



The Provision of Consultancy Services for Study and Design of Storm Water Drainage System and Preparation of Drainage & Sanitation Development Plan (DSDP) for Dodoma City for a period of 2020-2040



DRAINAGE AND SANITATION DEVELOPMENT PLAN (DRAFT)

JAN. 2020



AJOMA CONSULT LIMITED

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The Provision of Consultancy Services for Study and Design of Storm Water Drainage System and Preparation of Drainage & Sanitation Development Plan (DSDP) for Dodoma City for a period of 2020-2040



Introduction

I INTRODUCTION

■ Necessity of the DSDP Project

• Current Problems on Sanitation System

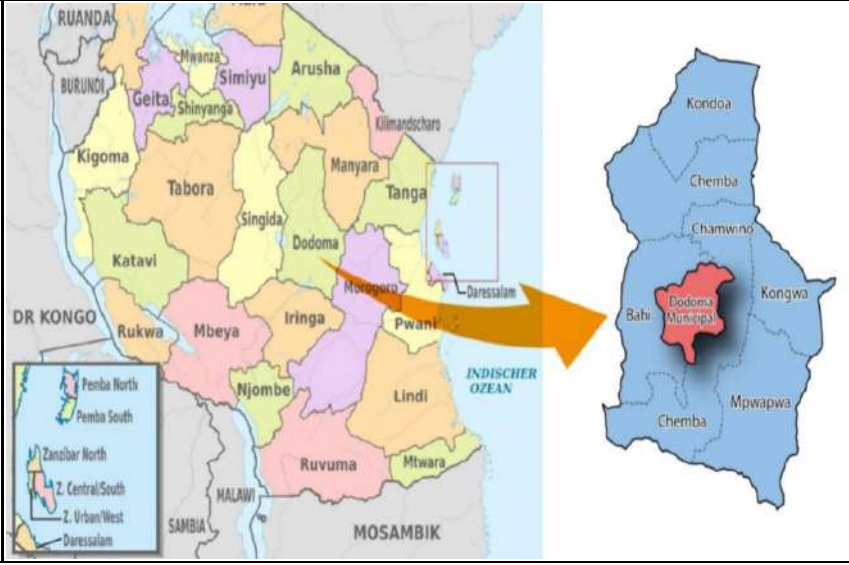


• Current Problems on Drainage System



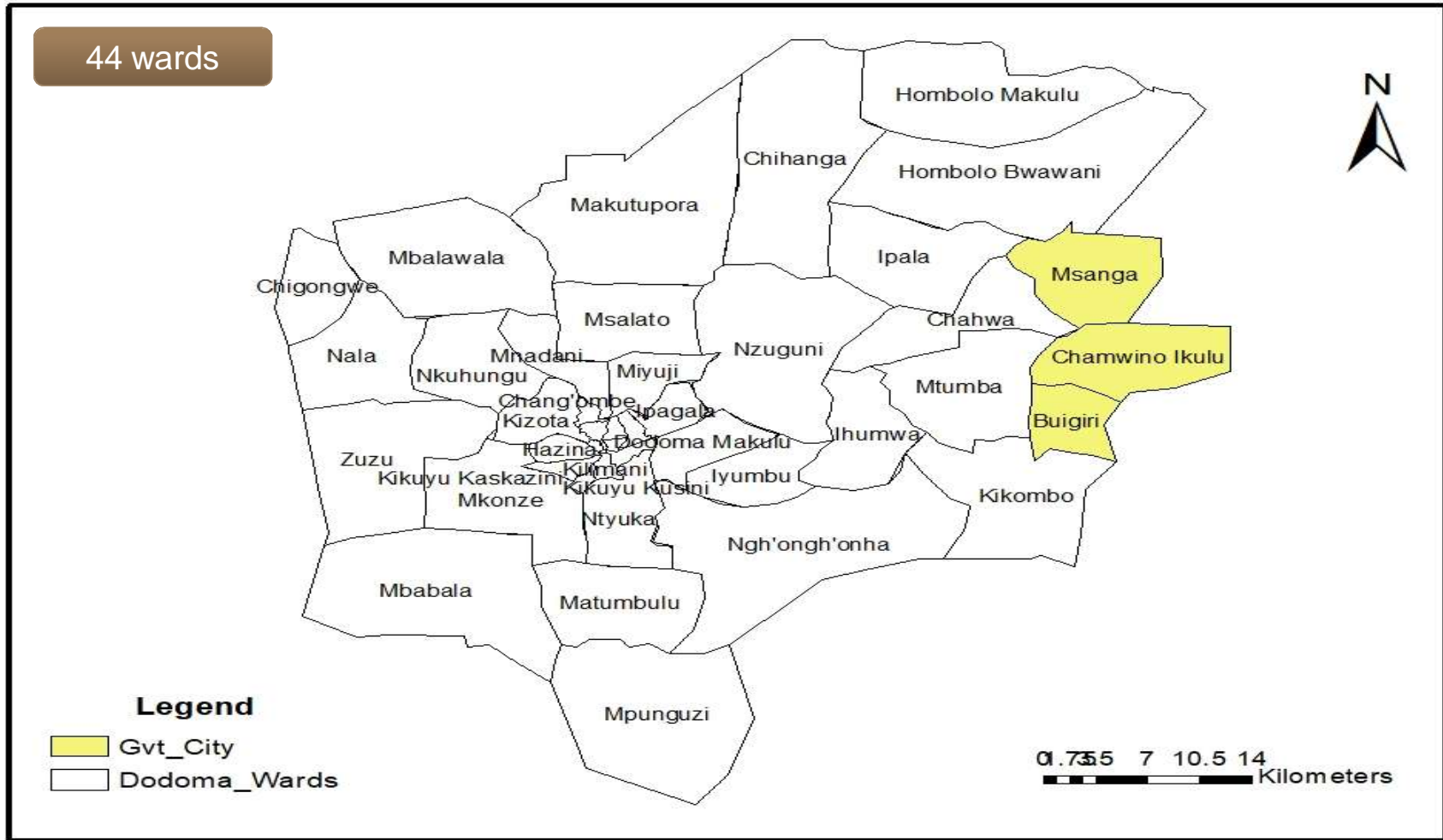
I INTRODUCTION

■ Project Overview

Item	Description
<p>Temporal Scope</p>	<ul style="list-style-type: none"> • 2020 - 2040 - Short - term Period : 2020 - 2025 - Medium - term Period : 2026 - 2035 - Long - term Period : 2036 - 2040
<p>Spatial Scope</p>	<ul style="list-style-type: none"> • The whole area of Dodoma City and; • 3 Wards (Msanga, Buigiri, Chamwino Ikulu) • Total 44 wards  <p>The map shows the geographical context of Dodoma City within Tanzania. The main map displays regional boundaries including Ruanda, Burundi, Geita, Shinyanga, Simiyu, Arusha, Kilimandscharo, Manyara, Tanga, Singida, Dodoma, Katavi, Tabora, Kigoma, Rukwa, Mbeya, Iringa, Pwani, Lindi, Mtwara, Ruvuma, DR KONGO, MALAWI, SAMBIA, and MOSAMBIK. An inset map of Dodoma City shows the following wards: Kondoa, Chembra, Chamwino, Kongwa, Bahi, Dodoma Municipality (highlighted in red), and Mpwapwa. The Indian Ocean (INDISCHER OZEAN) is also labeled.</p>
<p>Client</p>	<p>The City Council of Dodoma (CCD)</p>
<p>Consultants</p>	<ul style="list-style-type: none"> • Cheil Engineering Co., Ltd. (in Korea) • AJOMA Consult Limited (in Tanzania)

I INTRODUCTION

■ Project Area



I INTRODUCTION

■ Population Projection

Year	Population	Reference	Remark
2012	410,956	2012 National Census	<ul style="list-style-type: none"> • Without the 3 wards: <i>Msanga; Chamwino Ikulu; and Buigiri</i> • <i>Growth Rate : 5.5 %</i>
2019	579,590	Dodoma city Master Plan	
2025	844,118	Short-term Period	<ul style="list-style-type: none"> • Including the 3 wards • <i>Growth Rate : 5.5 %</i>
2035	1,441,875	Medium-term Period	
2040	1,884,473	Long-term Period	

$P_t = P_o(1+r)^t$ Formula for Geometric Series

Where,

P_t : Projected population after t years

P_o : Present population

r : Rate of growth

t : Number of years over which growth is to be measured

I INTRODUCTION

■ Focus Group Discussions

SN	FOCUS GROUP	DATE
1	DUWASA	16/10/2019
2	TANROADS	23/10/2019
3	TARURA	23/10/2019
4	RAS	24/10/2019
5	DAS	24/10/2019
6	DC	25/10/2019
7	Urban-Planners, Sociologists Environmentalists	25/10/2019
8	TRC	29/10/2019
9	Infrastructure Ministry	30/10/2019
10	Ministry of water and Irrigation	31/10/2019
11	Ministry of Lands, Housing and Human Settlements Dev.	01/11/2019
12	Water Basin (Wami-Ruvu)	05/11/2019
13	PO-RALG	06/11/2019
14	RUWASA and City Engineer	06/11/2019
15	Management Team of Chamwino District	07/11/2019
16	Management Team of CCD	11/11/2019

I INTRODUCTION

■ Focus Group Discussion



Consultancy Services for Study and Design of Storm Water Drainage System and Preparation of Drainage & Sanitation Development Plan(DSDP) for Dodoma City for a Period of 2020-2040

I INTRODUCTION

■ Presentation on the Draft DSDP at LGAs Level



The Provision of Consultancy Services for Study and Design of Storm
Water Drainage System and Preparation of Drainage & Sanitation
Development Plan (DSDP) for Dodoma City for a period of 2020-2040


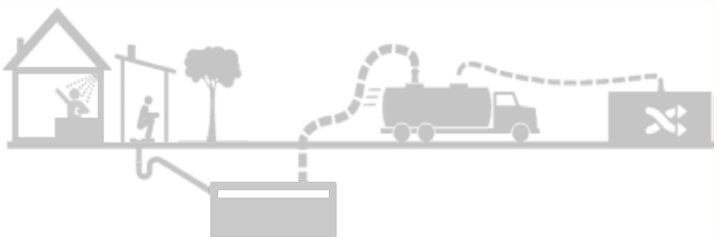


Sanitation Development Plan



II SANITATION DEVELOPMENT PLAN

■ Current Status of Existing Sanitation System

Item	Offsite Sanitation System	Onsite Sanitation System	
		Septic Tanks	Pit Latrines
Diagram			
Coverage Rate	6.0%	21.3%	71.3%
Waste Collection Method	Piped Sewerage System (Trunk Mains : 30.2km) (Reticulation Sewers : 58km)	Vacuum Tankers (10 Vacuum Tankers)	
Wastewater Treatment & Disposal	Waste Stabilization Ponds (WSPs)		

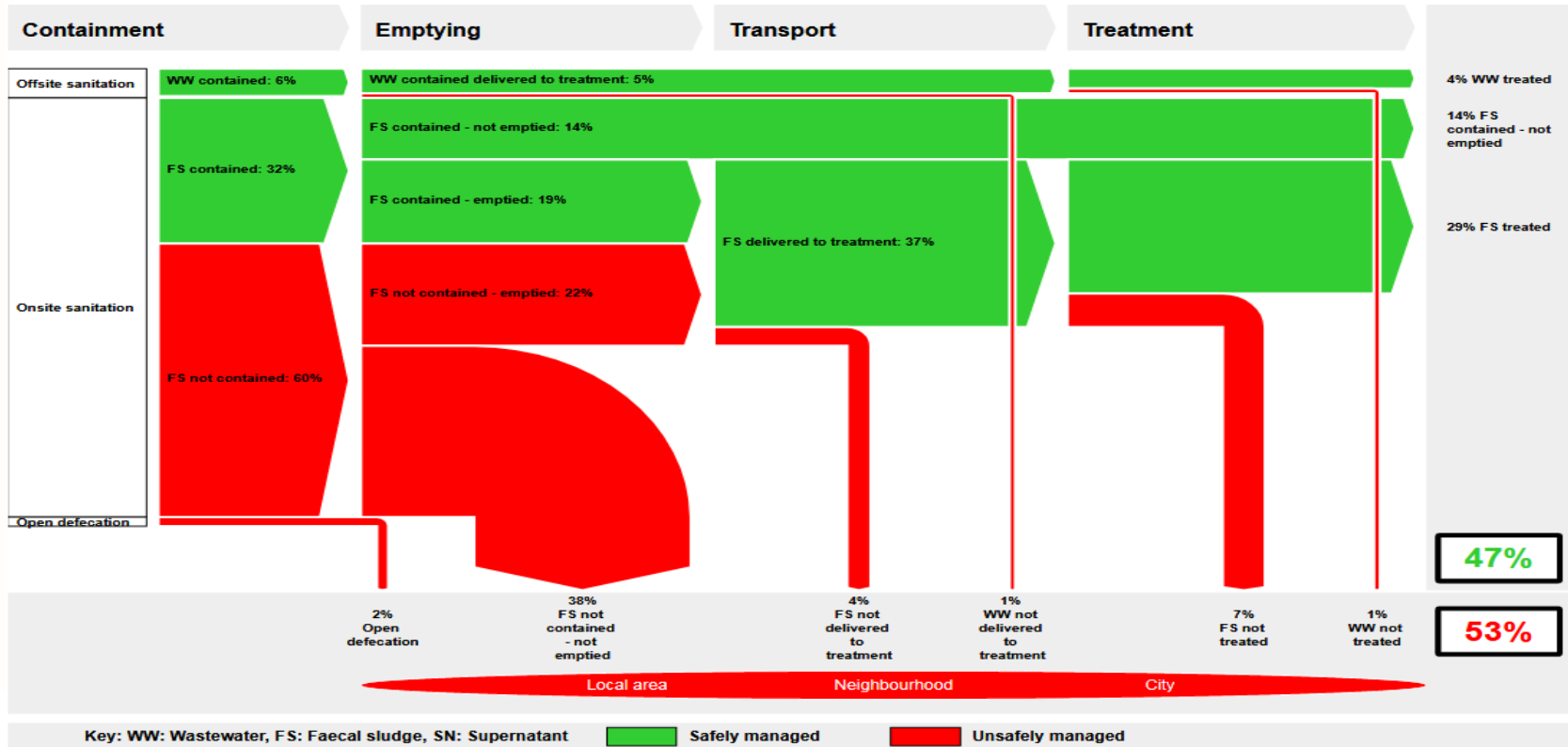
“Need to Expand the Offsite Sanitation System”

II SANITATION DEVELOPMENT PLAN

Shit Flow Diagram

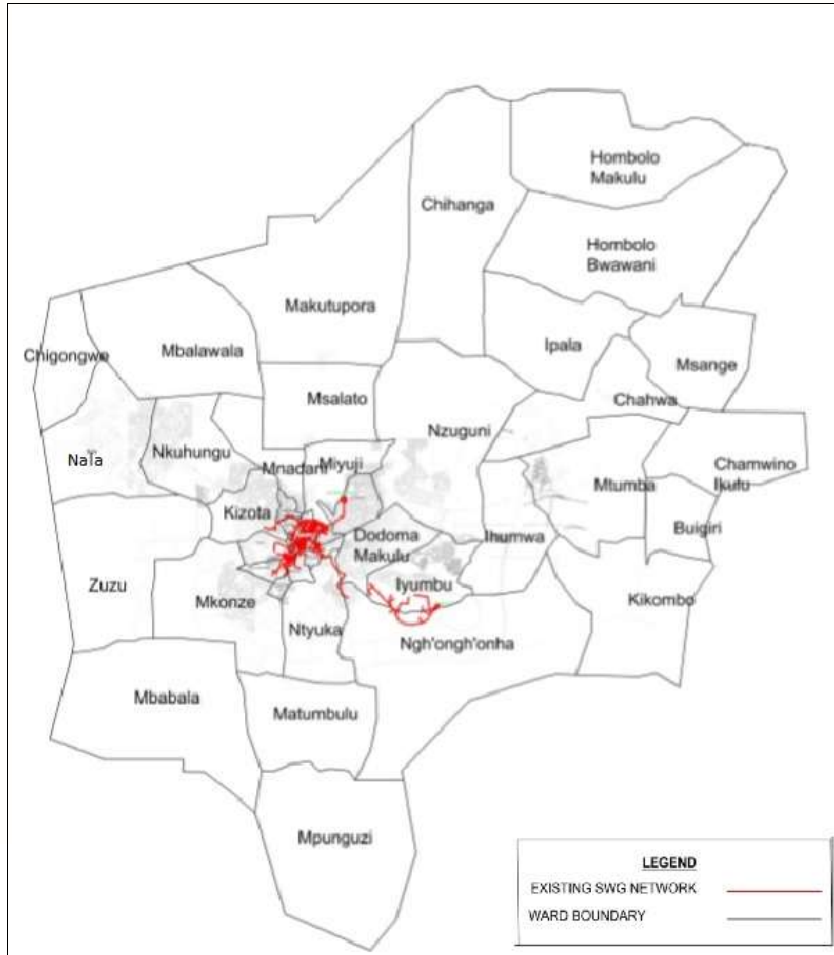
Dodoma, Dodoma Region, Tanzania
 Version: Draft
 SFD Level: 3 - Comprehensive SFD

Date prepared: 14 Nov 2019
 Prepared by: Cheil Engineering/Ajoma consul



II SANITATION DEVELOPMENT PLAN

Existing Offsite Sanitation System

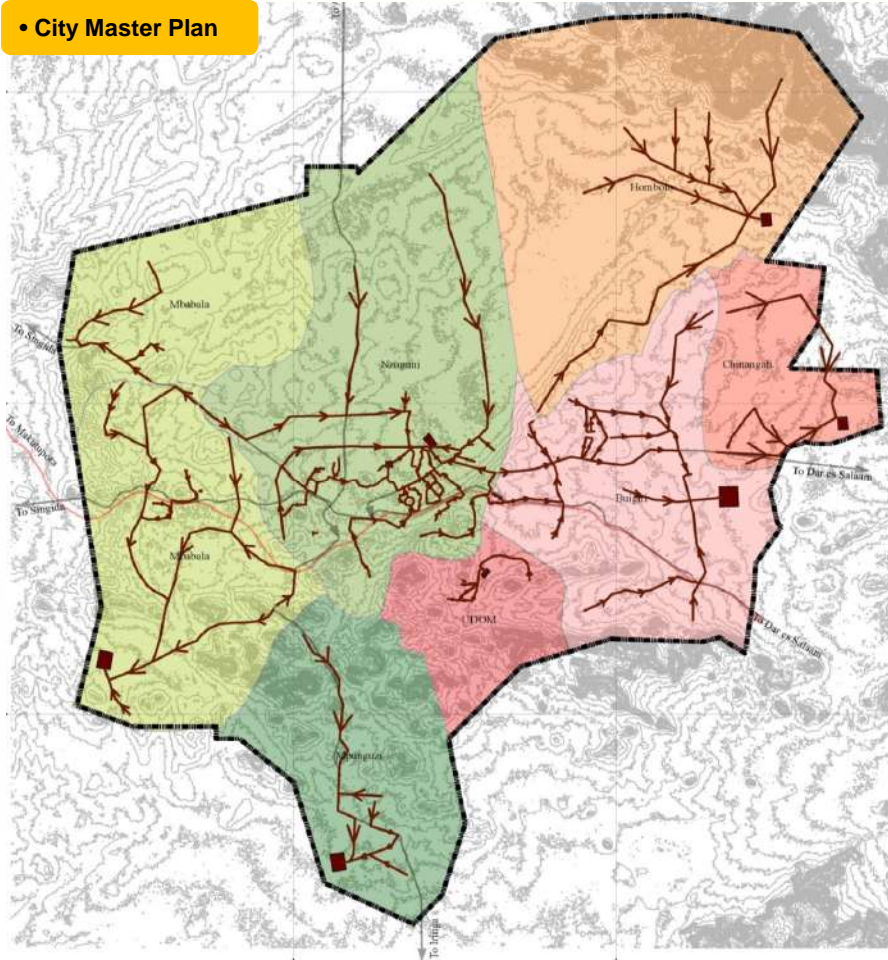


Central Area of Dodoma City			
Sewerage	No. of Ward	Dia.(mm)	Length(km)
Trunk Sewer	15	250-1000	30.2
Reticulation Sewer	12	150-350	58.0
Wastewater Treatment	Swaswa WSPs Design Capacity: Q=6,120m ³ /day Current Wastewater Flow : Q=4,320m ³ /day		
University of Dodoma			
Sewerage	No. of Ward	Dia.(mm)	Length(km)
Trunk Sewer	2	300	9.3
Reticulation Sewer	2	250	1.8
Wastewater Treatment	Udom WSPs Design Capacity: Q=9,000m ³ /day Current Wastewater Flow : Q=3,600m ³ /day		

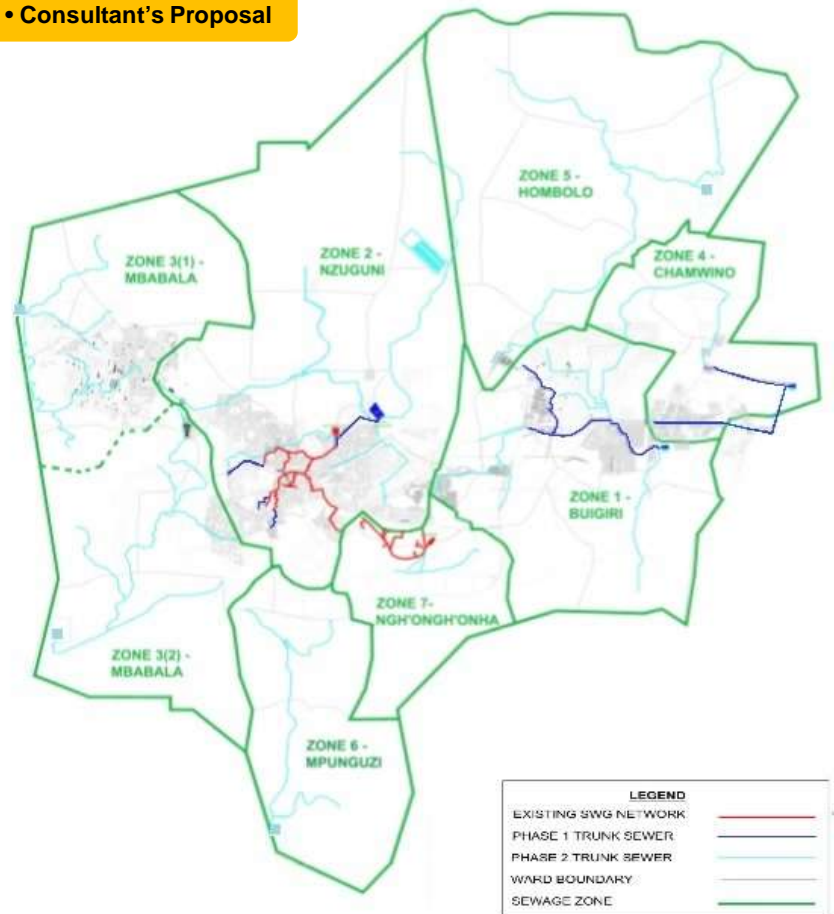
II SANITATION DEVELOPMENT PLAN

Wastewater Treatment Zones

• City Master Plan



• Consultant's Proposal



II SANITATION DEVELOPMENT PLAN

■ Wastewater Flow Projection (1)

Item	Target Year	
	2025 (Short-term period)	2040 (Long-term period)
Population	844,118	1,884,473
Domestic Water Demand (m ³ /d)	108,107	229,046
Non-domestic Water Demand (m ³ /d)	42,412	75,321
Total Water Demand (m³/d)	150,519	304,367
Applied conversion rate	75%	
Domestic & Non-domestic Wastewater Flow (m ³ /d)	112,889	228,275
Infiltration Allowance	20%	
Total Wastewater Flow (m³/d)	135,467	273,930

II SANITATION DEVELOPMENT PLAN

■ Wastewater Flow Projection (2)

S/No.	Description	Projected Wastewater in 2025 (m ³ /d)	Projected Wastewater in 2040 (m ³ /d)
1	Zone 1- Buigiri	22,573	41,746
2	Zone 2 – Nzuguni	73,538	150,326
3	Zone 3 – Mbabala(N)	7,918	16,470
4	Zone 4 – Mbabala(S)	7,777	16,248
5	Zone 5 – Chinangali	5,523	11,713
6	Zone 6 – Hombolo	9,612	19,966
7	Zone 7– Mpunguzi	5,043	10,421
8	Zone 8 – Udom	3,482	7,040
Total		135,467	273,930

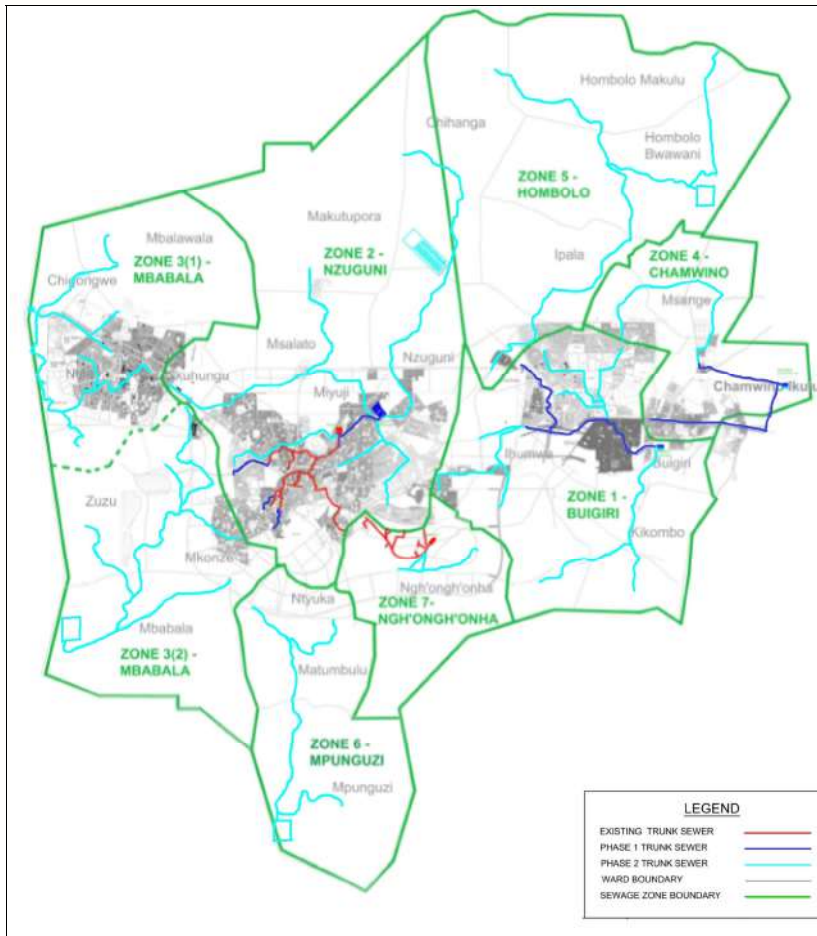
II SANITATION DEVELOPMENT PLAN

■ Phased Objectives

Phase	Targeted Coverage Rate by Sewerage System (%)	Objectives
Short-Term Period (2020 – 2025)	25.6%	<ul style="list-style-type: none"> • Expansion the existing sewerage system in the central area. • Construct a new Nzuguni WSPs and a pipeline to connect with the WSPs. • Construct a new sewerage system for government city and Chamwino Ikulu ward. • Construct a new WSPs in the Buigiri zone which will treat wastewater discharged from the government city. • Construct a new WSPs in the Chinangali zone which will treat wastewater discharged from the State House. • Campaign and education for sanitation and hygiene development • Improve the sanitation and hygiene environment for public buildings such as hotel, shopping center, school, hospital, public office and recreational facility, etc. • Improve the tariff system for sustainable management.
Medium-Term Period (2026 – 2035)	81.1%	<ul style="list-style-type: none"> • Construct a new sewerage system for the remaining central area. • Construct a new WSPs for covering the whole Nzuguni zone. • Construct a new sewerage system for areas which are located on a zone having impermeable soil and contaminated groundwater. • Rearrange the institutional frameworks of DUWASA and RUWASA to be responsible for managing onsite sanitation system • Establish a tax incentive to encourage people who uses onsite systems to connect to a sewerage system. • Changes in regulations to force people to use the sewerage system or advanced onsite system for buildings to be constructed.
Long-Term Period (2036 – 2040)	98.9%	<ul style="list-style-type: none"> • Strengthen the regulations about wastewater discharged from industrial factory and hospital, etc. • Construct a new trunk mains to cover the whole city. • Apply a advanced wastewater treatment technology on the WWTP. • Establish a local fund and legal aid provisions to support poor residents who are in a poor sanitation environment in the City.

II SANITATION DEVELOPMENT PLAN

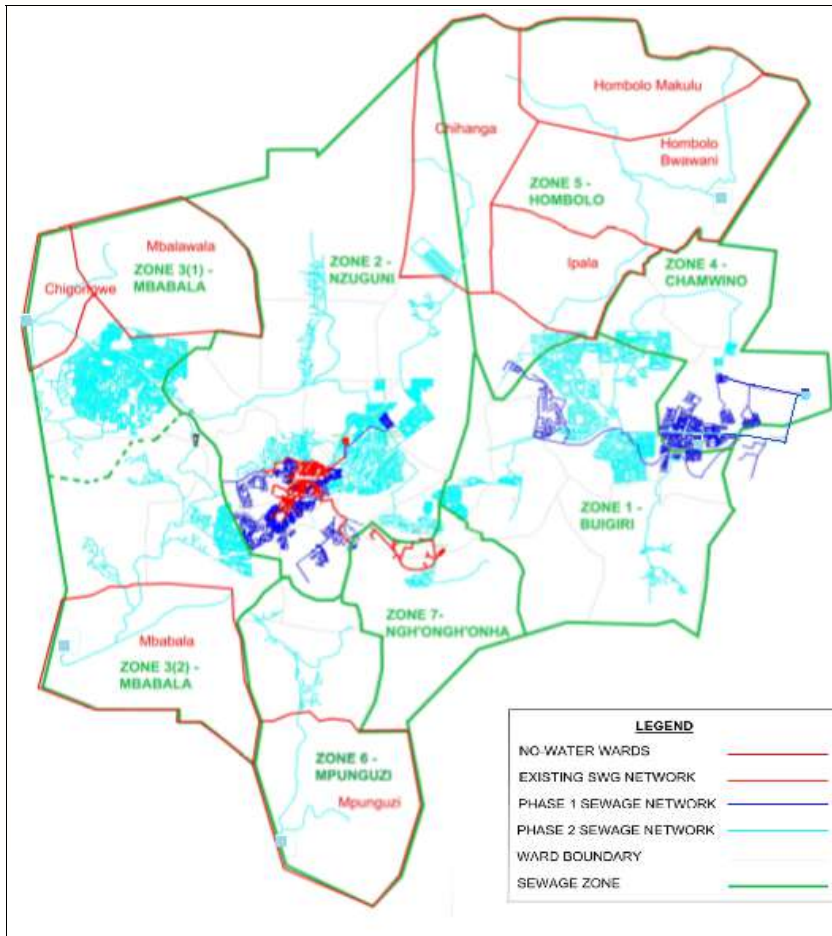
■ A Plan for Trunk Sewers



Zone Name	Trunk Sewer(km)		
	2020 - 2025	2026 - 2035	2035 - 2040
Buigiri Zone (Zone 1)	26.8	61.0	-
Nzuguni Zone (Zone 2)	12.5	86.6	-
Mbabala Zone (Zone 3 & 4)	-	119.7	-
Chinangli Zone (Zone 5)	21.6	19.5	-
Hombolo Zone (Zone 6)	-	63.1	-
Mpunguzi Zone (Zone 7)	-	35.3	-
Udom Zone (Zone 8)	-	18.3	-
Total	60.9	403.5	-

II SANITATION DEVELOPMENT PLAN

■ A Plan for Reticulation Sewers



Zone Name	Reticulation Sewer(km)		
	2020 - 2025	2026 - 2035	2035 - 2040
Buigiri Zone (Zone 1)	29.5	303.5	-
Nzuguni Zone (Zone 2)	263.9	615.4	31,6
Mbabala Zone (Zone 3 & 4)	-	651.8	242.9
Chinangli Zone (Zone 5)	199.1	71.6	-
Hombolo Zone (Zone 6)	-	18.8	310.8
Mpunguzi Zone (Zone 7)	-	22.0	87.8
Udom Zone (Zone 8)	-	18.8	-
Total	492.5	1,701.9	673.1

II SANITATION DEVELOPMENT PLAN

■ A Plan for Wastewater Stabilization Ponds (WSPs)

Treatment Zone	Facilities Name	Design Capacity (m ³ /d)	Dimensions of Ponds (mL × mW × mHe × No. of Ponds)			Sludge Drying Beds (m ²)	Required Area(ha)	Period to Implement
			Anaerobic	Facultative	Maturation			
Zone 1 – Buigiri	Buigiri	18,000	75×50×3.5×2	220×200×2×2	250×210×1×2	12,130	35	Short-term
		24,000	80×65×3.5×2	250×235×2×2	280×250×1×2	16,170	46	Medium-term
Zone 2 – Nzuguni	Nzuguni	34,000	100×70×3.5×2	300×275×2×2	330×300×1×2	22,900	61	Short-term
	Chihanga	117,000	170×145×3.5×2	550×515×2×2	600×570×1×2	78,800	155	Medium-term
Zone 3 & 4 – Mbabala	Mbabala(N)	16,000	70×50×3.5×2	210×185×2×2	230×205×1×2	10,780	33	Medium-term
	Mbabala(S)	16,000	70×50×3.5×2	210×185×2×2	230×205×1×2	10,780	33	Medium-term
Zone 5 – Chinangali	Chamwino Ikulu	6,000	40×32×3.5×2	130×115×2×2	140×125×1×2	4,040	16	Short-term
		6,000	40×32×3.5×2	130×115×2×2	140×125×1×2	4,040	16	Medium-term
Zone 6 – Hombolo	Hombolo	20,000	70×60×3.5×2	230×215×2×2	260×225×1×2	13,480	40	Medium-term
Zone 7 – Mpunguzi	Mpunguzi	10,000	50×45×3.5×2	170×145×2×2	180×165×1×2	6,740	23	Medium-term

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Storm Water Drainage Development Plan

III STORM WATER DEVELOPMENT PLAN

■ Rainfall Runoff Modeling

■ Design Storms Rainfall Intensity

Daily maximum rainfall data were used to estimate maximum rainfall intensity for different return periods based on Gumbel distribution.

The probability density function [f(R)] and Cumulative Distribution Function [F(R)] of Gumbel distribution is given by:

$$f(R) = \frac{e^{-\frac{(R_i - \alpha)}{\beta}} e^{-\frac{(R_i - \alpha)}{\beta}}}{\beta}, R_i, \beta > 0$$

$$F(R) = e^{-e^{-\frac{(R_i - \alpha)}{\beta}}}$$

- where α and β are location and scale parameters.

$$R_T = \alpha + Y_T \beta$$

- where

$$\alpha = \bar{R} - 0.5772157\beta$$

$$\beta = \left(\frac{\sqrt{6}}{\pi}\right) S_R$$

$$Y_T = -\text{Ln}(-\text{Ln}(1 - (1/T)))$$

- where \bar{R} and S_R are the mean and standard deviation of the recorded rainfall data.

III STORM WATER DEVELOPMENT PLAN

■ Extreme rainfall Estimates

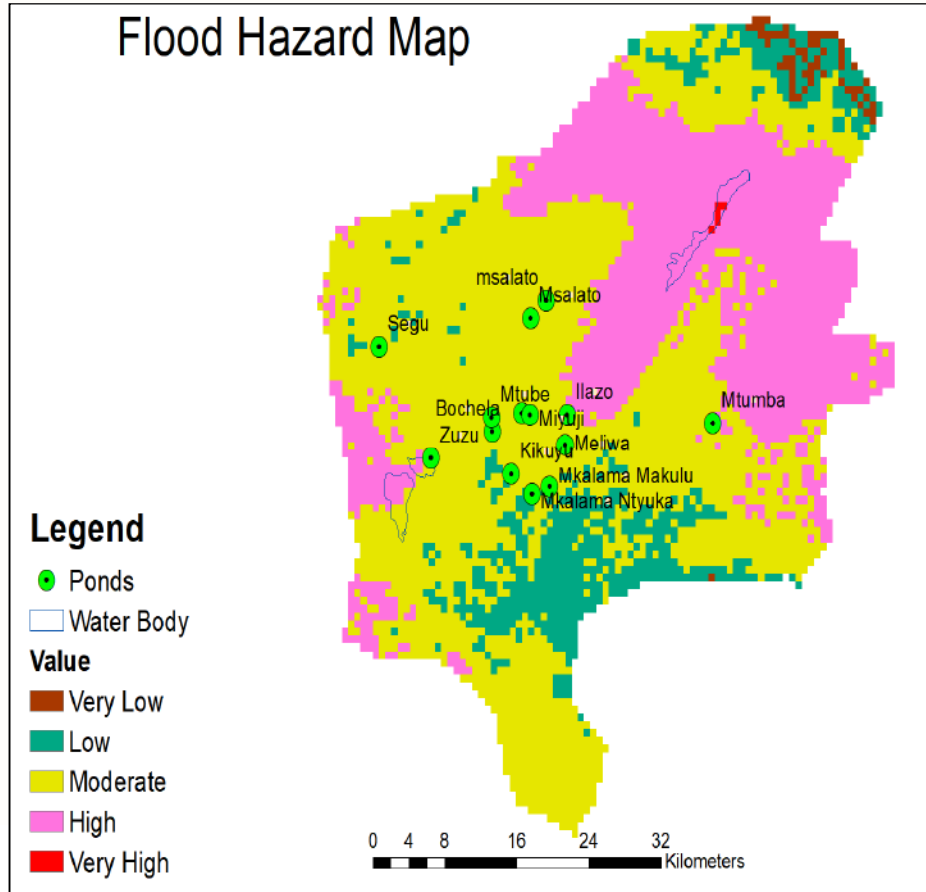
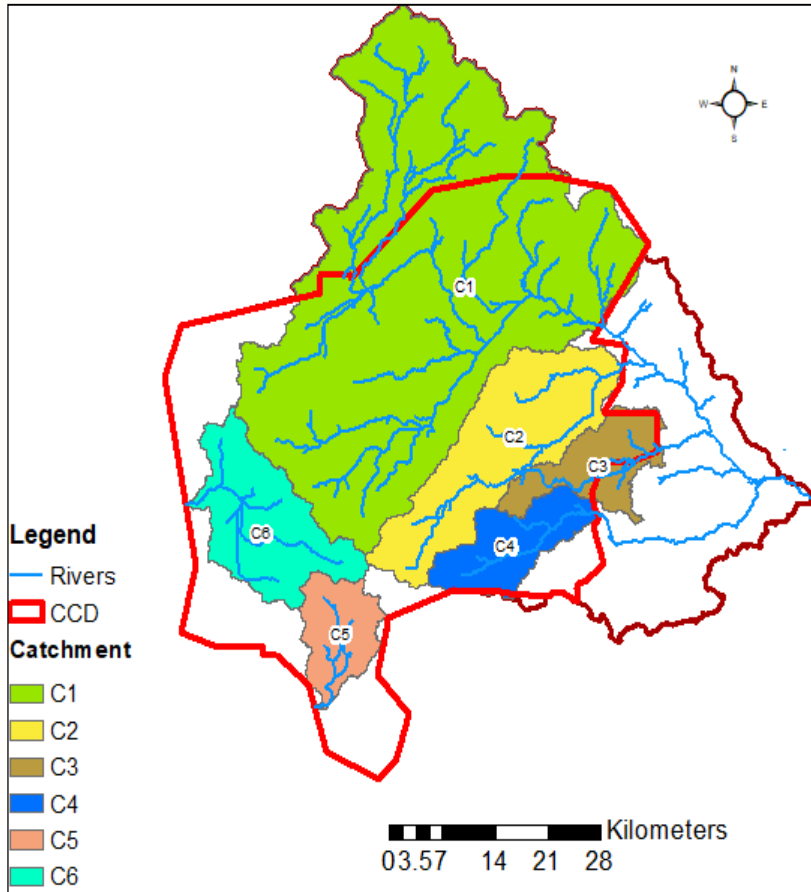
- Gumbel based extreme rainfall estimates for different return periods in the stations within and around CCD

Return Period, T (Years)	Gumbel Variate	Estimated Extreme Rainfall, R_T (mm)					
		Dodoma Airport	Bihawana Farmers	Bihawana Seminary	Mlowa Dam	Matambulu Dam	Dodoma Maji
2	0.37	67.03	71.17	67.45	51.69	59.99	63.12
10	2.25	93.84	138.00	94.44	84.52	93.63	91.01
20	2.97	104.09	163.54	104.76	97.07	106.48	101.66
50	3.90	117.35	196.60	118.11	113.30	123.12	115.46
100	4.60	127.29	221.37	128.11	125.47	135.59	125.79

III

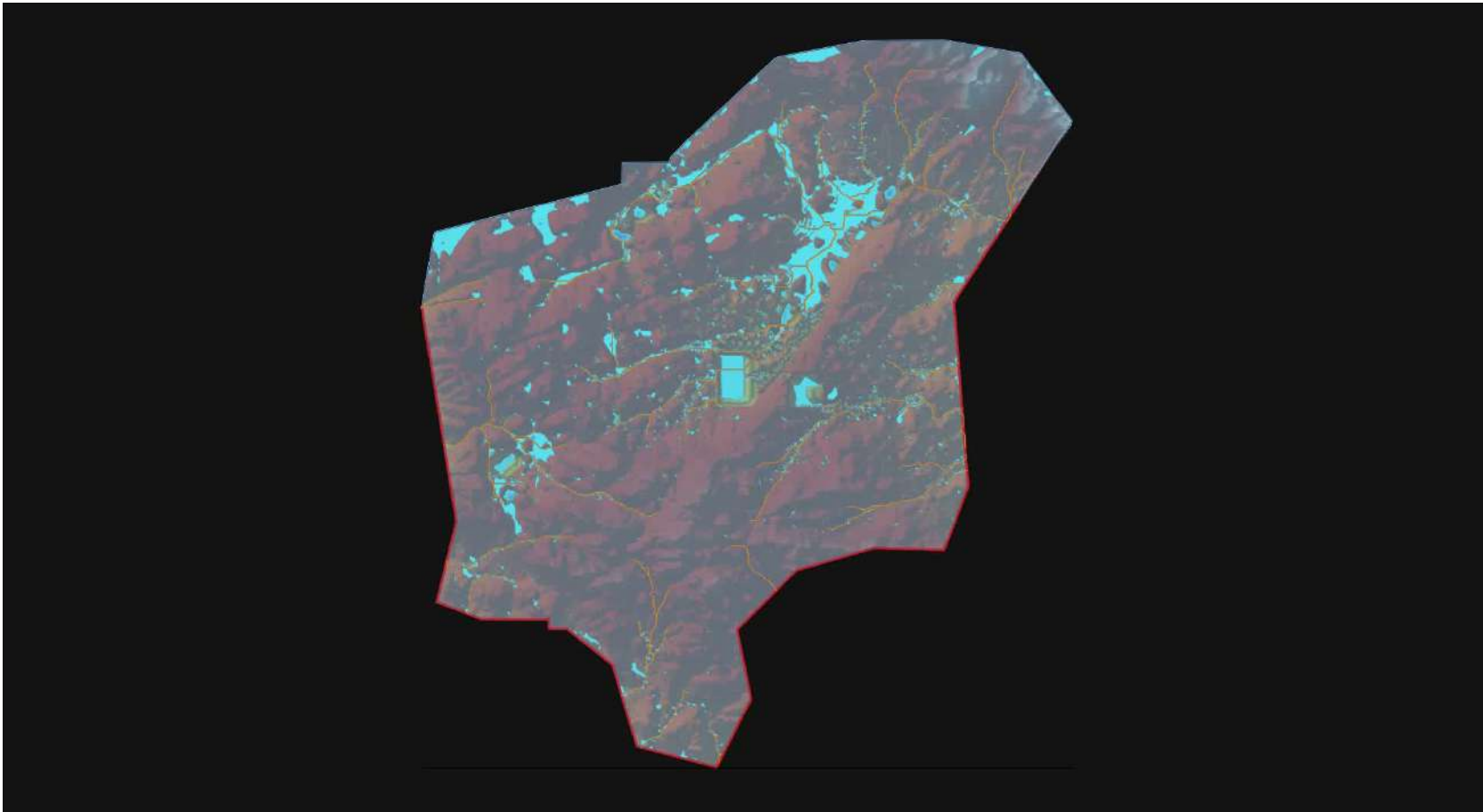
STORMWATER DRAINAGE SECTOR

Results of Baseline Assessment



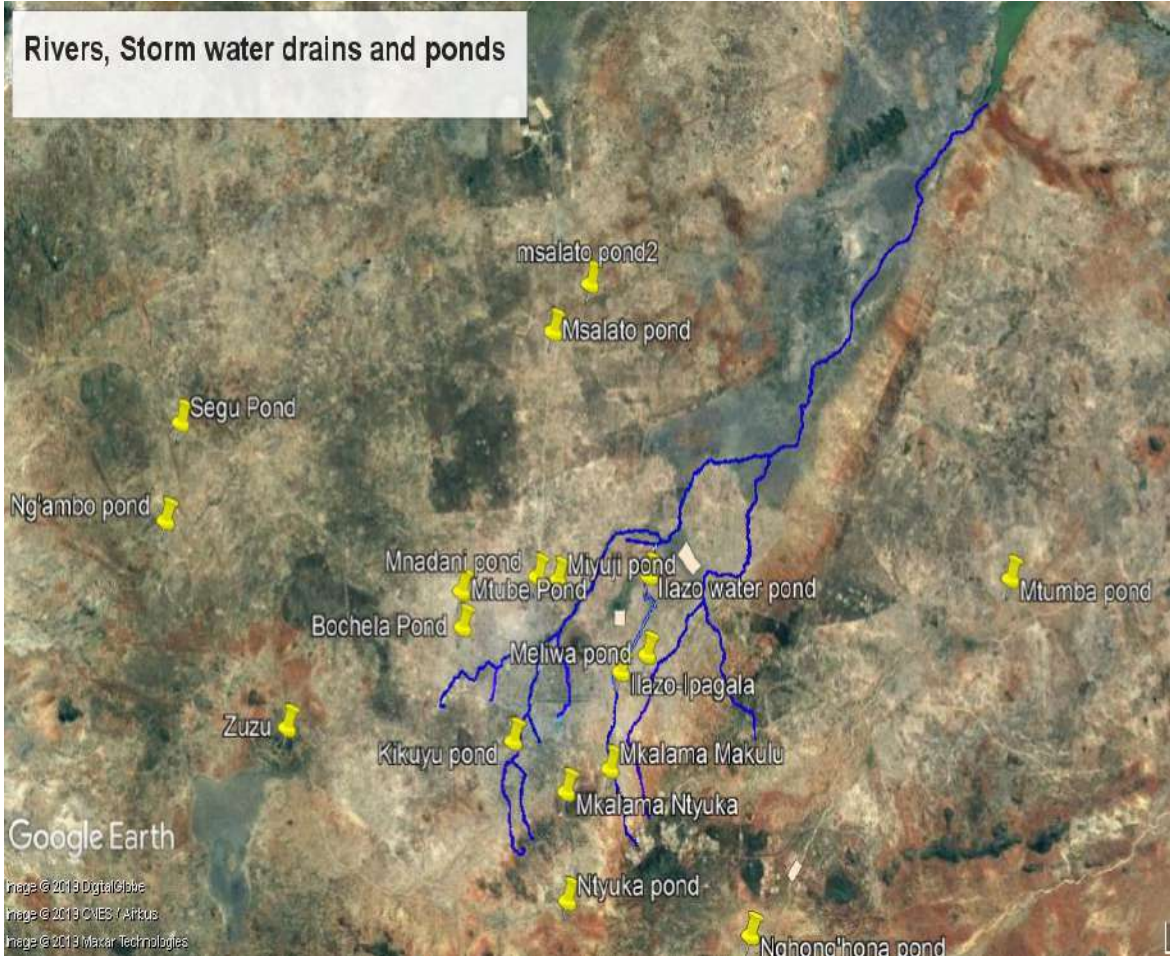
III STORM WATER DEVELOPMENT PLAN

■ Results of Flood Model (Video Clip)



III STORM WATER DEVELOPMENT PLAN

Existing Storm Water Drainage System



Name	Length
Pombe River	17.8 km
Imagi River	3.31 km
Kikuyu River	3.55 km
Mkalama River	6.15 km
Kisasa Storm Drain	9.36 km
Kizota Storm Drain	1.23 km
Mwangaza Storm Drain	12.02 km
Sabasaba storm Drain	3.35 km
Nkuhungu Storm Drain	6.20 km
Ilazo Ipagala	6.76 km
Total Length	69.73 km

III

STORM WATER DEVELOPMENT PLAN

■ Phased Objectives

Phase	Objectives
Short-Term Period (2020 – 2025)	<ul style="list-style-type: none"> • Rehabilitate the existing stormwater management facilities (Water Channels and Retention Ponds, etc.) to meet their capacity required for preventing floods which can occur in the most flood prone and important areas socially, economically and politically such as central area, government city and Chamwino Ikulu, etc. • Construct a new stormwater management facilities to prevent floods which can occur in the most flood prone and important areas socially, economically and politically. • Expand and rehabilitate the main rivers and drains between central area and hombolo dam so that they can collect and drain storm water to hombolo dam quickly and effectively. • Rearrange the institutional frameworks of related local governments to improve stormwater management. • Promoting the initiative, 'Make Dodoma Green' by encouraging people to plant trees.
Medium-Term Period (2026 – 2035)	<ul style="list-style-type: none"> • Construct a new stormwater management facilities to prevent floods which can occur in all flood prone areas in the city. • Install the infiltration basins near the boreholes as groundwater sources in Dodoma city, which are mainly located along the main roads and main rivers between central area and hombolo dam. • Prevent erosion and siltation by reinforcing banks of water channels and vegetation. • Improve recreational functions of stormwater management facilities such as forest, retention ponds and wet lands, etc. • Identify appropriate local government policies, schemes and process documents for the inclusion of stormwater management objectives and measures.
Long-Term Period (2036 – 2040)	<ul style="list-style-type: none"> • Improve stormwater management facilities to protect major infrastructures from flooding in the 100 Average Recurrence Interval (ARI) event. • Reduce the amount of impervious surfaces within the Dodoma city by • Reduce the amount of direct stormwater discharge into Hombolo dam by expanding infiltration basins, retention ponds and rainwater harvesting systems, etc. • Reduce the pollution load to the lake Hombolo(1,537km²) • Increase the amount of stormwater reuse within the Dodoma city • Implement stormwater management objectives and measures to identified local government policies, schemes and process documents. • Establish a local Climate Change Fund to cope with the negative effects of climate change.

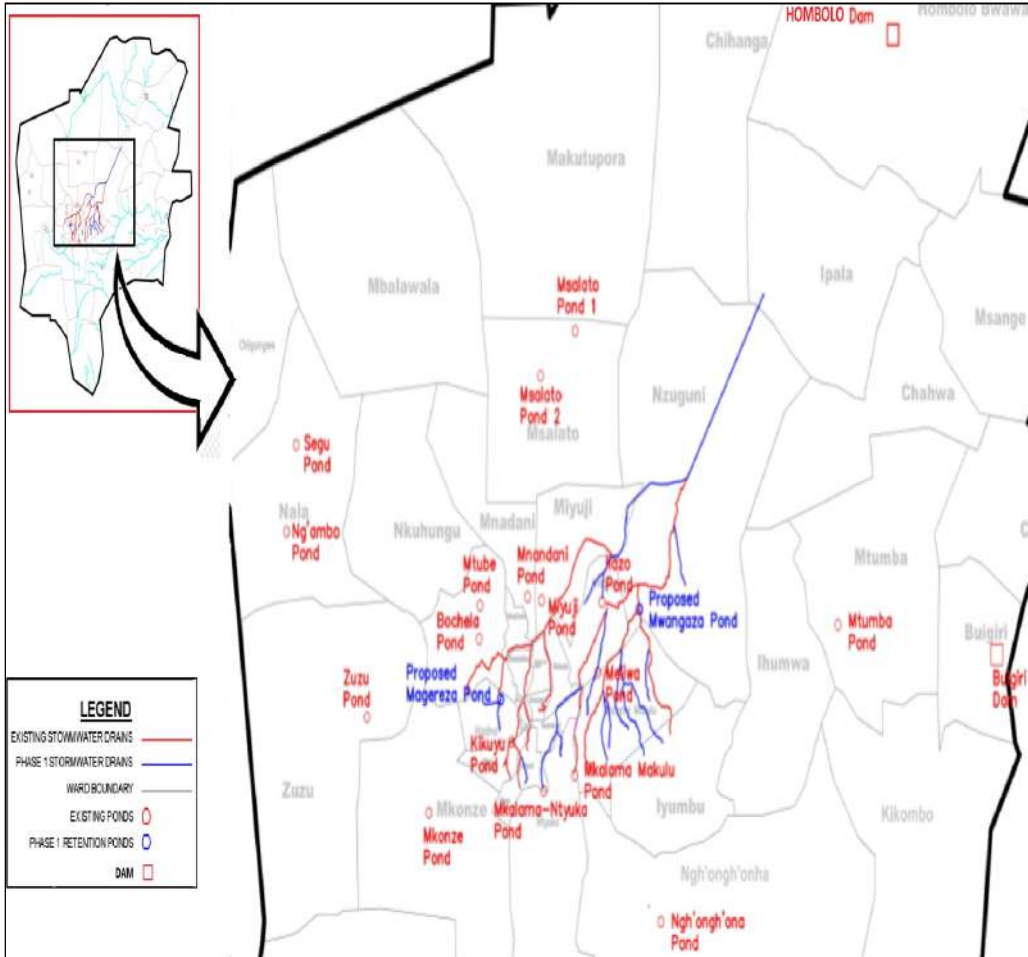
III STORM WATER DEVELOPMENT PLAN

■ A Coverage Plan for Storm Water Drainage

Period	Item	Areas to be Covered
Current	<ul style="list-style-type: none"> Storm water drains Rivers and water retention ponds 	<ul style="list-style-type: none"> Central area of the city
Short-Term (2020-2025)	<ul style="list-style-type: none"> Rehabilitation of the existing drainage system Construction of new drainage system (Storm water drains and water retention ponds) 	<ul style="list-style-type: none"> Central area of the city
Medium-Term (2026-2035)	<ul style="list-style-type: none"> Construction of new drainage system (Storm water drains & water retention ponds) Construction of infiltration facilities 	<ul style="list-style-type: none"> Northern part of the city Southern to Eastern part of the city Southern to Western part Makutupora and Ihumwa
Long –Term (2036-2040)	<ul style="list-style-type: none"> Construction of bridge and foot bridges 	<ul style="list-style-type: none"> Kikombo and Iyumbu

III STORM WATER DEVELOPMENT PLAN

■ A Coverage Plan for Storm Water Drainage_54.3km (Short-term Period)

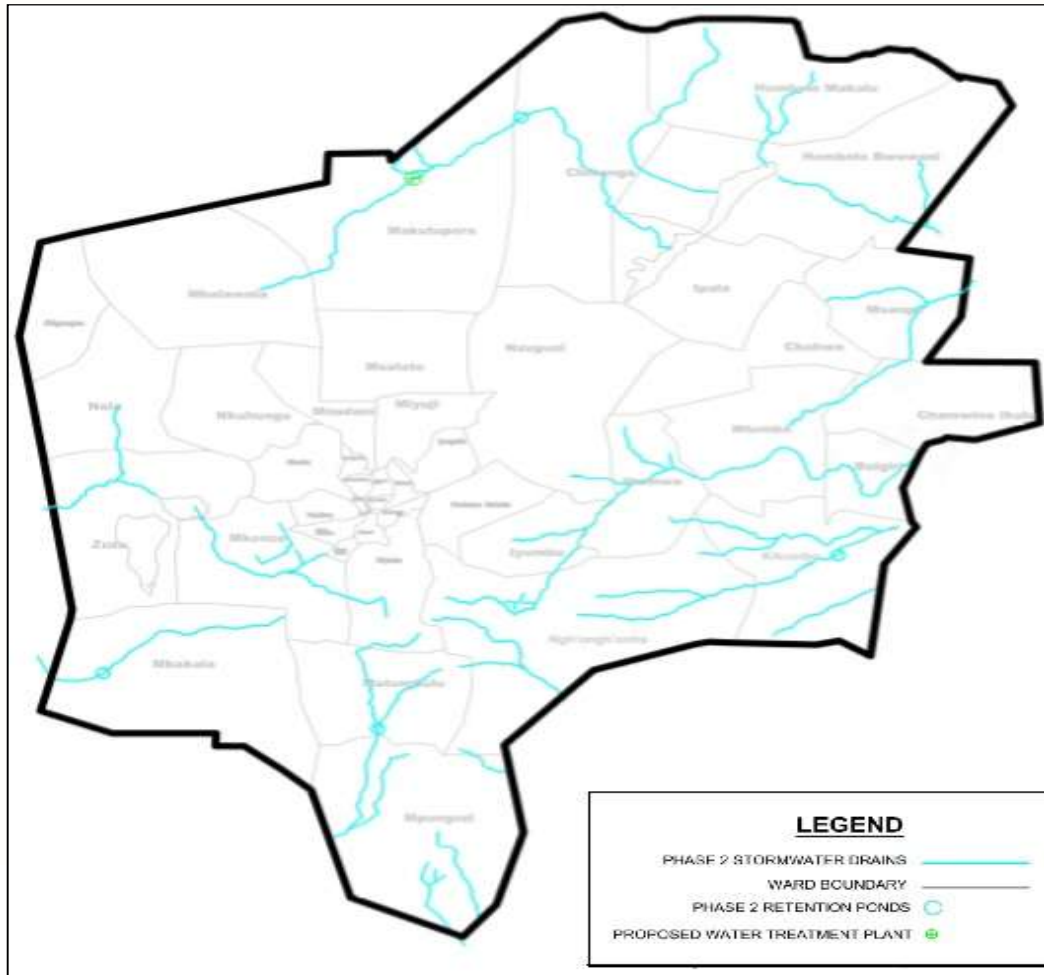


Drain Name	Ward	Trapezoidal	Vegetation	Gabion
		Length (km)	Planting (km)	(km)
P1-01	Dodoma Makulu	0.0	2.2	0.0
P1-02	Iyumbu	0.0	0.7	0.0
P1-02	Dodoma Makulu	0.0	3.1	0.0
P1-03	Iyumbu	0.0	0.4	0.0
P1-03	Dodoma Makulu	0.0	1.8	0.0
P1-03	Dodoma Makulu	2.2	0.0	0.0
P1-04	Dodoma Makulu	0.0	0.3	0.0
P1-04	Dodoma Makulu	3.3	0.0	0.0
P1-05	Dodoma Makulu	0.0	0.7	0.0
P1-05	Dodoma Makulu	1.5	0.0	0.0
P1-06	Dodoma Makulu	0.0	1.2	0.0
P1-06	Dodoma Makulu	1.7	0.0	0.0
P1-07	Dodoma Makulu	0.0	0.0	1.7
P1-07	Ipagala	0.0	0.0	2.6
P1-08	Ntyuka	0.0	1.1	0.0
P1-09	Kilimani	0.0	0.8	0.0
P1-09	Kilimani	0.0	0.0	0.3
P1-09	Tambukareli	0.0	0.0	2.3
P1-09	Makole	0.0	0.0	2.0
P1-10	Ipagala	0.0	0.0	1.8
P1-11	Ipagala	0.7	0.0	0.0
P1-11	Ipagala	0.0	1.3	0.0
P1-12	Miyuji	0.0	2.2	0.0
P1-12	Nzuguni	0.0	3.8	0.0
P1-13	Nzuguni	0.0	8.1	0.0
P1-13	Ipala	0.0	0.6	0.0
P1-14	Viwandani	0.7	0.0	0.0
P1-15	Hazina	0.0	1.4	0.0
P1-16	Hazina	0.0	1.2	0.0
P1-17	Nzuguni	0.0	2.5	0.0
Length (km)		10.1	33.4	10.8
Total Length (km)		54.3		

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III STORM WATER DEVELOPMENT PLAN

■ A Coverage Plan for Storm Water Drainage (Medium-term Period)



- The proposed storm water drains covers 388.1 km length.
- It also involves the construction of 4 new water retention ponds, and 2 infiltration facilities at Makutupora and Ihumwa for recharging groundwater.
- The implementation for these proposed drains will be in medium-term period.



STORM WATER DEVELOPMENT PLAN

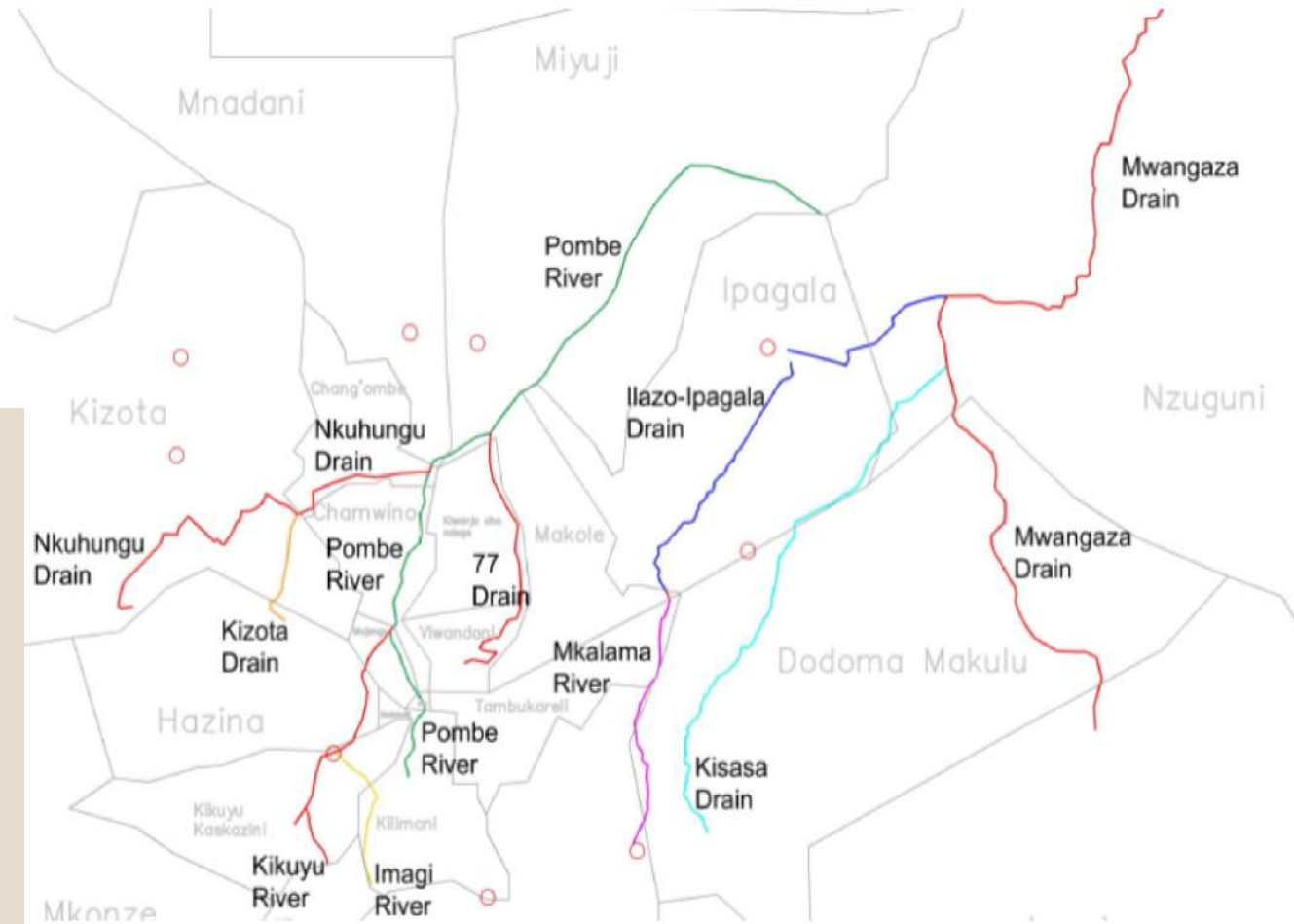
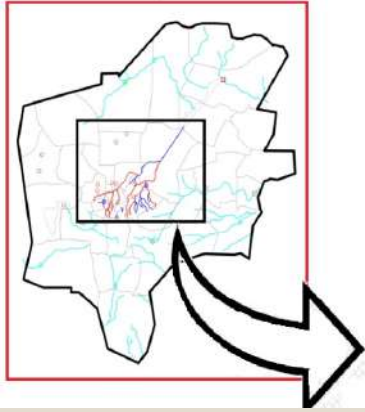
■ Total Lengths for Proposed Storm Water Drains (Medium-term Period)

Drain Name	Ward	Gabion Length (km)
P2-01	Ngh'ongh'onha	10.4
	Iyumbu	2.5
	Ihumwa	11.3
	Mtumba	2.3
	Buigiri	9.7
	Mtumba	1.0
P2-02	Buigiri	9.7
P2-02	Iyumbu	5.2
P2-03	Nzuguni	2.6
	Ihumwa	1.3
P2-04	Ihumwa	4.9
P2-05	Ihumwa	1.1
P2-06	Ngh'ongh'onha	12.1
	Kikombo	10.8
P2-07	Kikombo	7.0
P2-08	Ngh'ongh'onha	1.5
	Kikombo	11.4
P2-09	Ihumwa	1.4
	Ngh'ongh'onha	0.6
	Kikombo	5.8
P2-10	Kikombo	7.4
P2-11	Ngh'ongh'onha	12.4
P2-12	Matumbulu	0.8
	Ngh'ongh'onha	3.6
P2-13	Ntyuka	3.9
	Matumbulu	7.8
P2-14	Matumbulu	7.5
	Mpunguzi	9.4
P2-15	Mpunguzi	8.1
P2-16	Ngh'ongh'onha	1.0
	Mpunguzi	3.2
P2-17	Mpunguzi	10.3
P2-18	Mpunguzi	1.3

Drain Name	Ward	Gabion Length (km)
P2-19	Mpunguzi	7.4
P2-20	Mbabala	18.1
	Ntyuka	4.2
P2-21	Mkonze	9.0
	Mkonze	1.4
	Mkonze	2.2
	Zuzu	1.0
P2-22	Hombolo Bwawani	12.7
P2-23	Nala	3.7
	Zuzu	2.8
P2-24	Zuzu	9.6
P2-25	Mtumba	4.1
	Chamwino Ikulu	6.5
	Msange	9.4
P2-26	Mkonze	3.0
P2-27	Mkonze	1.2
P2-28	Mkonze	5.7
P2-29	Mbalawala	3.8
	Makutupora	12.7
P2-30	Makutupora	3.9
P2-31	Makutupora	3.4
	Makutupora	7.3
P2-32	Chihanga	13.7
	Ipala	5.6
P2-33	Hombolo Bwawani	5.9
P2-34	Hombolo Makulu	9.2
	Chihanga	5.0
	Hombolo Bwawani	5.0
P2-35	Hombolo Makulu	3.9
P2-36	Hombolo Makulu	7.3
	Hombolo Bwawani	2.3
P2-37	Msanga	7.7
TOTAL		388.1

III STORM WATER DEVELOPMENT PLAN

■ A Plan for Rehabilitation of the Existing Storm Water Drains

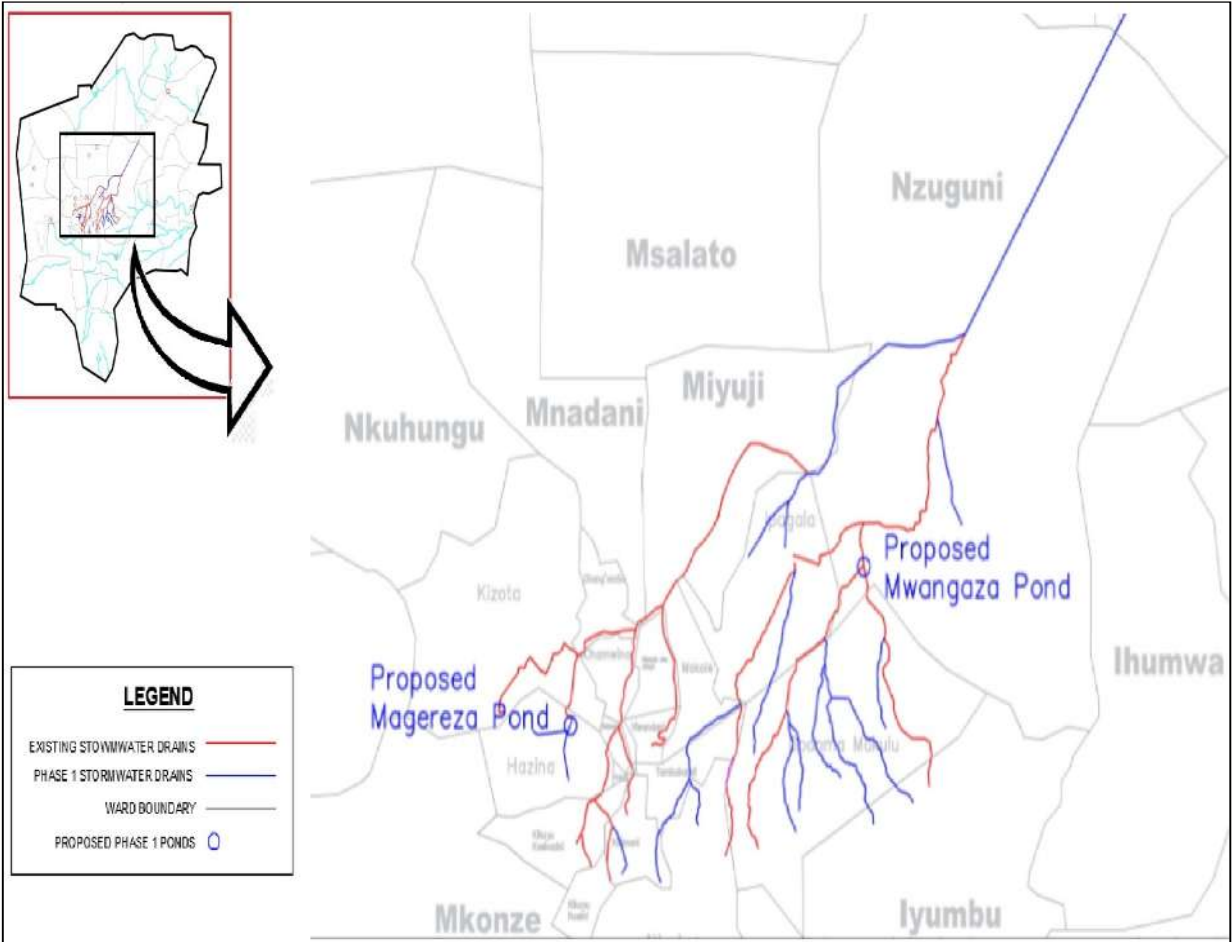


➤ ITEMS

- Banks of the Rivers and Storm Water Drains 40.09 km
- Culverts and Bridges
- Desiltation 27.24 km
- Construction of new trapezoidal 3.04 km and rectangular drains 0.18 km

III STORM WATER DEVELOPMENT PLAN

■ Proposed New Storm Water Drain_54.3km (Short-term Period)



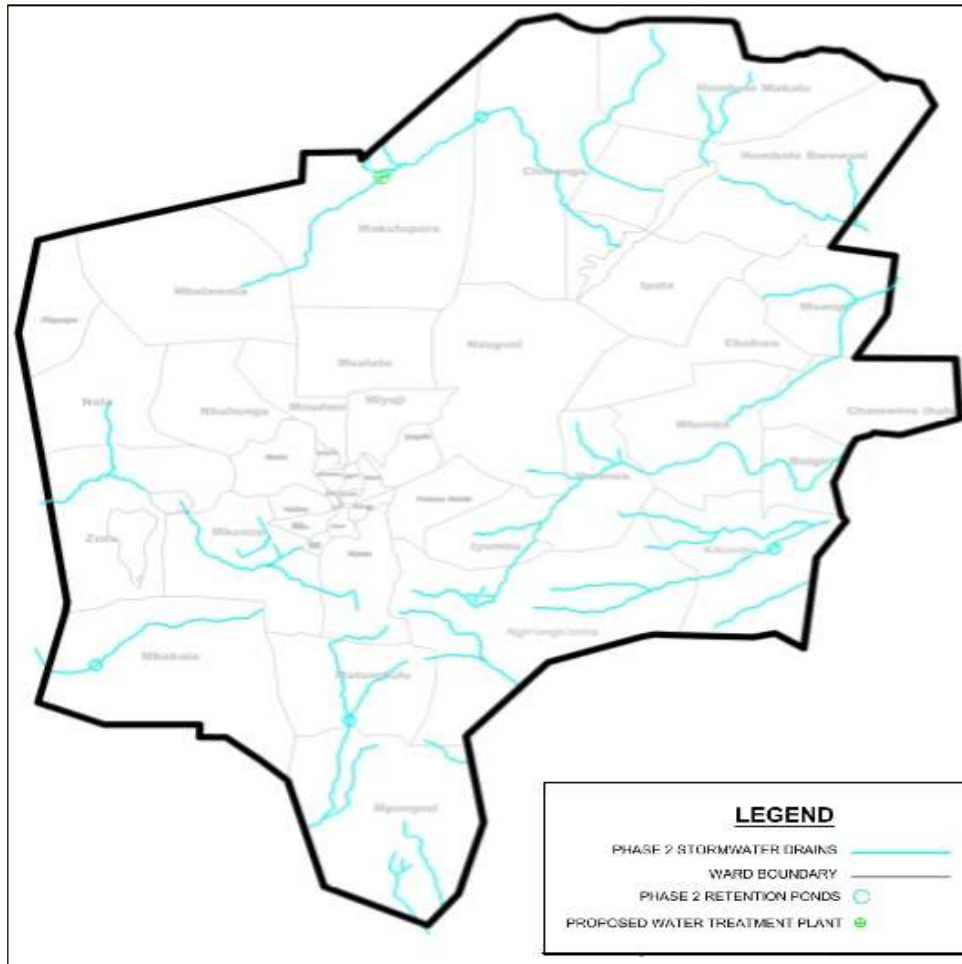
- Protection of banks with gabions (10.8 km)
- Trapezoidal drains (10.08 km)
- Vegetation plantation (33.37 km)

LEGEND

- EXISTING STORMWATER DRAINS ————
- PHASE 1 STORMWATER DRAINS ————
- WARD BOUNDARY ————
- PROPOSED PHASE 1 PONDS ○

III STORM WATER DEVELOPMENT PLAN

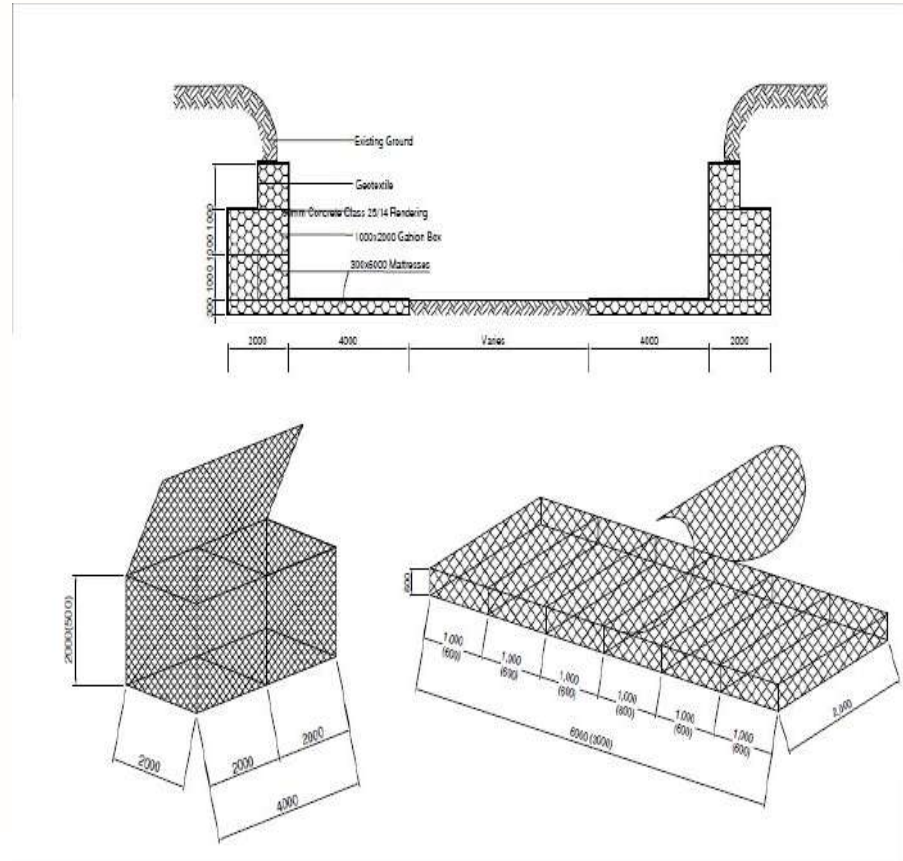
■ Proposed New Storm Water Drain_388.1km (Medium-term Period)



- Plantation of trees along the banks of the storm Water drains for protection as well as for green creation in Dodoma City.
- Gabion protection
- Construction of new water retention ponds for water storage at Kikombo, Matumbulu, Mbabala and Chihanga.
- Creation of infiltration facilities at Makutupora and Ihumwa to recharge ground water as it is the major source of water in Dodoma city.

III STORM WATER DEVELOPMENT PLAN

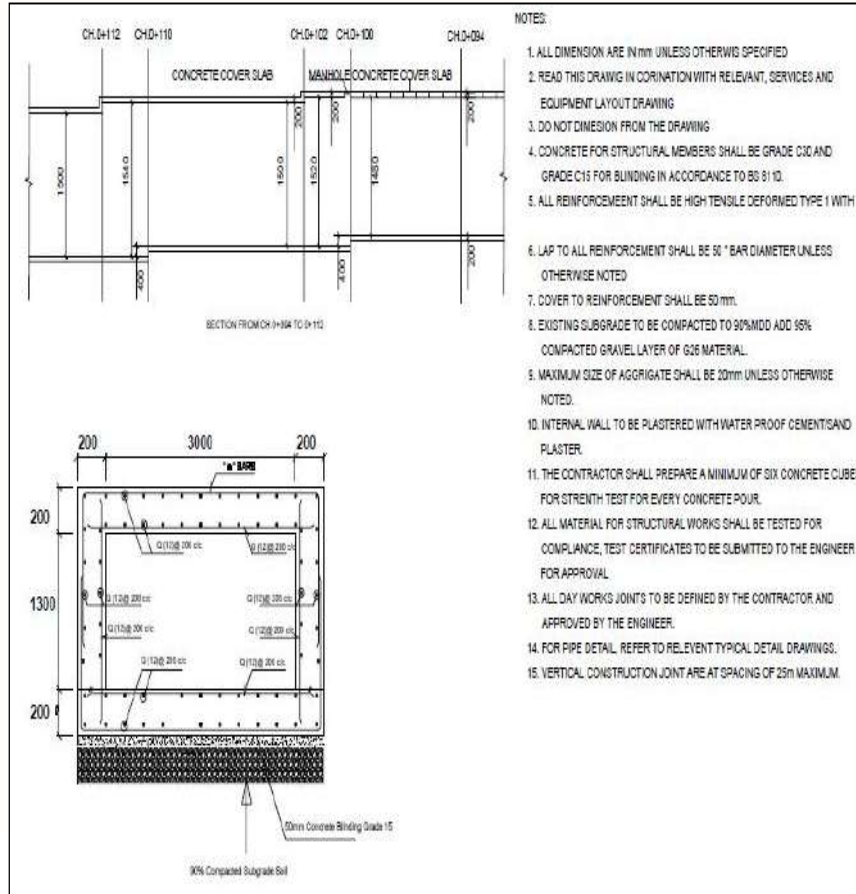
■ Gabions



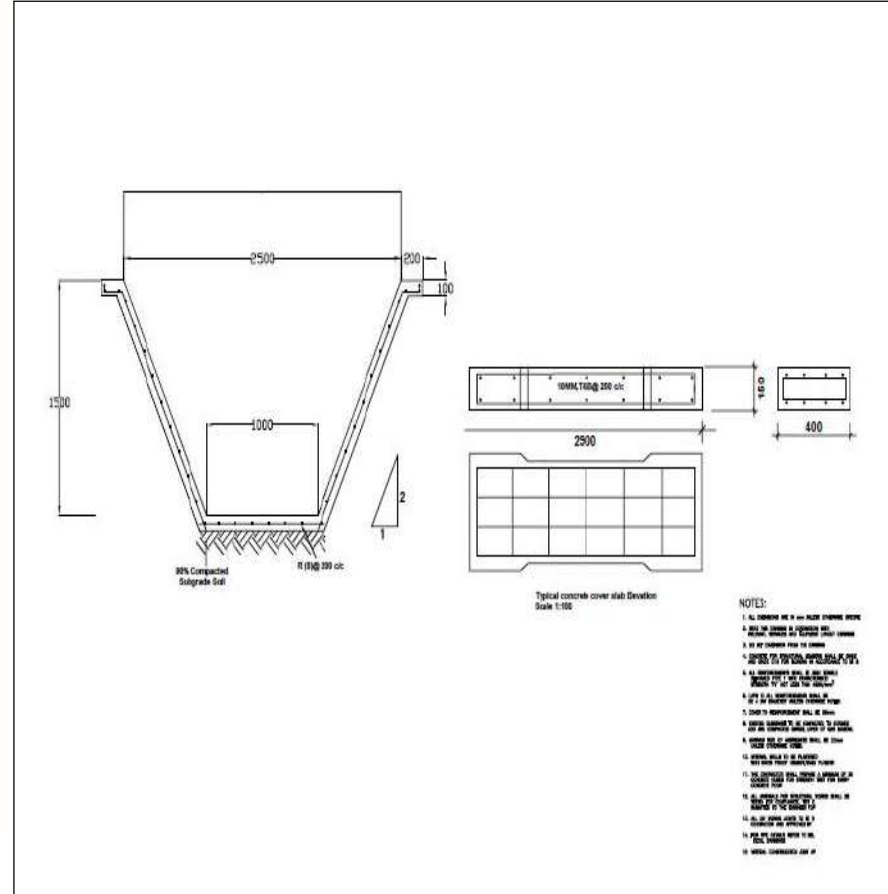
III

STORM WATER DEVELOPMENT PLAN

Concrete Trapezoidal and Rectangular Drains Details



- NOTES:
1. ALL DIMENSION ARE IN mm UNLESS OTHERWISE SPECIFIED
 2. READ THIS DRAWING IN CORINATION WITH RELEVANT, SERVICES AND EQUIPMENT LAYOUT DRAWING
 3. DO NOT DIMENSION FROM THE DRAWING
 4. CONCRETE FOR STRUCTURAL MEMBERS SHALL BE GRADE C30 AND GRADE C15 FOR BLINDING IN ACCORDANCE TO BS 81 10.
 5. ALL REINFORCEMENT SHALL BE HIGH TENSILE DEFORMED TYPE I WITH
 6. LAP TO ALL REINFORCEMENT SHALL BE 50 * BAR DIAMETER UNLESS OTHERWISE NOTED
 7. COVER TO REINFORCEMENT SHALL BE 50 mm.
 8. EXISTING SUBGRADE TO BE COMPACTED TO 90%MOD ADD 5% COMPACTED GRAVEL LAYER OF 636 MATERIAL.
 9. MAXIMUM SIZE OF AGGRIGATE SHALL BE 20mm UNLESS OTHERWISE NOTED.
 10. INTERNAL WALL TO BE PLASTERED WITH WATER PROOF CEMENTSAND PLASTER
 11. THE CONTRACTOR SHALL PREPARE A MINIMUM OF SIX CONCRETE CUBES FOR STRENGTH TEST FOR EVERY CONCRETE POUR.
 12. ALL MATERIAL FOR STRUCTURAL WORKS SHALL BE TESTED FOR COMPLIANCE, TEST CERTIFICATES TO BE SUBMITTED TO THE ENGINEER FOR APPROVAL
 13. ALL DAY WORKS JOINTS TO BE DEFINED BY THE CONTRACTOR, AND APPROVED BY THE ENGINEER.
 14. FOR PIPE DETAIL, REFER TO RELEVANT TYPICAL DETAIL DRAWINGS.
 15. VERTICAL CONSTRUCTION JOINT ARE AT SPACING OF 25m MAXIMUM



III STORM WATER DEVELOPMENT PLAN

■ Institutional Measures

- Establishment of an authority to manage stormwater for Dodoma city;
- Operation and maintenance of stormwater system including stormwater drains, side drains, water retention ponds and dams;
- Development of funding approaches to stormwater programs potentially including storm water user fees and the creation of a stormwater utility;
- Development of long-term asset management programs to repair and replace aging infrastructure;
- Storm water regulations to address comprehensive storm water needs;
- Establishment and Enhancement/enforcement of policies to make sure property owners consider the effects of stormwater before, during and after development of their land;
- Education of a community about how its actions affect water quality, and about what it can do to improve water quality.

III STORM WATER DEVELOPMENT PLAN

■ Non-structural Measures

➤ Maintenance Practices for Storm Water Drainage Channels

- *Cleanliness through involving the community*

➤ Campaign and Education

- *Starting from grassroots (Primary education level to higher education level on proper solid wastes management through 3 R's)*

➤ Promotion of the Initiative 'Make Dodoma Green'

- *Institutions, schools, Planting trees along the roads, houses, Planting trees in open spaces*

➤ Designation of Green Belt

➤ Establishment of a Flood Warning System and Evacuation Plan

The Provision of Consultancy Services for Study and Design of Storm
Water Drainage System and Preparation of Drainage & Sanitation
Development Plan (DSDP) for Dodoma City for a period of 2020-2040



Financial Analysis & Investment Plan

IV FINANCIAL ANALYSIS & INVESTMENT PLAN

■ Capital Expenditure (CAPEX)

- Identification of CapEx is essential for planning and design stages of Drainage & Sanitation Development Plan (DSDP) for Dodoma City for 2020-2040.
- CapEx is capital invested or planned to be invested in constructing or purchasing of fixed assets.
- It includes essential ancillary equipment, vehicles or even office buildings that support the operation of drainage and sanitation systems.
- Total CapEx for this DSDP was estimated to be **TZS 3,680 Billion** as shown in the following Table.

IV FINANCIAL ANALYSIS & INVESTMENT PLAN

■ CAPEX

Period	Sanitation Development (Unit : Billion Tsh)				Storm Water Drainage Development (Unit : Billion Tsh)				
	Total	Trunk Sewers	Reticulation Sewers	Wastewater Treatment	Total	Storm Water Drains	Ponds	Bridges	Foot Bridges
Short-term Period (2025)	563	89	292	182	146	82	62	-	2
Medium-term Period (2035)	1,864	302	1,079	483	691	611	80	-	-
Long-term Period (2040)	413	-	413	-	3	-	-	2	1
Total	2,840 Billion Tsh				840 Billion Tsh				
	3,680 Billion Tsh								

IV FINANCIAL ANALYSIS & INVESTMENT PLAN

■ Operational Expenditure (OPEX)

- OpEx are funds a company spends on ongoing day-to-day basis in order to run a business or system.
- It includes employee wages, inventory handling costs, minor maintenance and expenditures for office supplies that are operating expenses.
- OpEx runs between **5%** and **20%** of capital investments for experienced organisations and can be calculated from their reports.
- Total OpEx for this DSDP was estimated to be **TZS 37,396,160,476** as shown in the following Table.

IV FINANCIAL ANALYSIS & INVESTMENT PLAN

■ OPEX

ITEM	SHORT TERM	MEDIUM TERM	LONG TERM
Direct Operation Cost	2,129,985,730	2,321,684,500	2,646,720,330
Employee Benefits	20,967,619,090	21,761,927,800	24,808,597,692
Administration Expenses	3,254,457,430	3,579,900,560	4,081,086,638
Other Expenses	4,672,851,960	5,140,136,680	5,859,755,815
TOTAL	31,024,914,210	32,803,649,540	37,396,160,476

IV FINANCIAL ANALYSIS & INVESTMENT PLAN

■ Sustainability Considerations

- DUWASA is charged with development, operations and management of water supply and sanitation services in Dodoma.
- Financial statements of DUWASA for past ten years shows total revenues of **shillings 87,154,418,000** and total operation expenditures of **shillings 62,761,783,000**.
- Expanded facilities from DSDP means expanded customer base and revenues.
- Currently the sewerage system is serving only **6%** of the population of Dodoma urban due to the rack of lateral sewer. (The capacity of truck mains covers the 20% of the population.)

IV FINANCIAL ANALYSIS & INVESTMENT PLAN

■ Financing Sources

- Central Government Budget
- Transfers (Aid, Donations, Subsidies)
- PPP Arrangements
- Municipal Bonds

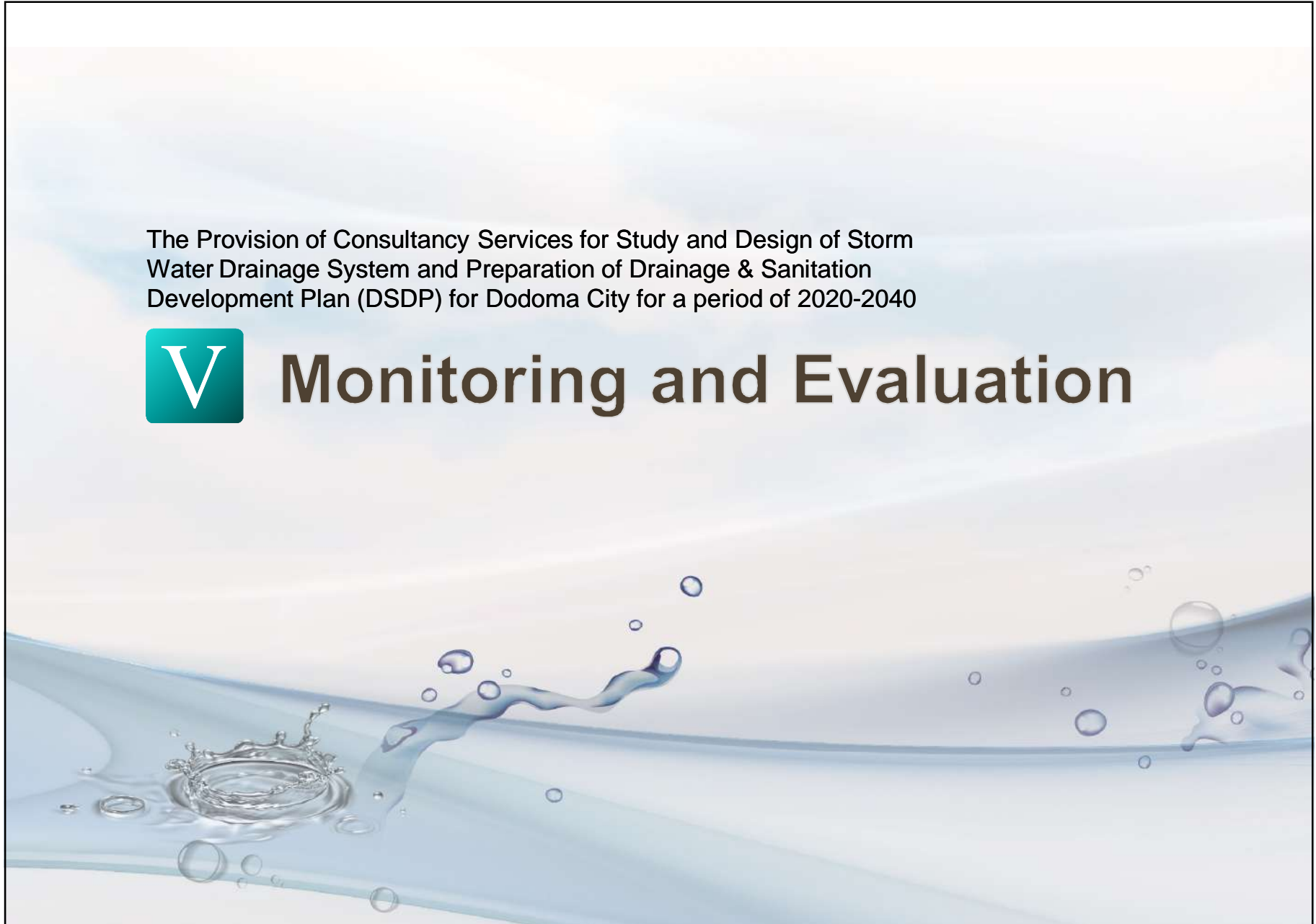
■ Cost Recovery Strategy

- Tariffs /User Fees
- Taxes/ Levies

The Provision of Consultancy Services for Study and Design of Storm
Water Drainage System and Preparation of Drainage & Sanitation
Development Plan (DSDP) for Dodoma City for a period of 2020-2040



Monitoring and Evaluation



V MONITORING AND EVALUATION

Strengthening M&E System in Sanitation Sector

- Capacity building to technical staff on how to conduct and practice monitoring and evaluation to the existing project or plan or program.
- The change of National policies and plans from Infrastructure to service oriented or approach.
- To maintain a well- coordinated, organized and supervised cleansing and flushing sanitation program after every three months.
- To establish an independent M&E section in DUWASA and adopting participatory approach

Coverage Rate Served by Sewerage

ITEM	Current	Short-term Period (2025)	Medium-term Period (2035)	Long-term Period (2040)
Population	612,193	844,118	1,441,875	1,884,473
Population served by Sewerage	36,732	215,734	1,168,697	1,864,057
Coverage Rate (%)	6.0%	25.6%	81.1%	98.9%

V MONITORING AND EVALUATION

■ Suggestion of M&E System in Drainage Sector

- To establish an independent Department for dealing with Drainage sector in the City Council of Dodoma
- To establish an independent section for in the drainage department for dealing with Monitoring and Evaluation
- Investing in Monitoring and Evaluation.
- Stormwater systems assessments.

■ Flood prone Area

ITEM	Current	Short-term Period (2025)	Medium-term Period (2035)	Long-term Period (2040)
Dodoma City (km²)	2,671.5			
Flood Prone Area (km²)	890.4	744.7	153.6	-
Rate of Flood Prone Area (%)	33.3%	27.9%	5.8%	-

The Provision of Consultancy Services for Study and Design of Storm
Water Drainage System and Preparation of Drainage & Sanitation
Development Plan (DSDP) for Dodoma City for a period of 2020-2040

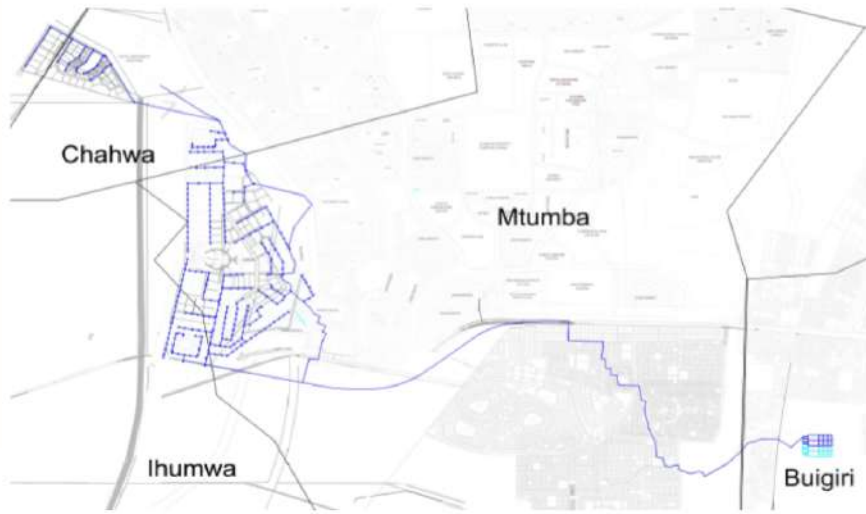


Priority Projects

VI PRIORITY PROJECTS

Sanitation Management Sector

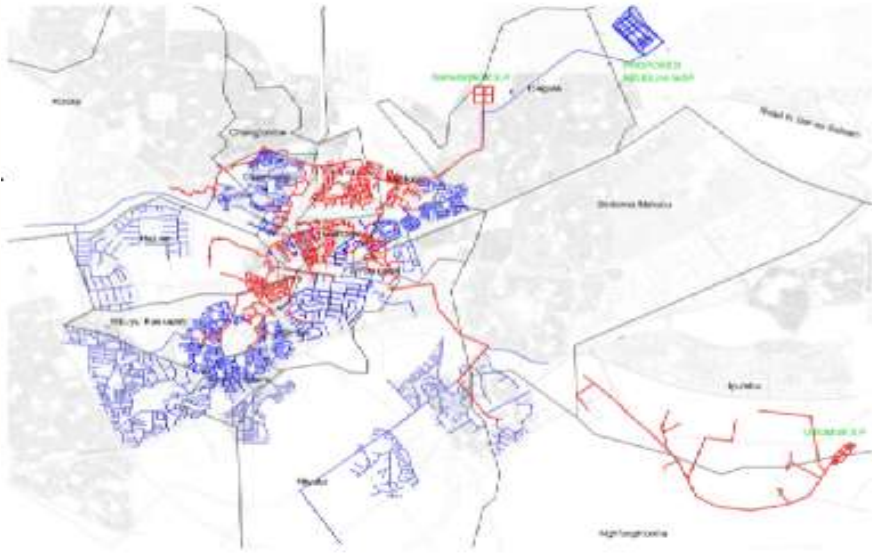
Priority Project (No. 1)

Project Title	Project for the Installation of Sewerage System for the Government City	
Project Purpose	To provide sewerage system to the Government City located within the Buigiri Zone	
Project Location	Government City within the Buigiri Zone	
Proposed Sewerage		Trunk Sewer(New) D250-1200, L=26.8km
		Reticulation Sewer(New) D250-400, L=29.5km
		Wastewater Treatment Facility(New) Q=18,000m ³ /day
		Approximate Cost 141 Billion Tsh

VI PRIORITY PROJECTS

Sanitation Management Sector

Priority Project (No. 2)

Project Title	Project for the Expansion of Existing Sewerage System at Central Dodoma City	
Project Purpose	The Increase in population to be served by the existing sewerage in the central area of the city	
Project Location	Central area of the Dodoma City within the Nzuguni Zone	
Proposed Sewerage		<ul style="list-style-type: none"> Trunk Sewer (Expansion)
		D250-1,800, L=12.5km
		<ul style="list-style-type: none"> Reticulation Sewer (Expansion)
		D250-300, L=263.9km
		<ul style="list-style-type: none"> Wastewater Treatment Facility(New)
Q=34,000m ³ /day		
<ul style="list-style-type: none"> Approximate Cost 	269 Billion Tsh	

VI PRIORITY PROJECTS

Sanitation Management Sector

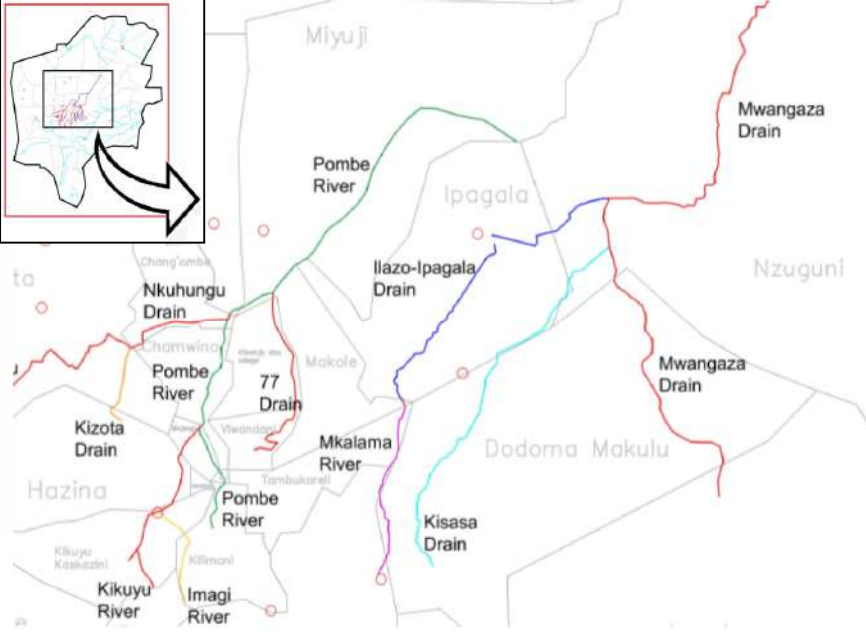
Priority Project (No. 3)

Project Title	Project for the Installation of Sewerage System in Chamwino Ikulu	
Project Purpose	To provide sewerage system to the Chamwino Ikulu in which the State House will be located	
Project Location	Chamwino Ikulu within the Chinangali Zone	
Proposed Sewerage		• Trunk Sewer(New) D250-700, L=21.6km
		• Reticulation Sewer(New) D250-300, L=199.1km
		• Wastewater Treatment Facility(New) Q=6,000m ³ /day
		• Approximate Cost 153 Billion Tsh

VI PRIORITY PROJECTS

■ Storm Water Management Sector

• Priority Project (No. 4)

Project Title	Rehabilitation of the existing storm water drains in Dodoma City.	
Project Purpose	To increase the efficiency of the existing storm water drains	
Project Location	Whole area of the Dodoma city	
Proposed Works		<ul style="list-style-type: none"> • Gabions 41 km • Desiltation 27.4 km • Planting Trees 5.2 km • Trapezoidal Drains 3.1km • Rectangular Drains 0.2 km • Approximate Cost 56 Billion Tsh

Consultancy Services for Study and Design of Storm Water Drainage System and Preparation of Drainage & Sanitation Development Plan(DSDP) for Dodoma City for a Period of 2020-2040

VI PRIORITY PROJECTS

■ Storm Water Management Sector

• Priority Project (No. 5)

Project Title	Rehabilitation of the existing water retention ponds in Dodoma City.			
Project Purpose	To increase the efficiency of the existing storm water retention ponds			
Project Location	Whole area of the Dodoma city			
Proposed Works		• Gabions		
		58.2 km		
		• Desiltation		
		58.2 km		
	• Approximate Cost			
	30 Billion Tsh			

VI PRIORITY PROJECTS

■ Storm Water Management Sector

• Priority Project (No. 6)

Project Title	The construction of the new proposed storm water drains and ponds	
Project Purpose	To eliminate the flooding problems in the central part of the city	
Project Location	CENTRAL Area of the Dodoma City	
Proposed Works		<ul style="list-style-type: none"> • Gabions
		10.7 Km
		<ul style="list-style-type: none"> • Trapezoidal drains
		10,1 Km
		<ul style="list-style-type: none"> • Planting Trees
33.4 Km		
<ul style="list-style-type: none"> • Ponds 		
2		
<ul style="list-style-type: none"> • Approximate Cost 		
60 BillionTsh		

The Provision of Consultancy Services for Study and Design of Storm
Water Drainage System and Preparation of Drainage & Sanitation
Development Plan (DSDP) for Dodoma City for a period of 2020-2040

VII Strategic Environmental Assessment (SEA)

VII STRATEGIC ENVIRONMENTAL ASSESSMENT

■ Rationale for Conducting SEA

Definition	SEA is an important tool that provide guidance to DSDP and other stakeholders on systematically integrating environmental and socio-economic concerns in policy, regulations and planning.
Purpose	SEA is conducted over a national or regional level plan and is not intended for the specific project.

■ Overview of SEA in Tanzania

- In the past SEA was conducted as per donor requirements on voluntary basis.
- In 2008 the SEA Regulations were developed to provide legal framework for SEA in the country.
- The 2018 National Guidelines for Strategic Environmental Assessment set out the requirements and procedure for conducting SEA in Tanzania.
- The Guidelines have been designed and set procedure to apply common approaches for SEA at sector and national levels.

VII STRATEGIC ENVIRONMENTAL ASSESSMENT

■ Legal Framework

The regulatory framework for the SEA in Tanzania is provided by the Environmental Management Act (CAP. 191) Regulations of 2005, and more specifically the Strategic Environmental Assessment (SEA) Regulations of 2008.

Other legal frameworks includes:

- National Environmental Policies / National land policies / National Gender Policies
- The Constitution of the United Republic of Tanzania, Cap 2 (1977)
- Land Acquisition Act, Cap.118 (R.E.2002) / The Land Act, Cap. 113 (1999)
- Land (Assessment of The Value of Land For Compensation) Regulations (2001)
- The Urban Planning Act (2007) / Land Use Planning Act (2007)
- Water Resource Management Act (2009) / Occupational Health and Safety Act (2003)
- Public Health Act (2009) / Employment and Labour Relation Act, Cap 366 (2004)
- HIV and Aids (Prevention and Control) Act (2008) / Road Act (2007)
- Local Government (Urban Authorities) Act (1982) / Water Supply and Sanitation Act (2009)

VII STRATEGIC ENVIRONMENTAL ASSESSMENT

■ Institutional Framework

- Vice President Office (VPO)
- President Office-Regional Administration and Local Government (PO-RALG)
- Minister responsible for Environment
- Directorate of Environment (DoE)
- City Council of Dodoma (CCD)
- Dodoma Urban Water Supply and Sanitation Authority (DUWASA)
- Regional Secretariat
- Energy and Water Utilities Regulatory Authority (EWURA)
- Water Basin Board
- Tanzania National Roads Agency (TANROADS)
- Tanzania Rural and Urban Roads (TARURA)
- Occupational Health and Safety Authority (OSHA)

VII STRATEGIC ENVIRONMENTAL ASSESSMENT

■ World Bank Requirements on SEA

The examination of environmental and social risks and impacts will be guided by the recent established **World Bank**, Environmental and Social Framework Guidelines, 2018 incorporated in Environmental Social Standard 1 (ESS1) to 10.

WB ESS 1-10 are:

- ESS1: Assessment and Management of Environmental and Social Risk
- ESS2: Labour and Working Conditions
- ESS3: Resources Efficiency, Pollution and Prevention
- ESS4: Community Health and Safety
- ESS5: Land Acquisition, Restrictions on Land Use & Involuntary Resettlement
- ESS6: Biodiversity Conservation
- ESS7: Indigenous People
- ESS8: Cultural Heritage
- ESS9: Financial Intermediaries
- ESS10: Stakeholders Engagement and Information Disclosure

VII STRATEGIC ENVIRONMENTAL ASSESSMENT

■ SEA Objectives

The objectives of conducting a SEA are to:

- Ensure that environmental concerns are thoroughly taken account of in draft Bills, regulations, plans, strategies or programmes;
- Enable the public to contribute to the consideration of environmental concerns in the preparation of Bills, regulations, plans, strategies or programmes;
- Establish clear, transparent and effective procedures for formulation of Bills, regulations, policies, strategies, plans or programmes; and
- Integrate environmental concerns into measures and instruments designed to further sustainable development.

VII STRATEGIC ENVIRONMENTAL ASSESSMENT

■ Steps in Conducting SEA

The steps defined in the regulations (article 11-(1)) to be followed include:

- Preparation of Project Briefs;
- Screening;
- Scoping;
- Developing terms of reference;
- Identification of alternatives and conducting assessments of likely impacts;
- Preparation of draft strategic environmental assessment report;
- Consultation and participation;
- Revision of draft strategic environmental assessment report;
- Approval of strategic environmental assessment report;
- Monitoring of significant environmental impacts of implementation of the Bill; and
- Regulations, policy, strategy, plan or programme.

VII STRATEGIC ENVIRONMENTAL ASSESSMENT

■ SEA Methodology

Methodology	How To
Collection of Baseline Data	<ul style="list-style-type: none"> • Existing literature sources • Previous studies • Field data gathering phase
Stakeholders Identification	<ul style="list-style-type: none"> • One to one interviews / Consultations • Stakeholders Workshop (with relevant interested groups such as Government • Offices, Institutions, Private Sectors Organizations and NGOs, etc.

VII STRATEGIC ENVIRONMENTAL ASSESSMENT

■ Environmental and Social Challenges

<p>Unplanned Areas</p>	<ul style="list-style-type: none"> • Some areas in the city are unplanned primarily in relation to residential and commercial land uses • DCC has master plan, but not all initiatives in their plans have been implemented due to lack of sufficient funds to adequately survey and service all areas. • Unplanned settlements will negatively affect the DSDP program especially infrastructure provision such as new drainage system and sewerage system.
<p>Insufficient Liquid and Solid Waste Management Systems</p>	<ul style="list-style-type: none"> • Liquid and solid waste management systems are not sufficient for the growing demand.
<p>Rapidly growing informal sector</p>	<ul style="list-style-type: none"> • Dodoma City like other towns in Tanzania is experiencing a rapidly growing informal sector of hawkers and street vendors that are creating self-employment opportunities but also negatively affect infrastructure services by increasing congestion and haphazard dumping of waste.
<p>Rural-urban migration</p>	<ul style="list-style-type: none"> • Following government decision to move to Dodoma Rural-Urban daily movements are very common. This will cause a large strain on the infrastructure services in the urban centres and requires constant monitoring of urban population trends and updated projections.

VII STRATEGIC ENVIRONMENTAL ASSESSMENT

Threats and Solutions

Threat	Solution
Ineffective solid waste systems	<ul style="list-style-type: none"> • Cleaning water ways • Solid wastes must be categorized according to their physical characteristics e.g. paper, plastic and metals; • Awareness raising on solid waste management from source to disposal and health
Disruption of Natural Drainage	<ul style="list-style-type: none"> • Natural flow regimes must be maintained meaning, whenever necessary, alternative and temporary drainage must be implemented;
Encroachment on the road reserves	<ul style="list-style-type: none"> • Involvement of the full range of stakeholders during project design
Rapid population growth and haphazard development of new areas	<ul style="list-style-type: none"> • Planning of infrastructure facilities in new development areas before people move there

VII STRATEGIC ENVIRONMENTAL ASSESSMENT

■ Conclusion and Recommendation

Conclusion	Recommendation
<p>Liquid and solid waste management systems are not sufficient to meet the Dodoma City growing demands for the services.</p>	<ul style="list-style-type: none"> In line with Dodoma City Master Plan 2019-2030, CCD being autonomous entities (body corporate) should prepare specific proposals for waste management infrastructure and/or equipment's and seek grants or credits from variety of financial institutions/Development Partners.
<p>Rapidly growing informal sector of hawkers and street vendors causing congestion, squatting, encroachment, littering, open defecation and increased health risks.</p>	<ul style="list-style-type: none"> Enforce by-laws that will allow informal businesses within certain acceptable standards and that are disseminated to the public.
<p>Rural-urban migration projections and daily movements of people that are not adequately monitored and updated will make it difficult to planning for and maintain sufficient urban infrastructure services.</p>	<ul style="list-style-type: none"> CCD should not solely rely on population data and projections provided by National Bureau of Statistics rather they should have their internal system to capture population data relevant for their planning needs that are updated annually.

VII STRATEGIC ENVIRONMENTAL ASSESSMENT

■ Tentative SEA Milestone

Activities	Responsible Authority for Preparation of SEA	Timeline for Preparation	Responsible Authority for Approval Process
1.Preparation of Project brief by CCD	CCD	2 Weeks	VPO
2.Screening of Subprojects	CCD	1 Week	
3.Preparation of Terms of References	CCD	1 Week	
4.Scoping	CCD	3 Weeks	VPO
5.Draft SEA Report	CCD	4 Weeks	VPO
6.Site Verificatio	CCD	1 Week	VPO
7.Stakeholders Workshop	CCD	1 Week	VPO
8.Submissin of Final SEA Report	CCD	1 Week	VPO

ASANTE SANA

**CHEIL & AJOMA WILL DO OUR BEST
TO MAKE SUCCESSFUL PROJECT.**