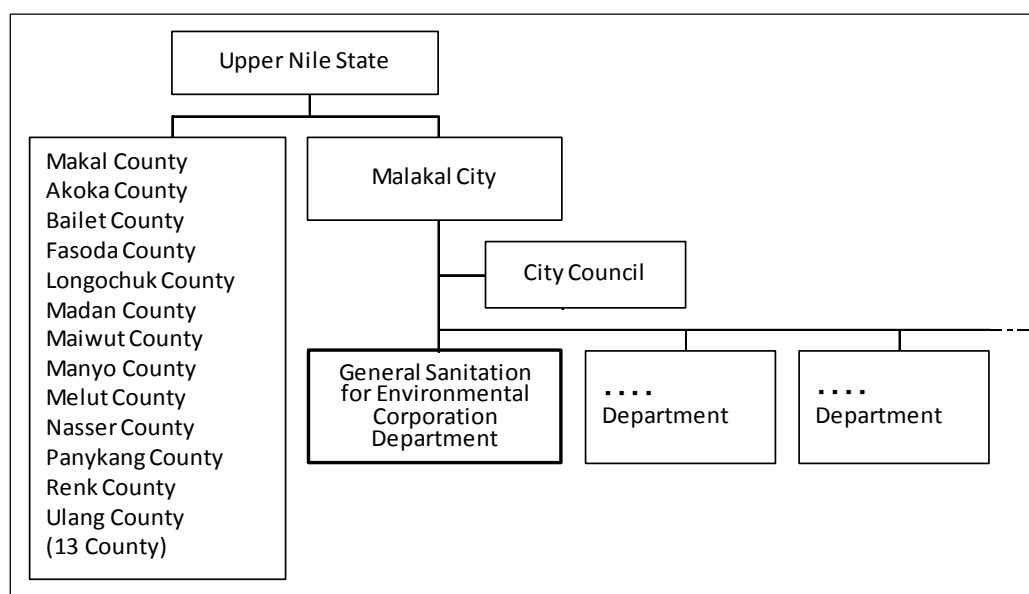
**Table 11.1-1** shows more detailed organizational structure under Directorate of Community and Public Health of Ministry of Health, UNS (MoH).

**Table 11.1-1 Organization Units under Directorate of Community and Public Health, MoH**

(As of June 2012)

Department	Unit	Sub Unit
Emergency Preparedness & Response	Disease Outbreak & Surveillance	Disease Outbreak Coordination
		Surveillance Coordination
	Disaster Management	Disaster Management Coordination
HIV/AIDS/STIs	Prevention & Control	BCC
		PMTCT
		VCT
		STI
	Surveillance	Information System (M&E)
	Treatment, Care & Support	ART Monitoring
Community Health	Family & Reproductive Health	Maternal Health
	EPI	Inspection
		Surveillance
		Cold Chain
Health Promotion	IEC/BCC Advocacy	
Public Health	Endemic Disease Control	Malaria
		Tuberculosis/Leprosy/Buruli Ulcer
		Guinea Worm
		Kalazar/Trypanosomiasis
		Onchocerciasis, Trachoma & Others
	Environmental Health	Water & Sanitation
		Garbage & Sewerage
		Vector Control
		Occupational Health & Non Communication Diseases
		Environmental Pollution & Hazards
Nutrition	Care & Support	Information Systems
	Preventive & Promotion	

Source: Ministry of Health, UNS



Source: Result of Interview Survey by JICA Project Team

**Figure 11.1-2 Organization Chart of UNS**



GSECD under Malakal Town is in charge of several tasks: street sweeping in the town, solid waste collection and transportation, and management of the landfill site. The organization chart of UNS in relation to the GSECD is shown in **Figure 11.1-2**.

## **11.2 POLICIES AND STRATEGIES**

As of June 2012, the “Environmental Protection Bill” was under preparation by the central government. Administrative agencies relating to solid waste management in Malakal Town do not have enough information about the draft of the Bill. The Director of GSECD said they were performing their duty under “Sanitation and Environmental Law” of 2002 which was a law before independence.

In Malakal Town, ordinances and regulations relating to solid waste management have not been implemented. No plans such as Master Plan, Strategic Plan and Construction Plan on solid waste management have been prepared. The MoPI&RD and State Ministry of Health might have a role of preparation of plans. The fact remains that it is very difficult for them to prepare the plans because there is no definite demarcation as to which agency should handle solid waste management primarily.

## **11.3 FINANCIAL RESOURCES**

The finance structure to support solid waste management in Malakal Town is ambiguous. One of the reasons is that the institutional framework of solid waste management sector was changed last fiscal year 2012.

It appears that a big enough budget for sweeping, waste collection and operation and maintenance for landfill site has not been secured yet. Regarding the budget for solid waste management, the GSCD makes decisions on number of workers to conduct sweeping and waste collection and disposal.

A waste fee from residents is not being collected, although there is some procedure for a waste collection fee in Malakal Town, which is similar to that of Juba. Only some residents, public institutions and offices that want door-to-door collection pay for waste collection. The procedure is not clear from the information obtained.

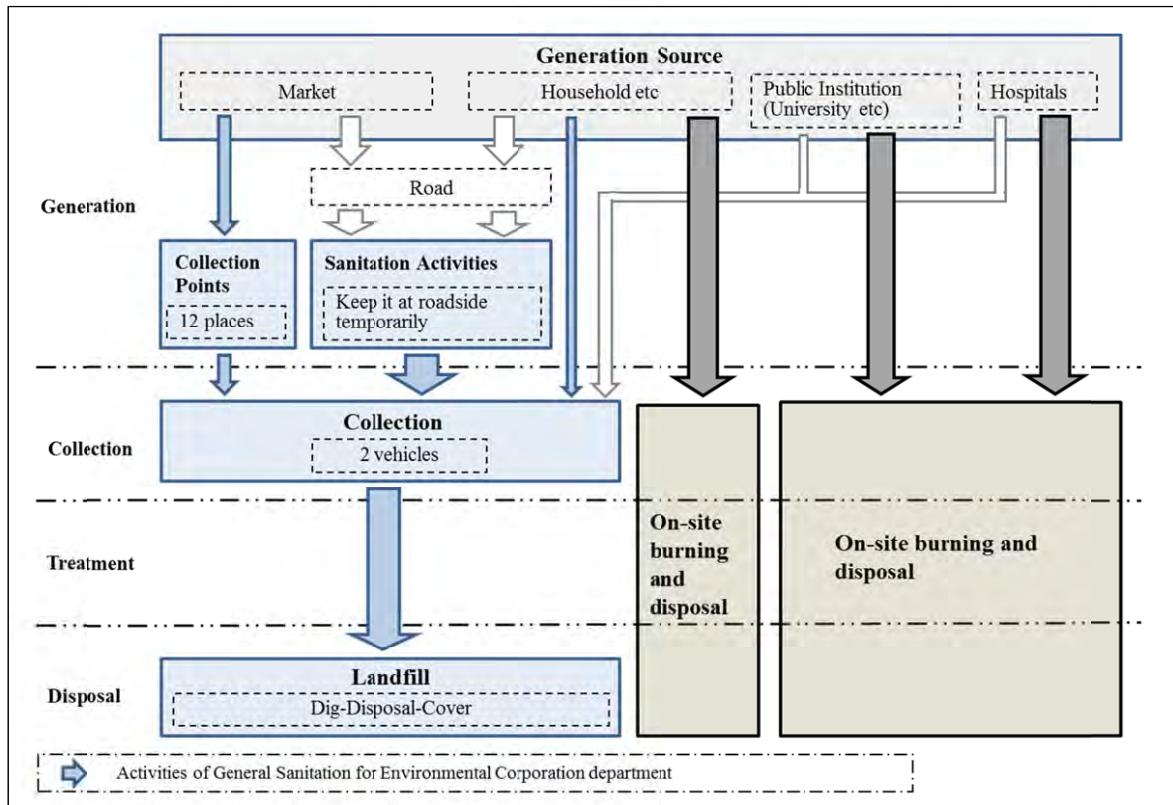
## **11.4 OPERATION AND MAINTENANCE SYSTEM**

### **11.4.1 Solid Waste Flow**

Malakal Town is now facing severe shortages of commodities such as oil, food and beverage because of unreliable and restricted logistics. This is one reason consumption is low. Therefore, amount of solid waste is increasing with population growth but it is not generated too much in this economic situation.

Following **Figure 11.4-1** shows current situation of solid waste flow in Malakal Town.

(As of June 2012)



Source: JICA Project Team

**Figure 11.4-1 Solid Waste Flow (2012)**

As for domestic solid waste, it seems that most residents treat and dispose of their garbage by themselves. In particular, combustible garbage is burned in their backyard. This is the common way of dealing with combustible garbage. Public institutions such as universities treat solid waste in the same manner. Regarding non-combustible garbage such as aluminium cans, pet bottles and ceramics, some of them are collected by collection vehicles and others may simply be thrown away somewhere.

Existing collection points with facilities are being set up near the market. Volumes of waste generated from markets may be gathered and collected at collection points. Sweepers, who are hired by General Sanitation for Environmental Corporation Department, carry out sanitation activities in town. They sweep roads and pick up waste from side ditches, and keep them at the roadsides temporarily.

Waste collection and disposal workers go around the town to collect waste from collection points and roadsides where waste is kept temporarily, and take them to landfill sites. The activities of the GSECD are shown in **Table 11.4-1**.

**Table 11.4-1 Activities of General Sanitation for Environmental Corporation Department**

(As of June 2012)

Items	Description
Name of department	General Sanitation for Environmental Corporation Department (under Malakal City Council)
Main duties	Drainage, general sanitation, solid waste management
Budget	Source of budget: Malakal City Council Expenditure for Salary: SSP*8,000 /month/person (January ~ June 2012) Expenditure for Salary: SSP20,000 /month/person (January ~ June 2012)
Main operations	To sweep in town Working time: AM8:30~PM13:00 Monday-Friday To collect garbage Working time: AM8:30~PM17:00 Monday-Sunday
Workers	Number of sweeper: 100 persons (* It depends on budget.) Salary: SSP80/month (January ~ June 2012) Number of waste collection/disposal worker: 30 persons (* It depends on budget.) Salary: SSP670 /month/person (January ~ June 2012)
Collection system	Collection vehicles: 2 vehicles (volume: 12m <sup>3</sup> ) (Vehicles are rented-cars. Cost is SSP12,000/car/month with 1 manager and 1 driver.) Frequency to landfill site: 3 times/day/one car Collection points: Total: 12 places (out of them, 4 places with facilities) Each Quarter (Northern, Central, Eastern, Southern): 3 places (1 place with facilities)
Facilities	Two kinds of landfill (one for garbage, the other for human waste) Location: Out of town, approximately 4km far from town (Area for landfill site is approved by Malakal City Mayor) Disposal area (length×width×depth): Approximately 10m×5m×10m Period of use for one disposal area: 2 weeks~1 month

\*SSP: South Sudan Pounds

Source: Interview Survey to General Sanitation for Environmental Cooperation Department under Malakal Town Council undertaken by JICA Project Team

#### 11.4.2 Domestic Solid Waste

##### (1) Solid Waste Generation and Composition

There is no statistical data about the amount of domestic solid waste, since facilities measuring weight are not established at landfill sites. Moreover, the results of examination of waste composition are not available. According to site surveys, a lot of aluminium cans of beverages were found at roadsides as well as collection points.

##### (2) Collection and Disposal

Presently, a collection system for domestic solid waste generated from households is not established. It means most of domestic solid waste is not being collected. There are 12 collection points in Malakal Town and some of them are located near markets. Basically, solid wastes from markets are disposed at collection points. It is then collected and transported to landfill sites by a collection vehicle rented with one manager and one driver.

(As of June 2012)



Collection Point (Terawa area)



Collection Point (Terawa area)



Collection Point (El Saha area)



Collection Vehicle



Collection Activities



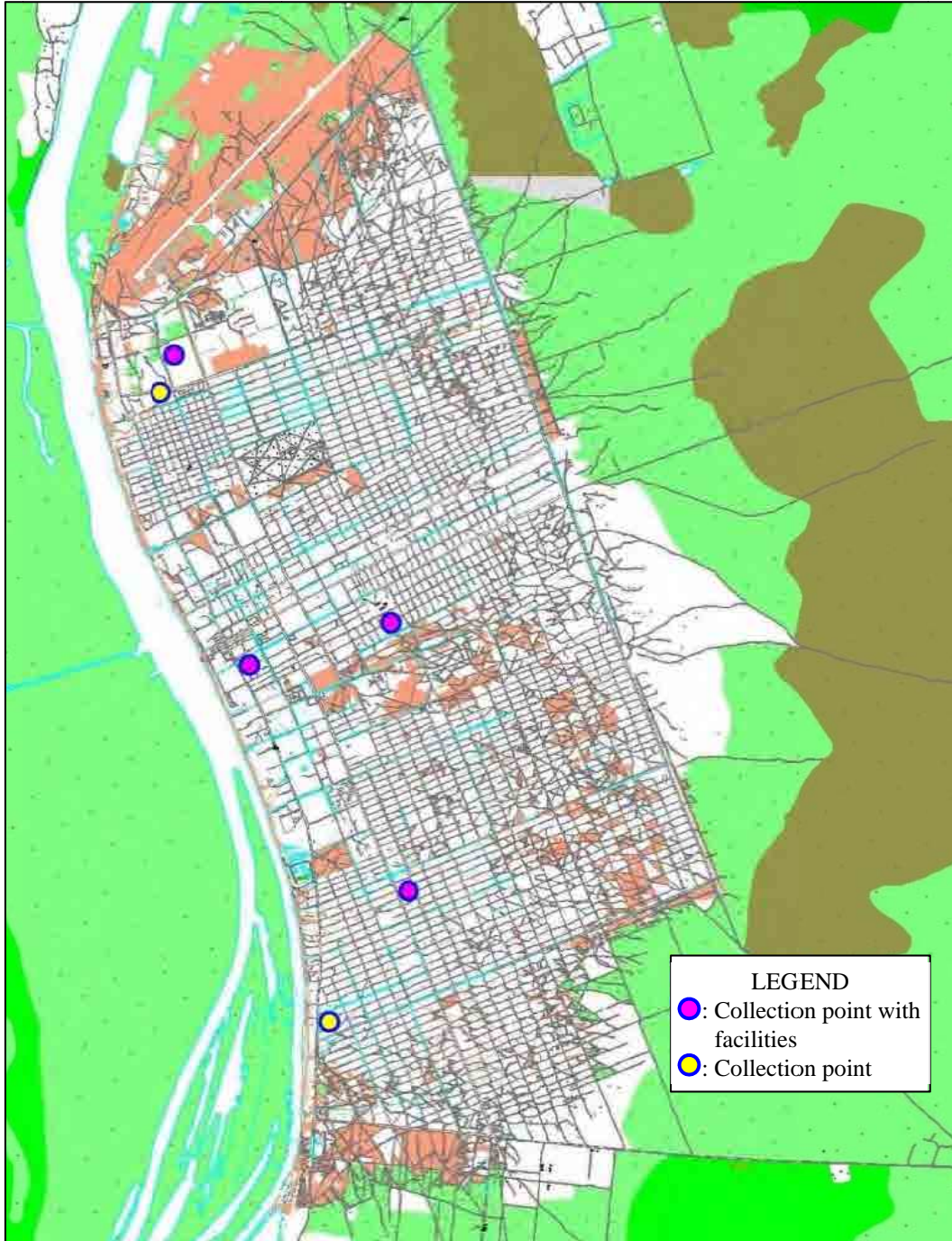
Collection Activities

Source: JICA Project Team

**Photo 11.4-1 Garbage Collection in Malakal Town**



(As of June 2012)



Source: JICA Project Team

**Figure 11.4-2 Location of Collection Points**

### (3) Sanitation Activities

Dust bins are not set up in Malakal Town. People throw away their trash anywhere. Hence, volumes of solid waste are scattered but particularly at roadsides and ditches. Presently, about 100 sweepers who are mostly female sweep the roadsides and ditches from Mondays to Fridays. The wastes gathered by sweepers are set at roadsides temporarily, and waste collection and disposal workers collect them with collection vehicles regularly.

(As of June 2012)



Sweeping Activities



Sweeping Activities



Sweeping Activities



Sweeping Activities

Source: JICA Project Team

**Photo 11.4-2 Sweeping Activities in Malakal Town**

### 11.4.3 Industrial Solid Waste

There is no large industrial factory in Malakal Town and therefore, hardly any industrial solid waste is generated. Presently, industrial solid waste is disposed in the same manner as domestic solid waste.

### 11.4.4 Medical Solid Waste

There is one teaching hospital and several health centres in Malakal Town. Some medical wastes such as syringes, needle and waste clothes with blood, classified as infectious medical waste, are very dangerous for patients and workers. Currently, separation at source is not used even at teaching hospitals and workers do not pay much attention to infectious medical waste. Medical waste generated from educational hospitals are treated and disposed at temporary places inside the hospital. It seems some infectious medical wastes are incinerated but those temporary places do not function properly to manage medical solid waste.



(As of June 2012)



Dust Bin in Educational Hospital



Dust Bin in Educational Hospital



Temporary Place for Treatment and Disposal

Source: JICA Project Team



Infectious Medical Waste

### Photo 11.4-3 Disposal of Medical Waste

## 11.5 FACILITIES AND STAFFING

Regarding facilities for solid waste, treatment facilities such as a composting plant and recycling facilities have not been constructed. It is reported that there are two kinds of landfill, one is for domestic solid waste and the other is for human waste disposal. The cell method is adopted.

## 11.6 FINDINGS FROM RELEVANT SURVEY(S)

### 11.6.1 Household Survey Results

The household survey conducted as a part of Town Profile Survey provides information regarding the garbage collection and disposal condition.

#### (1) Amount of Garbage Generation

The median amount of garbage generation amount per household is 2.5kg, 2.5kg, 4.5kg, 6.5kg and 3.5kg for polythene bags and cloths, wooden goods, metallic materials, animal waste and other waste respectively.

**Table 11.6-1 Amount of Garbage Generation per Week (1/2)**

(As of January 2013)

Amount of Garbage (kg)	PET* bottles, clothes, fabrics		Glass Bottles		Polythene bags, clothes in kg per week		Wooden Goods (kg/week)	
	Number (H.H.)	%	Number (H.H.)	%	Number (H.H.)	%	Number	%
1	14	10.9%	8	5.7%	13	9.7%	7	7.3%
2	21	16.4%	32	22.7%	46	34.3%	23	24.0%
3	15	11.7%	23	16.3%	18	13.4%	18	18.8%
4	12	9.4%	25	17.7%	18	13.4%	9	9.4%
5	14	10.9%	15	10.6%	15	11.2%	13	13.5%
6	6	4.7%	10	7.1%	10	7.5%	11	11.5%
7	1	0.8%	2	1.4%	0	0.0%	4	4.2%
8	3	2.3%	2	1.4%	1	0.7%	4	4.2%
9	3	2.3%	0	0.0%	0	0.0%	1	1.0%
10	24	18.8%	7	5.0%	0	0.0%	5	5.2%
More than 10	15	11.7%	17	12.1%	13	9.7%	1	1.0%
Total	128	100.0%	141	100.0%	134	100.0%	96	100.0%

Source: Town Profile Survey undertaken by JICA Project Team \*PET: Polyethyleneterephthalate

**Table 11.6-2 Amount of Garbage Generation per Week (2/2)**

(As of January 2013)

Amount of Garbage (kg)	Metallic Materials (kg/week)		Animal Waste (kg/week)		Other Waste (kg/week)	
	Number (H.H.)	%	Number (H.H.)	%	Number (H.H.)	%
1	9	15.0%	8	11.6%	7	15.6%
2	7	11.7%	6	8.7%	9	20.0%
3	6	10.0%	0	0.0%	4	8.9%
4	7	11.7%	8	11.6%	4	8.9%
5	13	21.7%	5	7.2%	7	15.6%
6	4	6.7%	6	8.7%	0	0.0%
7	8	13.3%	1	1.4%	2	4.4%
8	4	6.7%	6	8.7%	5	11.1%
9	0	0.0%	4	5.8%	1	2.2%
10	0	0.0%	15	21.7%	1	2.2%
More than 10	2	3.3%	10	14.5%	5	11.1%
Total	60	100.0%	69	100.0%	45	100.0%

Source: Town Profile Survey undertaken by JICA Project Team

## (2) Garbage Collection Service

According to the household surveyed, garbage collection service is available for only 26% of households.

**Table 11.6-3 Availability of Garbage Collection Service**

(As of January 2013)

Availability of Garbage Collection Service	Number	%
Yes	137	25.6%
No	399	74.4%
Total	536	100.0%

Source: Town Profile Survey undertaken by JICA Project Team



The service providers for garbage collection are varied. County, Payam, Boma and community are listed as a local administrative body that provides garbage collection service.

**Table 11.6-4 Use of Garbage Collection Service by Service Provider**

(As of January 2013)

Service Provider	Use of Service		Assorted garbage collection	
	Yes	%	Yes	% to Use of Service
County Service	158	35.3%	45	28.5%
Payam Service	20	4.5%	8	40.0%
Boma Service	14	3.1%	8	57.1%
Private Service	160	35.7%	109	68.1%
Community Service	91	20.3%	55	60.4%
Other Service	5	1.1%	7	140.0%
Total	448	100.0%	232	51.8%

Source: Town Profile Survey undertaken by JICA Project Team

**Table 11.6-5 Frequency of Garbage Collection Service by Different Providers**

(As of January 2013)

Frequency	County	Payam	Boma	Private	Community
<i>(In number)</i>					
Less than once	4	1	39	0	0
Once a week	8	8	0	1	0
Twice a week	44	3	39	0	0
Three times a week	5	0	0	51	0
Four times a week	39	4	1	7	0
Once everyday	0	0	0	12	38
More than once a day	3	0	0	15	0
Total	103	16	79	86	38

Source: Town Profile Survey undertaken by JICA Project Team

### (3) Recycling

The recycling of solid waste for compost and fuel are not widespread in Malakal Town.

**Table 11.6-6 Recycle of Garbage for Compost**

(As of January 2013)

Recycle of Garbage for Compost	Yes	No
Yes	15	3.4%
No	421	96.6%
Total	436	100.0%

Source: Town Profile Survey undertaken by JICA Project Team

**Table 11.6-7 Recycle of Garbage for Fuel**

(As of January 2013)

Recycle of Garbage for Fuel	Number	%
Yes	10	2.8%
No	344	97.2%
Total	354	100.0%

Source: Town Profile Survey undertaken by JICA Project Team

#### (4) Residents' Opinion for Garbage Collection Service

The households satisfied with garbage collection service at 41% are slightly higher than those dissatisfied at 39%. As for the issues households feel are frequency of collection service and long distance to the dumping points.

**Table 11.6-8 Issues with Garbage Collection Situation**

(As of January 2013)

Issues with Garbage Collection	Number	%
The distance between house and garbage dumping point is too far.	99	20.2%
Frequency of garbage collection services is too few.	147	30.0%
Garbage collection service is unreliable.	19	3.9%
Total sample number	490	-

Source: Town Profile Survey undertaken by JICA Project Team

### 11.7 PROGRAMMES AND PROJECTS

The MoPI&RD, State Ministry of Health and GSECD have not acknowledged any on-going projects related to solid waste management.

### 11.8 NEEDS AND ISSUES

#### 11.8.1 General Issues

General issues on solid waste management sector are shown below;

- (i) No definitive demarcation of duties and roles in the relevant agencies.
- (ii) No laws and regulations at state level
- (iii) No Master Plan
- (iv) No statistical data such as the amount of generation and disposal, waste composition (and there are no facilities to do so).
- (v) Lack of budget for collection/transportation, sanitation activities, landfill management.

The followings are required to respond the issues.

- (i) To strengthen capacity for solid waste collection.
- (ii) To introduce source separation.
- (iii) To reduce amount of solid waste to be disposed of.
- (iv) To establish proper treatment method for solid waste composition.
- (v) To define the of demarcation of duties and roles for solid waste management in relating agencies.
- (vi) To establish proper treatment and disposal system for medical solid waste including infectious waste.
- (vii) To secure a budget for solid waste management (Collection/transportation, sanitation activities, landfill management).

### **11.8.2 Urgent Needs**

Based on the results of the fact-finding survey by means of site visits and questionnaire or interviews with relevant agencies or authority, issues concerning solid waste management sector are identified, taking into consideration for preparation of the Comprehensive Plan.

Urgent issues of solid waste management are shown below.

- (i) Lack of capacity for collection and transportation against daily waste generation.
- (ii) Lack of collection point with facilities.
- (iii) No established collection system for domestic solid waste (Most residents treat domestic solid waste by themselves).
- (iv) No implementation of land fill sites management based on a long-term plan.
- (v) Improper treatment and disposal of medical solid waste including infectious waste.

### **11.8.3 Consideration for the Comprehensive Plan**

#### **(1) Relation to the Social Economic Infrastructure Development**

The service area of waste collection should be determined with consideration of the urban expansion area. Development of the urban area in the east side of the Ring Road shall be involved in development plan for 2022. Based on the proposed principle that a landfill site should be located in Malakal Town, Malakal Town is responsible for selection of the landfill site.

#### **(2) Cooperation Work with Other Sectors**

To enable waste collection points, it is necessary to secure space on streets. Therefore the road development plan should consider allocating these spaces throughout the town.

#### **(3) Application to the Comprehensive Plan**

Establishment of a solid waste management system is essential for the maintenance of hygiene and improvement of urban amenity. In addition, it contributes to conserve natural environment of the Nile River through preventing scattered solid waste.

Regarding industrial waste, it should be treated by related entities, based on principle that waste-discharging entities shall be responsible for waste disposal.

#### **(4) Capacity Development**

The Comprehensive Plan comes up with a new collection system with vehicle and the construction of a landfill. Along with the new collection system, staff will learn solid waste management methods, collection plan, operation and monitoring. Also car mechanics will be employed and trained in repairs.

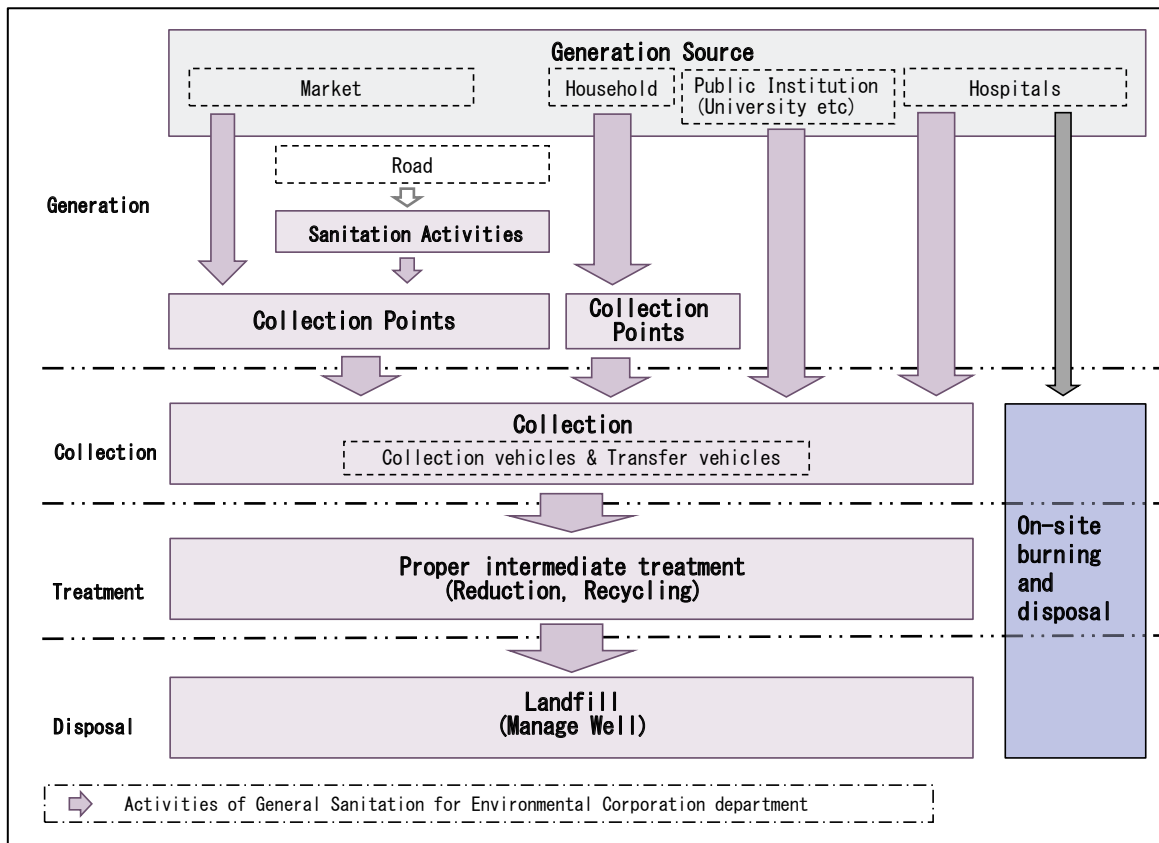
## 11.9 SOLID WASTE MANAGEMENT SECTOR DEVELOPMENT PLAN

### 11.9.1 Objectives of Solid Waste Management Sector

#### Capacity Development for Solid Waste Management

The duties and roles for solid waste management in related agencies are to be clarified and management ability for waste collection and landfill should be strengthened.

Figure 11.9-1 shows appropriate solid waste flow to be attained by 2022.



Source: JICA Project Team

**Figure 11.9-1 Solid Waste Flow (2022)**

#### Collection Ratio

Key tasks for management are to collect solid waste as much as possible and to transfer it to landfill site as soon as possible. The existing urban areas such as Central, Northern, Southern and Eastern Payams (Quarters) should be managed as service areas for waste collection by 2022. The new urban area to the east side of Ring Road, which is developed in accordance with urban plan, should be included in the service area. The target collection ratio for the service area in 2022 is 50%.

#### Medical Solid Waste Management

Solid waste generated by hospitals should be treated on-site.

#### Capacity Development Needs on Solid Waste Management

New Collection System of Solid Waste, a Proper Plan on Collection, Maintenance Plan of Vehicle

and Needed Equipment, Maintenance Plan of Landfill, Regulation of Landfill Construction, Regulation of the Treatment of Medical Waste, the Guideline of the Treatment of Medical Waste, etc.

### **11.9.2 Strategy for Solid Waste Management**

Based on the targets mentioned above, strategies to achieve the solid waste management targets are conceived as follows;

#### Capacity Development for Solid Waste Management

- To clarify the scope of work for related agencies at the early stage.
- To improve the way of thinking and knowledge of related agencies about waste collection, source separation, reuse and recycling.
- To promote resource recovery by recycling and reuse, which can be applicable for wider area.
- To establish the financial and administrative system, so that the necessary budget for waste management (waste collection, clean-up activities, landfill management) can be secured.
- To improve the tariff system of waste collection, in order to ensure the budget for waste collection.

#### Collection Ratio

- To secure sufficient human resources and equipment such as collection vehicles at the start of the project.

#### Medical Solid Waste Management

- To properly treat medical solid waste in hospitals, separately from domestic waste to ensure safety.
- To raise the awareness of staff, workers, patients and all other persons related to hospitals and health centres.

### **11.9.3 Solid Waste Management Plan**

#### **(1) Collection/Transportation Plan**

Solid waste left lying in the street has negative health consequences. Therefore all of the solid waste generated by Malakal Town in a day should be collected and transferred to the landfill site to maintain a sanitary situation.

A collection system should be established at first. Currently, only a few households, public institutions and hospital receive the door-to-door collection service. They can afford to pay a collection tariff for the service. However, most households are not willing to pay for waste collection, for reasons of ignorance about the effects. Therefore, the door-to-door collection system is suitable for only public institutions, hospital and offices. They can receive optimal service whenever they want by paying the tariff. On the other hand, a collection point system is recommended for general households, considering affordability to pay the tariff into account.

At the market, much solid waste is gathered to the collection point. But a certain volume of waste is thrown away next to the collection point or vacant land. It is recommended to install enclosed depots for waste collection to indicate the collection point clearly. Moreover, measures to enhance public awareness should be conducted in parallel.

The mandates of the General Sanitation for Environmental Corporation Department includes solid waste collection/transportation for Malakal Town. For the collection activities they currently use rented trucks. They should have own collection vehicles to manage collection activities efficiently.

Based on the results of site survey by JICA project Team, the present amount of solid waste collection is calculated for 2012. According to the result, the amount of solid waste collection is estimated for 2013 – 2022. It shows that 13 collection vehicles be necessary in 2022 to collect the waste.

Results of calculation and estimation are shown in **Table 11.9-1**. Proposed manners for waste collection are shown in **Table 11.9-2**. And proposed locations of proper collection points are shown in **Figure 11.9-2**.

**Table 11.9-1 Results of Calculation and Estimation of Solid Waste Collection (2012 – 2022)**

Year	Population	Waste generation	Collection ratio	Amount of waste collection	Amount of disposal	Number of required collection vehicles
	person	t/day	%	t/day	t/year	vehicle(12m3)
2012	153,000	38.25	40%	15.30	5,585	4
2013	166,928	41.73	40%	16.69	6,092	4
2014	180,270	54.08	45%	24.34	8,884	6
2015	194,038	58.21	45%	26.19	9,559	6
2016	200,248	60.07	45%	27.03	9,866	6
2017	206,655	82.66	45%	37.20	13,578	8
2018	213,268	85.31	45%	38.39	14,012	8
2019	220,093	88.04	45%	39.62	14,461	9
2020	227,136	113.57	50%	56.79	20,728	12
2021	234,404	117.20	50%	58.60	21,389	13
2022	241,000	120.50	50%	60.25	21,991	13

Note: Calculation and estimation is conducted by using numerical values obtained from the hearing survey

Source: JICA Project Team

**Table 11.9-2 Proposed Waste Collection System in Malakal Town (2022)**

<b>Item</b>	<b>Description</b>
Method of Collection	Households: Collection point system Market: Collection point system Public institution: Door-to-door system Hospital: Door-to-door system
Frequency	Collection point (household): Once per day Collection point (market): Once per day Public institution: whenever they want (at least once per week) Hospital: whenever they want (at least once per week)
Number of Collection Points Equipped Enclosed Depots	Household and Market: Total; 73 places Northern Payam (Quarter): 18 places Central Payam (Quarter): 4 places Eastern Payam (Quarter): 12 places Southern Payam (Quarter): 24 places East side area of Ring Road: 15 places (All market sites have one collection point.)
Number of Collection Vehicles	13 collection vehicles

Source: JICA Project Team

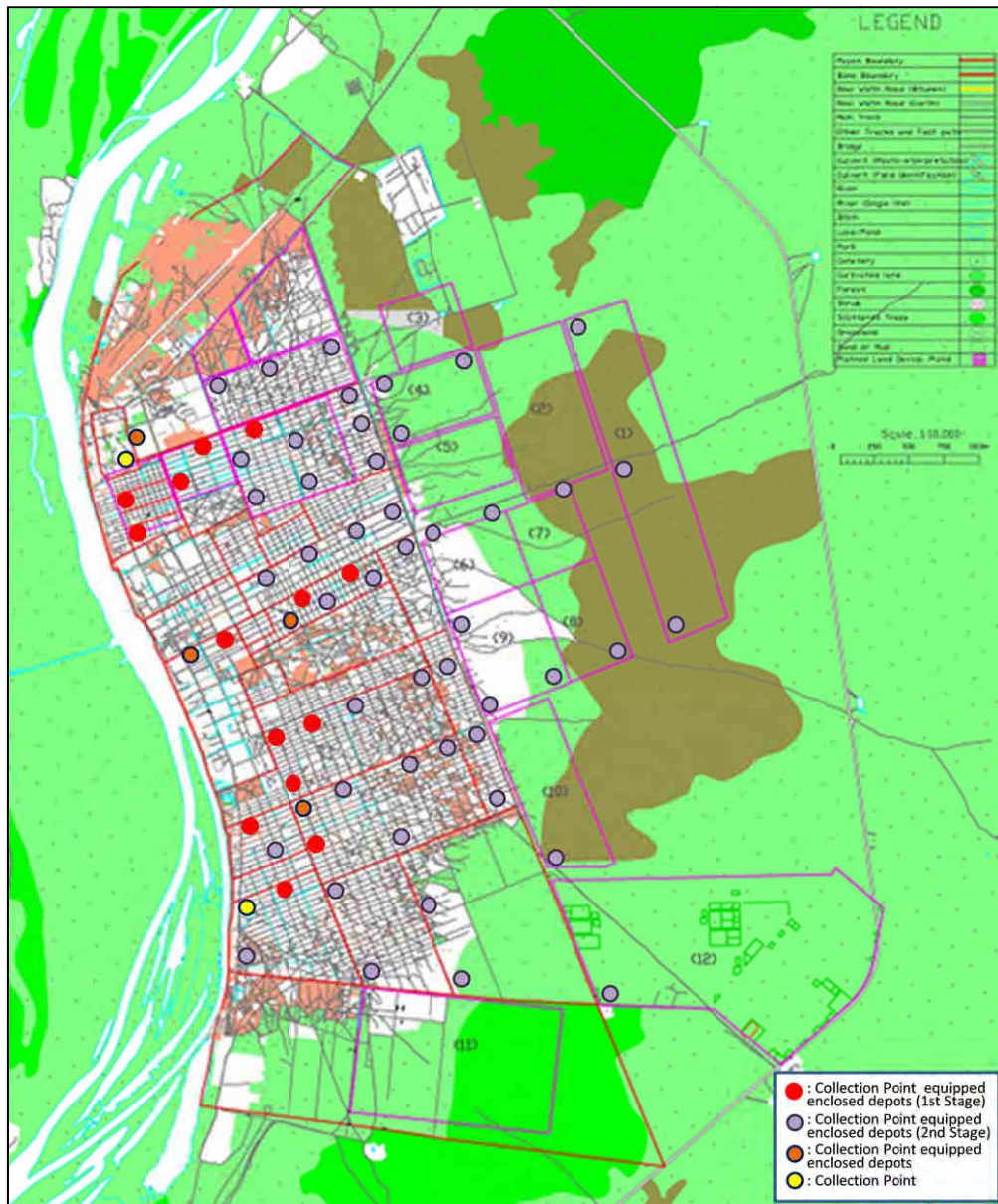


Figure 11.9-2 Proposed Locations of Collection Points

## (2) Treatment Plan

There is no intermediate treatment facility such as a composting plant, material separation facility or incinerator. Currently there is no market for compost and recyclables in Malakal Town. But intermediate treatment is one of the ways to minimize the amount of solid waste disposal. Therefore, intermediate treatment method should be taken into consideration, even though it is difficult to develop intermediate treatment facilities at present.

In fact, a lot of aluminium can are collected and the amount of plastic bottles is expected to increase rapidly. Therefore, in the first stage, a recycling area for hand separation should be developed at the landfill site, so that the waste of aluminium and plastic can be recycled.

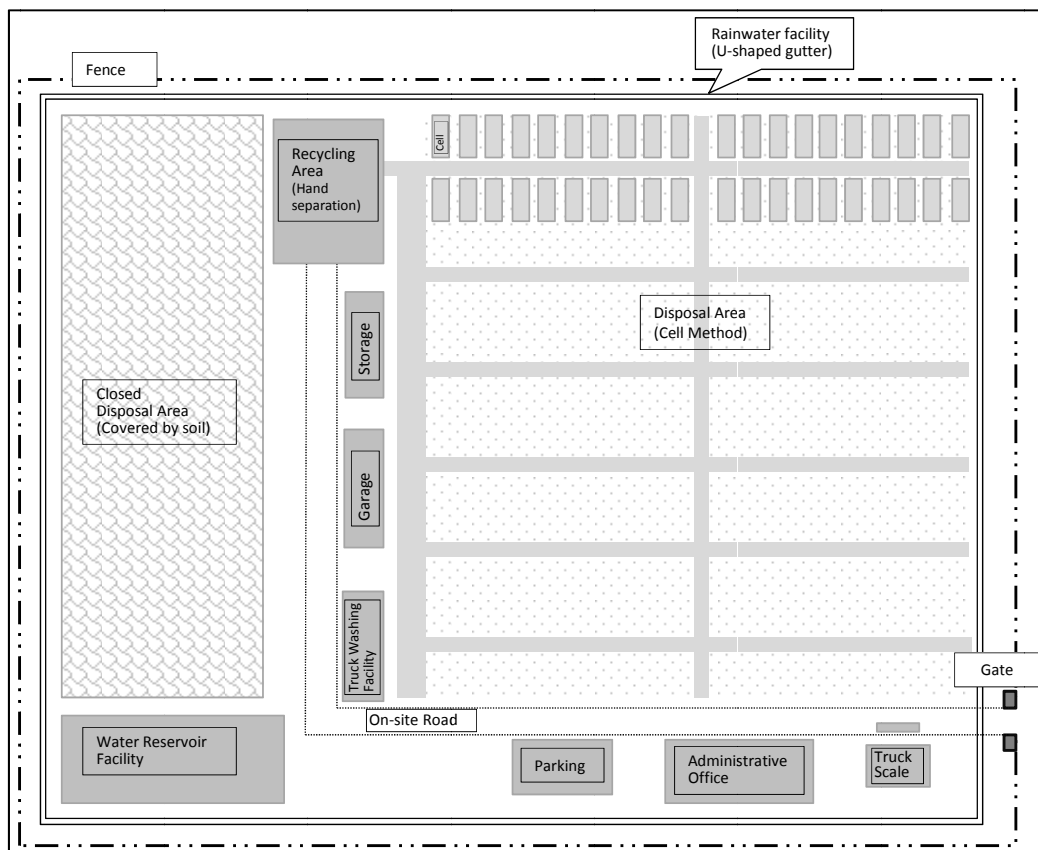


### (3) Disposal Plan

The disposal cell method, which is adopted at present, is appropriate, considering the climate of Malakal Town. However, the landfill sites have neither liner system nor leachate treatment facilities, so it is difficult to prevent the site impacting on the surrounding area.

Also there are no management facilities at the landfill site, such as administrative office, truck scale and fence. These are required to keep away the general public and to make a record of disposed solid waste. Therefore, these facilities should be constructed in the existing landfill site.

Figure 11.9-3 shows conceptual layout of facilities in the landfill site.



Source: JICA Project Team

Figure 11.9-3 Conceptual Layout of Landfill Site

### (4) Operation and Maintenance

Malakal Town, which is newly established, is responsible for waste collection and sanitary activities. However, the departments of Malakal Town are still not clearly organized. Therefore, the financial system is unclear.

Malakal Town allocates some budget for waste collection and sanitary activities based on requests from General Sanitation for Environmental Corporation Department. However, it is not enough to cover all expenditures.

The revenue waste collection tariff, collected from the door-to-door collection service, is not

enough for operation and maintenances service. And it is not clear how to collect it and how to utilize it for O&M. It is, therefore, required to enhance the tariff system along with the capacity development mentioned in the next clause.

#### **(5) Capacity Development for Solid Waste Management**

Since Malakal Town is newly established, its administrative framework is in the process of formulation. The main agency with responsibility for solid waste management is not clear. Firstly, the State Ministry of Health should be defined as the leading organization for solid waste management. After that, MoH of UNS, General Sanitation for Environmental Corporation Department and Malakal City Council should lead the following:

- (i) To define the duties and roles for solid waste management in relating agencies.
- (ii) To make plans such as an implantation plan and construction plan in line with the master plan.
- (iii) To make ordinances and regulations regarding solid waste management.
- (iv) To secure a budget for solid waste management (collection/transportation, sanitation activities, landfill management).
- (v) To develop required facilities and equipment.
- (vi) To strengthen the capacity for collection and transportation activities.
- (vii) To manage the operation and maintenance of landfill site.
- (viii) To enhance public awareness of the solid waste disposal system as well as the related administration.

### **11.10 SOLID WASTE MANAGEMENT SECTOR PROJECT**

The following solid waste plans shall be necessary in order to achieve appropriate solid waste flow mentioned above:

SM-1: Solid Waste Collection Activities Improvement Project

SM-2: Landfill Management Improvement Project

SM-3: Medical Waste Management Improvement Project

#### **(1) Solid Waste Collection Activities Improvement Project (SM-1)**

An outline of the solid waste collection activities is shown in **Table 11.10-1** and **Table 11.10-2** for Phase-1 and Phase-2 respectively.

**Table 11.10-1 Outline of Solid Waste Collection Activities Improvement Project (Phase-1)**

Project Type	Technical assistance	
Overall Goal	Sanitary situation is improved in Malakal Town.	
Project Purpose	Solid waste collection capacity for Malakal Town is enhanced.	
Implementation Agency	General Sanitation for Environmental Corporation Department	
Main Outputs, Activities	<ul style="list-style-type: none"> <li>• A more efficient solid waste collection system is reconsidered and established.</li> <li>• A construction plan for the collection points is prepared and implemented.</li> <li>• An Implementation Plan for efficient sanitation activities is prepared and implemented.</li> <li>• Public education activities are implemented to improve collection ratios.</li> <li>• Facilities and equipment to enhance capacity of collection are developed.</li> </ul> <Proposed facilities/equipment> <ul style="list-style-type: none"> <li>• Construction of collection points (73 sites) and 1 workshop</li> <li>• Procurement of collection vehicles (6 vehicles) for 2017</li> </ul>	
Project Cost	Collection vehicles 6 vehicles, V=12m <sup>3</sup>	US\$1.8 million
	Workshop	US\$0.3 million
	Collection points 73 sites	US\$0.2 million
	Project Implementation 9 experts	US\$2.7 million
	Total	US\$5.0 million

Source: JICA Project Team

**Table 11.10-2 Outline of Solid Waste Collection Activities Improvement Project (Phase-2)**

Project Type	Financial assistance	
Overall Goal	Sanitary situation is improved in Malakal Town.	
Project Purpose	Solid waste collection capacity for Malakal Town is enhanced.	
Implementation Agency	General Sanitation for Environmental Corporation Department	
Main Outputs, Activities	<ul style="list-style-type: none"> <li>• Collection system to collect solid waste efficiently is reconsidered to improve collection ratio.</li> <li>• Collection vehicles to enhance capacity of collection are procured.</li> </ul> <Proposed facilities/equipment> <ul style="list-style-type: none"> <li>• Procurement of collection vehicles (7 vehicles) for 2022</li> </ul>	
Project Cost	Collection vehicles 7 vehicles, V=12m <sup>3</sup>	cost US\$2.1 million

Source: JICA Project Team

**(2) Landfill Management Improvement Project (SM-2)**

An outline of the solid waste plan for improvement facilities relating to Landfill Management is shown in **Table 11.10-3**.

**Table 11.10-3 Outline Landfill Management Improvement Project**

Project Type	Financial assistance	
Overall Goal	Sanitary situation is improved in Malakal Town.	
Project Purpose	Solid waste generated from Malakal Town is properly treated and disposed of.	
Implementation Agency	Ministry of Physical Infrastructure and Rural Development	
Main Outputs, Activities	<ul style="list-style-type: none"> <li>• Landfill site is properly managed.</li> <li>• Construction plan on disposal cell is prepared.</li> <li>• Related facilities for landfill site are developed.</li> </ul> <Proposed related facilities> <ul style="list-style-type: none"> <li>• Administrative building</li> <li>• Truck Scale</li> <li>• Recycling area</li> <li>• Drainage (3,000m)</li> <li>• Gate and Fence (2,000m)</li> </ul>	
Project Cost	Administrative building	US\$0.2 million
	Weight scale 30t, 3m×8m	US\$0.5 million
	Drainage, Gate, Fence	Drainage: 3,000m, Fence: 2,000m
	Detailed Design & Supervision 6 experts	US\$1.0 million
	Total	US\$2.7 million

Source: JICA Project Team

### (3) Medical Waste Management Improvement Project (SM-3)

Outline of the solid waste plan for improvement of medical waste management is shown in **Table 11.10-4**.

**Table 11.10-4 Outline of Medical Waste Management Improvement Project**

Project Type	Technical assistance	
Overall Goal	Medical waste management is improved in Malakal Town.	
Project Purpose	Capacity of management for medical waste is developed at Educational Hospital.	
Implementation Agency	MoH, Educational Hospital	
Main Outputs, Activities	<ul style="list-style-type: none"> <li>• Medical waste is properly managed by medical staff.</li> <li>• Source separation of medical waste is enhanced at hospital.</li> <li>• Infectious medical waste is properly incinerated.</li> </ul>	
Project Cost	Project Implementation	5 experts US\$2.0 million

Source: JICA Project Team

## 11.11 IDENTIFIED CD NEEDS FOR SOLID WASTE MANAGEMENT SECTOR

Identified Capacity Development (CD) needs for Energy Sector related to the proposed projects are presented in **Table 11.11-1** by level and by scheme. The following training was provided to the staff of the relevant departments including MoH under the Project: 1) English documentation training/Information Technology (IT) skill training; 3) Accounting training; and 4) Project Management Training. (See the detail in **Chapter 15**.)

**Table 11.11-1 Capacity Development Logframe (Solid Waste Management Sector)**

(As of August 2012)

Area	CD items	Individual	Organization	Institution	Target	Urgent Project	Technical Cooperation	Training in OECD countries	Training in neighboring countries	WS/Training in South Sudan
Solid Waste Management	Establishment of new collection system	Operation of collection vehicle	To organize the division of waste collection To allocate human resources To allocate budget	To establish new collection system of solid waste	Malakal City Council		✓	✓		✓
	Making the collection plan	Planning method	To strengthen the division of planning To allocate human resources To allocate budget	To set up a proper plan on collection	Malakal City Council		✓	✓		✓
	Implementation of the plan	Monitoring and reporting method Evaluation method	To strengthen M&E division To allocate human resources To allocate budget		Malakal City Council		✓	✓		
	Dissemination of activities	Method of people's awareness raising	To set up the series of dissemination activities		Malakal City Council		✓	✓		✓
	O&M	Maintenance of collection vehicles Maintenance of collection points Maintenance of landfill	To manage the budget To allocate human resources To manage allocated budget	To establish maintenance plan of vehicle and needed equipment To establish maintenance plan of landfill To plan and allocate the budget needed to implement the plans	Malakal City Council		✓	✓		✓
	Making a plan on landfill			To institutionalize to construct/set up new landfill cell To make a plan of landfill construction	Malakal City Council		✓	✓		
	Construction of the landfill	Planning and designing Supervision			Malakal City Council		✓	✓		
	Treatment of medical waste	Treatment method of medical waste	To organize the division of the treatment of medical waste To allocate human resources (technicians) To manage allocated budget	To establish the regulation of the treatment of medical waste To set up the guideline of the treatment of medical waste To plan and allocate budget to treat medical waste in alignment with the guideline	Malakal City Council SMoH		✓	✓		

Source: JICA Project Team