FOREWORD

Historically, Iringa was established as an administrative centre for the southern highland regions of Tanganyika during the German Colonial rule. While its resource base has remained almost the same, the economic base has transformed significantly from agro-based processing to education and tourism. From the 1960s, Iringa used to be an industrial centre for maize processing vegetable and fruit canning, diamond cutting, tobacco processing, cotton ginning and production of soft drinks. Most of these industries collapsed in the 1980s following the world economic recession that was precipitated by the rise in fossil fuel prices and structural adjustment programmes. It was until the 1990s when higher learning institutions started to locate in Iringa that the economy of the town re-emerged. The resurgence of the economy has been accompanied with the booming population resulting into a number of challenges. These include; the rapid growth of unplanned settlements, depletion of forest resources along mountain slopes, limited number of surveyed and serviced land and deteriorating buildings and infrastructure both in the central business district and peri-urban areas.

The preparation and completion of this master plan is a timely endeavour that will not only address these challenges but also provide a framework for charting out courses of action and formulating programmes and projects to realize the vision of the municipality. Becoming a centre of education excellence and tourism for the southern highland circuit as a vision of the municipality complements well with the immediate resource bases namely; the Ruaha and Udzungwa National Parks, tourist attraction sites and many tertiary education facilities that have been established in Iringa municipality. The proposals for infrastructure improvement including the railway link between Makambako and Dodoma via Iringa, by-pass roads, Airport expansion, and development of satellite towns and designation of ten percent of the municipal developable land for industrial uses provide a catalytic base for transforming the economy of Iringa consistent with the national strategy of realizing an industrial – based economy. This Master Plan should therefore serve as a tool for harnessing these potentials with a view of contributing towards improved living standards of the people.

In view of the foregoing, I commend the Iringa Municipal Council, not only as a Planning Authority but by venturing into Master Planning exercise amidst scarce human and financial resources. I wish to recognize and commend the contribution of all stakeholders who facilitated the realization of this Master Plan. These include; the World Bank, The Ministry of Lands, Housing and Human Settlements Development, the Iringa Region Administrative Secretariat, the Technical Team, Public and Private Institutions and individuals. I remain hopeful and optimistic that this Mater Plan will be fruitfully used to spearhead the social, economic and 1environmental development of Iringa Municipality.

William V. Lukuvi (MP)

Minister For Lands, Housing and Human Settlements Development

Tanzania

Date 30th June, 2017

MASTER PLAN APPROVAL

I, **Prof. John M. Lupala**

Director of Urban Planning by virtual of powers vested in me under section 12(4) of the Urban Planning Act No. 8 of 2007 DO HEREBY approve:

The Iringa Master Plan (2015-2035)

Signature

Date 30th June, 2017

ACKNOWLEDGEMENT

The preparation of Iringa Master Plan 2015-2035 would not have been possible without valuable contributions of various stakeholders. In this regard, the Technical Team would like to extend our heartfelt gratitude to the following:

The World Bank for funding the preparation of this master plan through the Urban Local Government Strengthening Programme (ULGSP); The Ministry of Lands, Housing and Human Settlements Development (MLHHSD) for the unweathering material and human resources support, we would like to particularly thanks : Hon. William Lukuvi (Minister for Lands, Housing and Human Settlements Development), Dr. Angelina Mabula (Deputy Minister), Dr Yamungu Kayandabila (Permanent Secretary), Dr. Moses Kusiluka (Deputy Permanent Secretary) and Prof. John M. Lupala (Director of Rural and Town Planning). We enjoyed the technical support from the Ministry's staff namely; Mr. Amulike Mahenge, Mr Nzori Kinero, Mrs. Bertha Mlonda, Mr. Dioscory Kanuti, Mr. Gabriel Luvanda, Mr. Raphael Nemes, Mr. Mackdonald Mshana, and Mr. Mapambano Baseka. We further extend our appreciation to the Dean of the School of Urban and Regional Planning (SURP) of Ardhi University for attaching students to work Iringa with the team of experts during data collection phase.

We are grateful to the Iringa Regional Commissioner Hon. Amina Masenza; Iringa Regional Administrative Secretary, Ms. Wamoja Ayubu; Iringa District Commissioner, Hon. Dr. Richard Kasesela; Iringa Urban Constituency Member of the Parliament, Hon. Rev. Peter Msigwa for their efforts, support, guidance, cooperation and encouragement. We feel indebted to Officials of Iringa Municipal Council, Iringa Municipal Councilor Ward Executive Officers, Sub-Ward Leaders and all residents of Iringa Municipality for creating a conducive working environment and providing us with relevant data.

It is not easy to mention everyone who facilitated or participated in one way or another during the preparation of the Iringa Master Plan, each one's contribution is highly appreciated.

Hon. Alex Boniphace Kimbe

Mayor Iringa Municipal Council

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ABBREVIATIONS

AEZ	Agro Ecological Zone
BBA	Bachelor of Business Administration
CBD	Central Business District
CBOs	Community Based Organizations
CTC	Care and Treatment Centre
EMS	Electronic Mails Services
FBOs	Faith Based Organization
GDP	Gross Domestic Product
GN	Government Notice
HBC	Home Based Care
HIV	Human Immune deficiency Virus
AIDS	Acquired Immune Deficiency Syndrome
IMC	Iringa Municipal Council
IRUWASA	Iringa Urban Water Supply and Sanitation Authority
KIUMAKI	Kikundi cha Utunzaji Mazingira cha Kihesa-Kilolo
LGAs	Local Government Authorities
MLHHSD	Ministry of Lands, Housing and Human Settlements Development
MUCUs	Moshi University College of Cooperative
NBS	National Bureau of Statistics
NGO's	Non- Government Organizations
PHCI	Primary Health Care Institute
PITC	Provider Initiated Testing and Counseling
PMTCT	Prevention of Mother to Child Transmission
RPC	Regional Police Commanding Office
RUCU	Ruaha Catholic University
STI	Sexually Transmitted Infections
SUDP	Strategic Urban Development Plan
SURP	School of Urban and Regional Planning
TANESCO	Tanzania Electric Supply Company
TANROAD	Tanzania Roads Agency
TANZAM	Tanzania Zambia Highway
TBS	Tanzania Bureau of Standards
TTCL	Tanzania Telecommunications Limited
UDEM	Urban Development and Environment Management
ULGSP	Urban Local Government Strengthening Program
VCT	Voluntary Testing and Counseling
VETA	Vocational Education Training Authority
VMMC	Voluntary Medical Male Circumcision
THMIS	Tanzania HIV/AIDS and Malaria Indicators Survey
NMB	National Microfinance Bank
NBC	National Bank of Commercial
GRN	Great Road North
MOEVT	Ministry of Education and Vocational Training

EXECUTIVE SUMMARY

This document contains technical analyses providing details of issues presented in the main report of Iringa Master Plan. Most of the data for the technical supplements were collected during the review of the 1980 Master Plan. The master Plan Technical supplements are presented in six chapters which include the planning process which addresses the steps followed in preparing the master Plan. Other chapters include; CBD redevelopment plan, housing characteristics, informal settlements transport and communication and public utilities. On methodology front, this master plan many data collection approaches were used including interviews, household surveys, observations, traffic counts and official interviews and discussions. This plan was also presented to a series of stakeholders meetings and a wider presentation was carried out during public hearing meetings. The CBD redevelopment plan has been formulated to guide development of the central functions of Iringa municipality. While improvement in infrastructure and other facilities have been recommended, the boundary for CBD has been also extended to provide ample land for CBD functions. The zoning planning will guide development of all parcels of land in this area including land coverage, floor area ratio and height of buildings.

This technical supplement also provides strategies of addressing informal settlements. Specific approaches have been recommended for settlements identified to be at infancy, consolidating and saturated stages of growth. Detailed characterization of housing describing types, condition, ownership, total stock and recommended development conditions have been enunciated. Similarly, characteristics of transport and communication particularly issues on transport and traffic characteristics, road network pattern, accident statistics, parking, travel characteristics and recommended standards for various road classes have been discussed. The last chapter in this supplement dwells on public utilities. It provides on current supply, demand and recommendation on water, sewage, electricity, solid waste management and storm water drainage.

The Municipal Council in collaboration with other stakeholders have a role to ensure that proposals contained in these technical supplements are implemented for sustainable development of Iringa municipality.

Dr. Donald W. Mafwere
MUNICIPAL DIRECTOR,
IRINGA MUNICIPAL COUNCIL

TECHNICAL SUPPLEMENT

1

THE PLANNING PROCESS

1.1 INTRODUCTION

The aim of this technical supplement is to analyze in detail, urban planning information collected by technical team as part of the process preparing the Iringa master plan. The Technical supplements involve additional information complementing the master plan main document. These technical supplements address different important issues including data and technical specifications for public utilities. The technical supplements have been divided into six sections. These are: the planning process, Iringa central area, unplanned settlements, transport and communication, public utilities and five year development plan (2015 to 2020). Each section is described with the maps, figures, tables and drawings that help to elaborate different land uses of Iringa municipality.

1.2 THE PLANNING PROCESS

The procedures for the preparation of Master plans are described in the Urban Planning Act (Number 8) of 2007; these procedures are supplemented by the General Guidelines for the preparation of general planning schemes. However, this section addresses the key aspects of the plan preparation that were adopted in the preparation of this Master Plan. The preparation process of this Master plan went through several stages as follows:

Stage 1: Consultation, declaration and administration

Iringa Municipality in its capacity as a Planning Authority started the process to prepare this Master Plan in 2013. It started by the Full Council passing a resolution for the intention to prepare a Master plan. The declaration of the planning area was followed the Ministry of Lands, Housing and Human Settlements development issuing a Government Notice Number: 218 of 29th May 2015 that declared the planning area.

The Planning Authority formed several planning committees which comprised of General Planning Committee that constituted the Council Management Team; Technical Committee that comprised of staff from different departments within planning authority and Technical Sub-Committee that was formed by Technical Committee members and other stakeholders. Planning Authority conducted public hearing meetings in all 18 wards as a way of collecting public opinion from stakeholders and also as requirement by the Urban Planning Act (2007). In these public hearing meetings a number of key issues were raised by stakeholders. Prior to public hearing meetings, the Planning Authority conducted several consultative stakeholder meetings in March 2014. In these meetings the existing situation of Iringa Municipality was presented and several issues were raised to be considered in the planning process. In a way with stakeholders and public hearing meetings were used as tool for public participation to ensure that the planning process was as inclusive as possible.

Stage 2: Data collection

Data were collected by the technical team through surveys, interview, traffic and parking survey, observations and review of relevant documents. Official data for this plan were collected from each department and other service providers within Municipality these include; TANROADS, Postal and TTCL, Police-Traffic, Airport Authority and Education institutions. Documents review was conducted by going through various documents related this including; Iringa Master Plan (1980-2000); Social Economic Profile of 2013 and Iringa Redevelopment Plan (2000 – 2017). A total of 540 household interviews were conducted. This was administered through questionnaire forms. A total of 30 questionnaires were administered per each ward that constitute the present municipality of Iringa.

Stage 3: Data analysis and concept development

Detailed data analysis was conducted by the technical team. This was followed by situation analysis based on data collected. In the course of analyzing data, reference was also made to international, national and local development agendas. This analysis facilitated the identification of identified potential development areas, projections for land requirements, population and housing demands. Three concepts were developed as a stepping stone towards concrete plan proposals. These were compact concept, radial concept and satellite centre. Finally, the concept adopted was a "composite concept" with a large component of satellite development patterns. After approval of the Concept Plan, the planning team started to develop the vision and mission that was shared widely to have consensus agreement of what Iringa is anticipating to achieve.

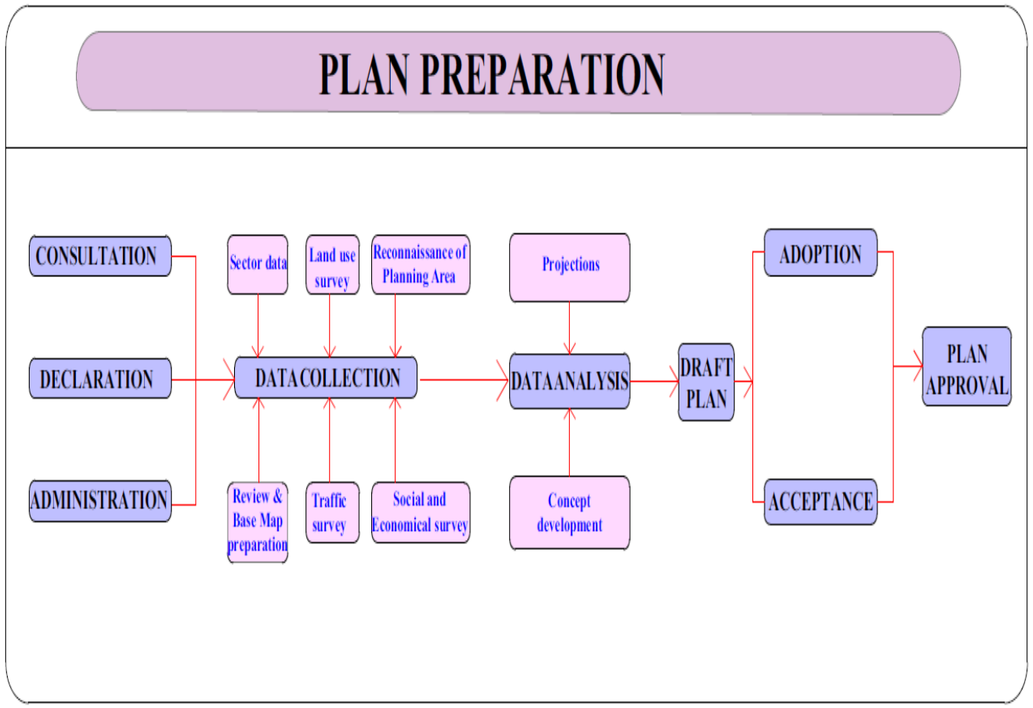
Stage 4: Draft plan adoption and acceptance

The draft Master Plan was presented to the Council Management Team; the Urban Planning Committee and Full Council for adoption and acceptance. That was followed by convening the second stakeholders' consultative meeting for discussion, scrutiny and improvement of the draft Master plan. The final draft of Master Plan was submitted to the Ministry of Lands, Housing and Human Settlements Development through the Regional Secretariat for endorsements and comments. Some comments were raised by these stakeholders and were incorporated in the final draft of master plan.

Stage 5: Plan approval

As per Urban Planning Act number 8 of 2007, all the Master Plans must be approved by the Director for Urban Planning to make sure such documents legally binding. Prior to this approval, the master plan has to be endorsed by the RAS office with minutes of public hearing meetings. This stage was adhered to and this master plan was approved in June 2017.

Figure 1.1: Plan preparation process



1.3 BASIS FOR PLANNING PROPOSALS

The structure of this master plan is based on a neighborhood unit as unit lowest unit for planning, through this unit; it has been possible to organize the growth hierarchy into communities and districts. The hierarchy of services has been also provided based on this hierarchical structure of planning the entire town.

At the lowest level, it is recommended to have four categories of plots sizes. The minimum plots size will be 300 squares metres is for a new areas; 90 square metres for regularization of consolidated unplanned settlements, Medium plot size of 800 squares metres and 1500 square metres for low density and 2400 square metres for super low density (Figure 1.2).

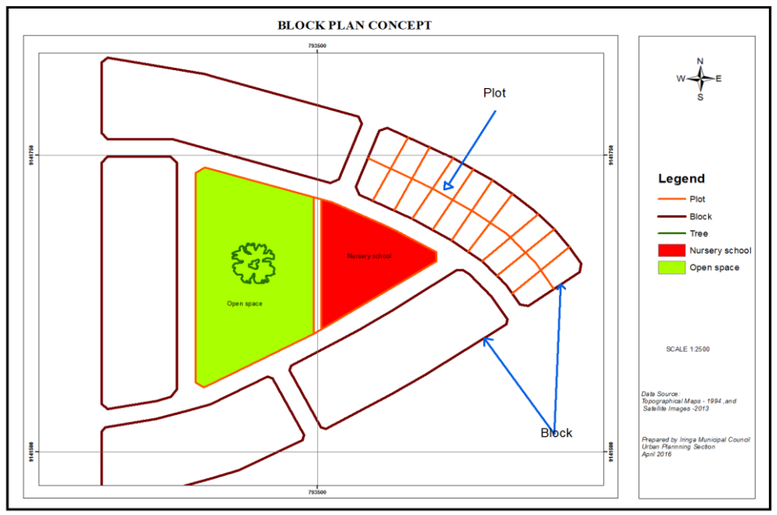
Figure 1.2: Proposed plot Size

PROPOSED PLOT SIZE			
S/No.	Density	Plot size (M)	Plot area (M^2)
i	High	15x30	300
ii	Medium	20x40	800
iii	Low	30x50	1500
iv	Super low	40x60	2400
v	Regularization of unplanned settlements	9x10	90

Block plan

Block plans comprising 20 plots should be designed to accommodate 100 people. A total of 5 blocks should constitute a housing cluster of approximately 500 people identified by an open space and pre-primary or nursery school. (Figure 1.3).

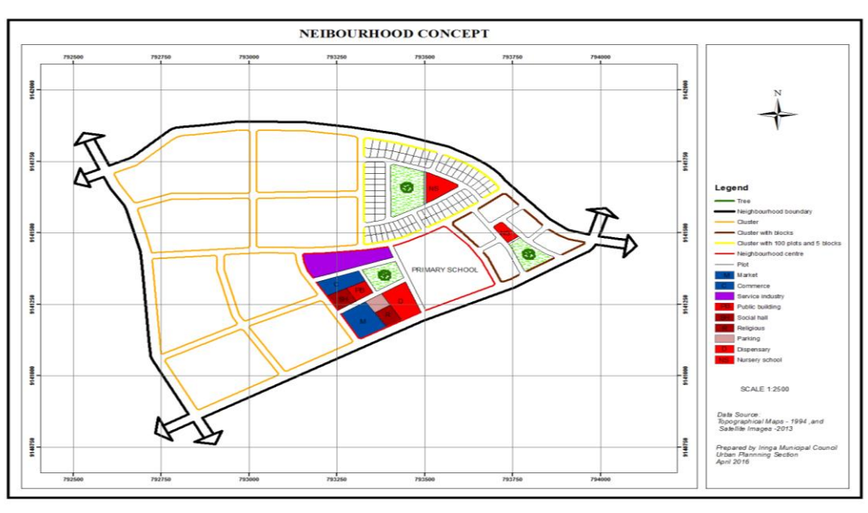
Figure 1.3: Block Plan



Neighborhood

About six (6) to ten (10) clusters combined together should culminate into a neighborhood unit of 3000 to 5000 (Figure 1.4).

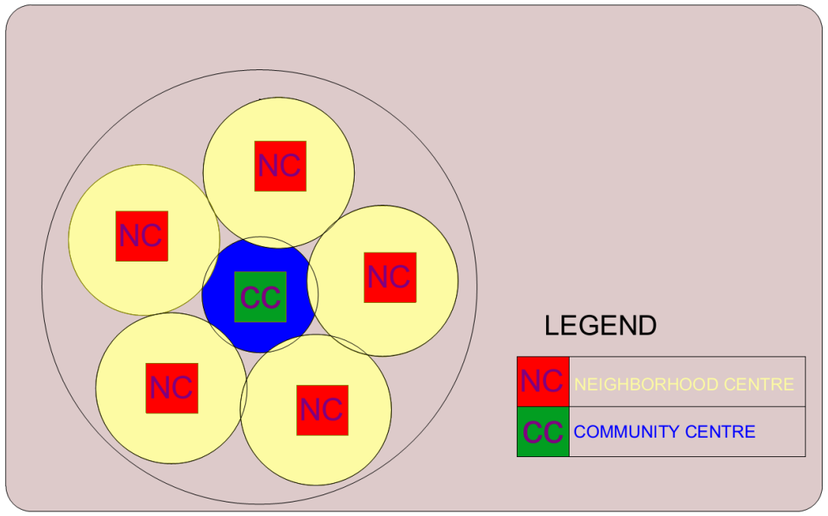
Figure 1.4: Neighborhood Proposed



Community

From the basic plot, housing cluster and neighborhood, the community structure is developed combining fives neighborhood units. The population for a community may range between 15,000 to 30,000 people (Figure 1.5).

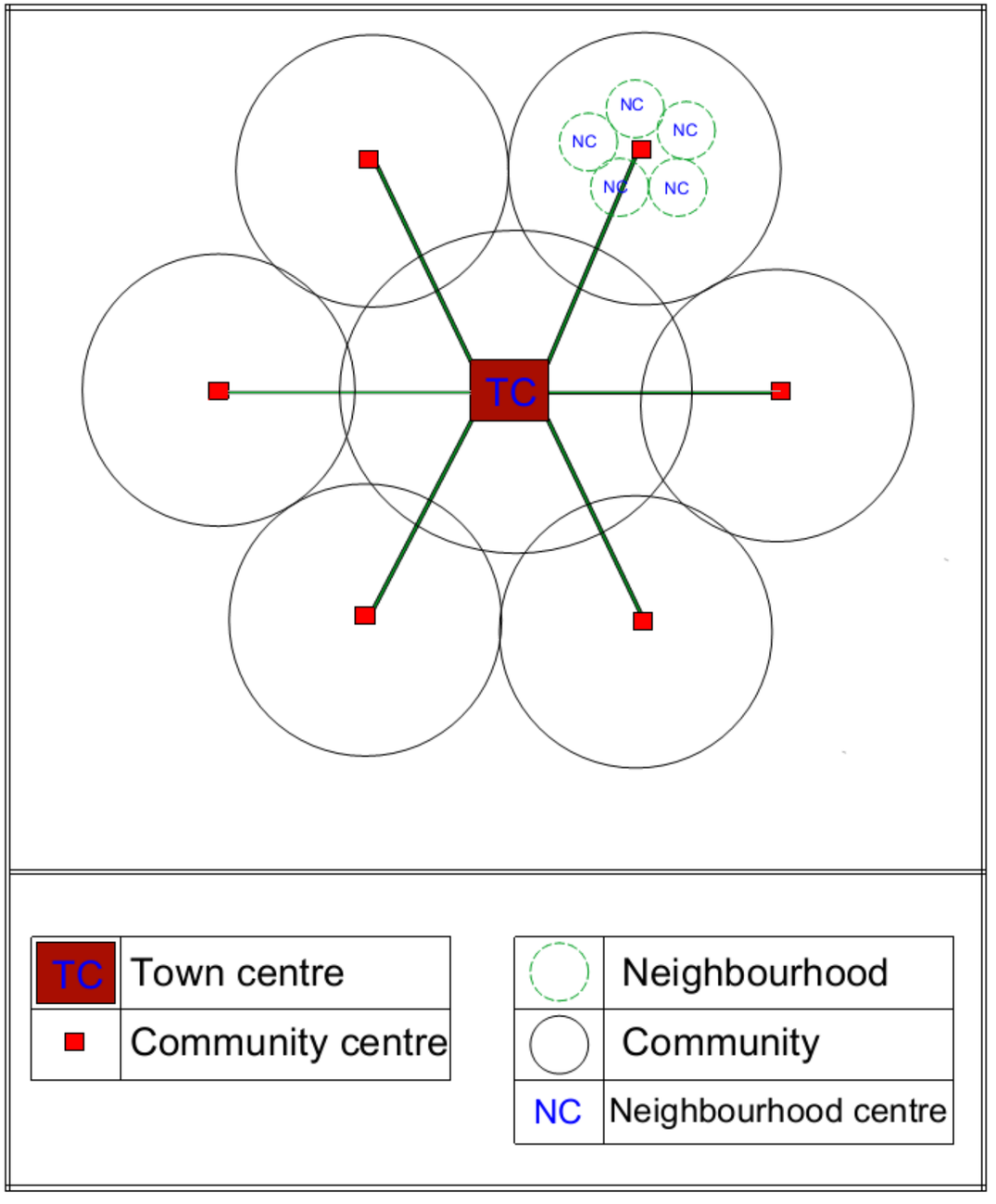
Figure 1.5: A model Community



District centre (Satellite Town)

It is further recommended that six communities should constitute a planning district, as per Iringa master plan, planning districts could as well constitute the satellite towns (Figure 1.6). In its local context, there will be three planning districts, identified as Nduli, Mkoga and Igumbilo. Each planning district will accommodate a population ranging from 90.000 to 180,000 people. As per Human settlements hierarchy these figures commutes potential future municipalities when Iringa has grown to the status of a city.

Figure 1.6: Planning District (satellite Town)



TECHNICAL SUPPLEMENT

2

CENTRAL AREA (CBD) REDEVELOPMENT PLAN

2.1INTRODUCTION

The area delineated on TP/DRG.NO 24/91/596 with approval by the Director of Human Settlements Development on 21st July 1996 and gazette via G.N 481 of 20th Dec.1996 is the Iringa Town Centre Redevelopment area. The central area is located in the southern trim of the plateau underlying Iringa town. The centre has a total area of 212 hectares, covering about 0.6 percent of the entire town. Being a core of social and economic activities of the town and the region at large, the central area is well linked by a strategic network of road. This network is strengthened by the two National trunk roads, namely: The TANZAM highway (Tanzania – Zambia) and the Great North Road.

2.2 THE NEED FOR A REDEVELOPMENT

Currently, the Iringa town central area is a planned for high-density development area with many buildings that have deteriorated to poor conditions. About 81 percent of all buildings in the area are in poor physical condition calling for urgent replacement or rehabilitation. The major land use within central area is residential which has a total of 795 buildings out of 1391 buildings. This represents 57.1 percent of all buildings in the area. The housing stocks of the central area undermine the core functions and activities that are supposed to be located in the Central Business District. Therefore, there is a need for redevelopment plan so as to bring about social and physical, economic and environmental changes.

Given the present status of this central area, the redevelopment scheme intends to ensure that major functions and activities rendering services to the majority of the town population and region are provided with adequate space and facilities. In doing so, the sparsely located major functions and activities could be efficiently and effectively managed and consolidated. The scheme also intends to create a good visual image of the central part of the town.

2.3 PREVIOUS REDEVELOPMENT PLANS

There was only one attempt for preparation of Iringa redevelopment Plan for its central area. The central area Redevelopment Plan was an integral part of the Iringa Master Plan, which was prepared by the Regional and Urban Planning Office in 1980. This plan was supposed to guide the CBD growth for the period of 20 years (1980 – 2000). The aim of the plan was to create a visual image to the central area by providing a sound pattern and framework for the development of the central area.

The plan took a long time to materialise due to multiple problems. Some these problems were:

i. Poor municipal finances

The Municipal council had no adequate funds allocated for the Redevelopment projects. Thus, implementation of the plan was as challenging task because issues such as compensation for land acquisitions, funding infrastructural improvement projects and provision of public services were not timely implemented.

ii. Low pace of house construction

Majority of landowners in Central area seemed to have limited cash flow to redevelop houses in the central area. This situation was caused by the decline of the economy in 1980s. Analysis of the income of the central area residents showed that most of the people in the area were within the low-income bracket.

iii. Development policies

The decade of 1970–1980s saw majority of building worth TZS 100,000 (1971 prices) being nationalised. This policy discouraged real estate developers and contributed to shifting focus from landed properties to other economic sectors.

iv. Stakeholders involvement

The CBD Redevelopment plan was prepared by local experts in the 1980. However, the planning process that was adopted during those years did not involve as many stakeholders as would be required. Therefore ownership of the plans so prepared was equally law.

Stakeholder's involvement is very important for any project sustainability. Facilitating the community participation will enable the Municipal authority identify problems and develop strategies to address them in collaboration with the community. Thus, there is a need for central area stakeholders and Municipal council to work closely during preparation of Redevelopment Plan. Under the current liberalized economic environment, the rule of the private sector in the implementation of the CBD redevelopment plan remains to be critical. Interms of physical state the CBD is deficient of pedestrian ways, characterised by dilapidation of houses and unguided change of uses. Building height have been well regulated to achieve a balanced skyline and cityscape.

2.4 POPULATION

The estimated population for the central area by 1980 was 26,770 people. This area has a total population of 35,626 people (September, 2014). This figure presents an increase of population by 4.2 percent. The most densely populated areas in the CBD include the central areas of Gangilonga, Kwakilosa and Makorongoni wards. The least densely populated commercial areas are: Kitanzini, Mshindo and Mivinjeni wards. According to the survey that was conducted during daytime from 0600 hours to 0930 hours, in six entry points along the boundary of the central business areas revealed that there were about 23,075 people entering the central area each working day. The population statistics provided by the ward executive officer shows that people residing in the central area were about 35,626, hence, the total day population of Iringa central area was estimated to 55,699 people.

2.5 ECONOMIC BASE

The economic activities and function within the central area are directly interrelated with the other social–economic activities taking place in the whole town and the region. The commercial sector, which includes wholesale and retail sellers of various commodities, is the predominant economic activity within the central area. The central area will continue to be the core of economic activities for the town and region. The town centre of Iringa also accommodates informal commercial activities like petty trading. Petty trading is predominant activity conducted along road junctions, road reserves, along streets and at bus terminals. These include shoe making and repair, tailoring, carpentry and street vendors. The service sector, which includes, among other things, petrol stations and garages is also economically significant.

2.6 EMPLOYMENT

Like similar cases in most urban centres in Tanzania, Iringa has since the colonial era been functioning as an administrative centre for the entire region. Thus, a good number of people working in the town are employed in the government or public. Other employers include co-operative society's private firms and individual.

2.7 EXISTING LAND AND BUILDINGS USE

Residential

The household survey conducted in September 2014 revealed that 47.9 percent of the residential area was changed into commercial/residential and institution uses. The remaining residential area is scattered in Mivinjeni, Makorongoni and Mwembetogwa. Residential use is also dominant around Magereza (Police line) area along Kenyatta Drive. The general land use description is residential, commercial/residential cover 48.9 percent, institutional use cover 20.1percent, commercial cover 6.2 percent, industrial cover 0.1 percent, open space cover 11.6 percent and transport and circulation cover 13.1 percent of total land.

Commercial /Residential

Ccommercial/residential use is dominant in Mshindo, Kwakilosa, Gangilonga, Miyomboni/Kitanzini wards and along Dodoma- Iringa road. This is the largest land use in the central area. It covers 103.91 hectares which accounts for 48.9 percent of the total land.

Institutional

The second largest land use is covered by institutions. These institutions includes; administrative offices, primary and secondary schools, regional hospital, numerous dispensaries, churches and other public institutions. It covers a larger portion of eastern side of the town where they are Government offices. It also include areas covered by the community centre, financial Institutions, community facilities and Parastatal organizations. It covers 42.51 hectares which accounts for 20.1 percent of the total land.

Commercial

The central area has been retained as the core for commercial activities of commercial activities concentration is found along Jamat and Sultan Streets. Vend services are accommodated in commercial/residential areas. Arcades to protect pedestrians from intense sunlight and rain have been incorporated on ground floors. Other activities of purely commercial nature are located Uhuru Avenue. Stalls for small-scale business are accommodated in peri urban markets. Commercial cover 13.08 hectares representing 6.2 percent of the total area.

Industries

Industrial establishments are existing in Gangilonga along Uhuru Avenue. These comprise of the National Milling Corporation and a number of service industries and warehouses. Another existing major industrial establishment is the Tanzania Diamond Cutting (TANCUT) located along Kenyatta Drive in the south-eastern part of the central area. This building has been changed to commercial/residential use. The industry is no longer operating.

Open space

Existing open spaces and recreational sites include open spaces near CCM Building, Regional Headquarters, the Central Square, cemeteries, stadium, golf course and unbuildable space. In total open spaces cover 24.59 hectares of land which is equivalent to 11.6 percent of the total land designated.

Transport and Circulation

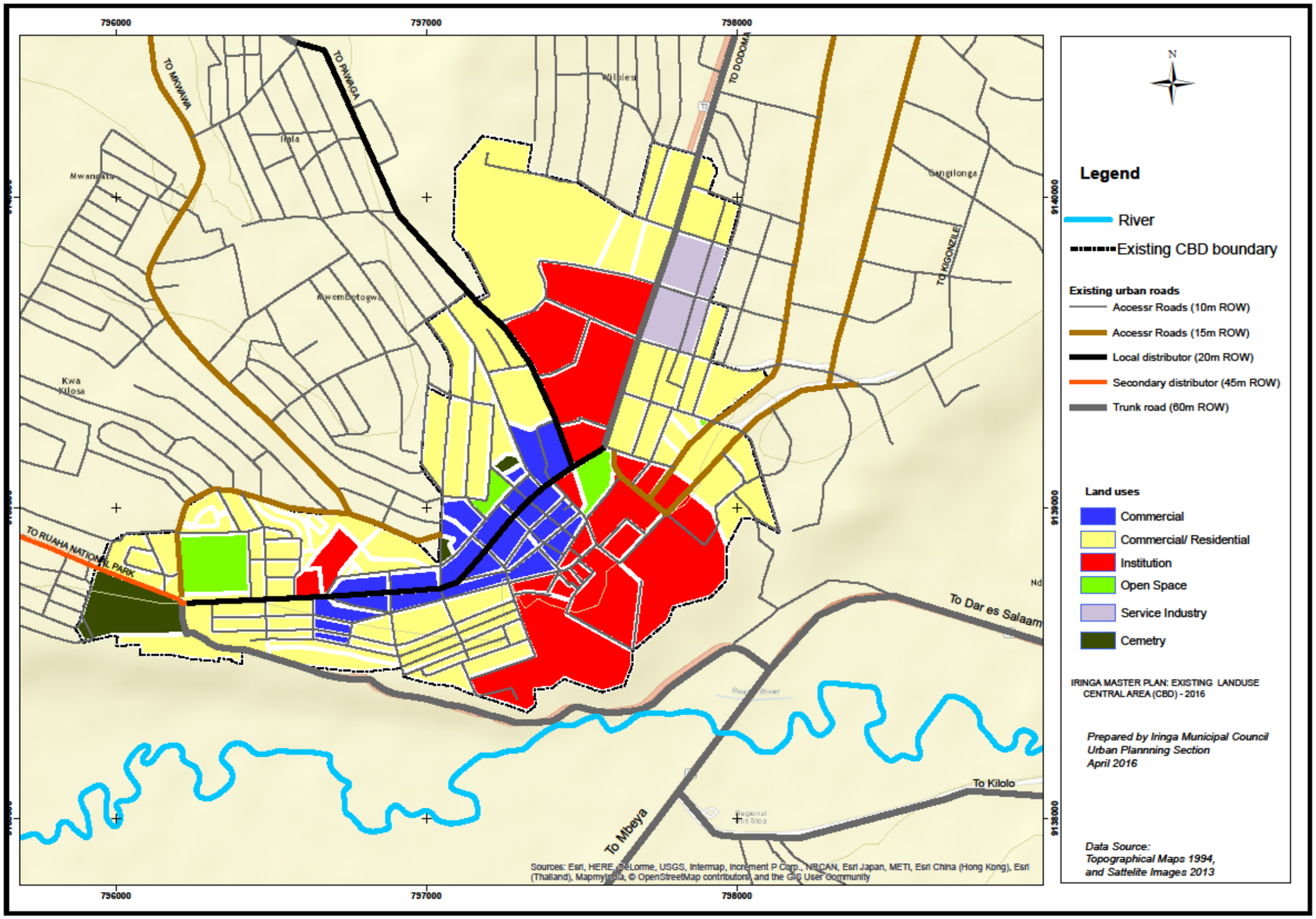
Transport and circulation use includes that area covered by central bus terminal, the central car park and roads. The bus terminal covers a larger part of about one-hectare. Categories of roads include primary and secondary distributors, local and access roads and pedestrian ways. The circulation system (roads and paths) cover 27.8 hectares equivalent to 13.1 percent of land surveyed. The system consists of several types of road with different hierarchical in nature. These are trunk roads, arterial road local and access road.

Table 2.1: Existing land use distribution in CBD

Land use	Area in Ha	Percent
Residential/Commercial II	61.40	28.8
Residential/Commercial I	42.51	20.1
Institutional	42.51	20.1
Commercial	13.08	6.2
Open Spaces & Cemetery	24.59	11.6
Transport & Circulation	27.80	13.1
Industrial	0.11	0.1
TOTAL	212.00	100

Source: Physical surveys September, 2014

Map 2.1: Existing land uses



2.8 BUILDING CONDITION

The redevelopment area had a total of 1391 buildings. The majority of these buildings were in poor form and physical condition. Few houses, about 9.6 percent are in good condition and structurally sound. Most of these houses were built with sand and cement blocks or burnt bricks with plastered and painted external surface. Buildings without plaster have been classified as being in fair condition. About 57.5 percent of buildings were poor in condition; most of them were built by unburned soil/clay bricks. This is a common phenomenon as the central area is the oldest part of the town. These buildings need to be replaced or rebuilt under the proposed redevelopment conditions. Indeed about 2.3 percent of all buildings surveyed were dilapidated and condemned. (Table 2.2)

Table 2.2: Existing housing condition

Building condition	Good	Fair	Poor	Condemned	Total
No. of houses	133	426	801	31	1391
Percentage	9.6	30.6	57.5	2.3	100

Source: Physical Survey September 2014

2.9 BUILDING HEIGHT

Iringa town is generally characterized by low-rise development. Many building fall between four to five floors and only a few are above seven. The survey conducted in September 2014 revealed that 41.3 percent of all buildings are between three and four floors followed by buildings with one to two floors 29.3 percent, five and six floors were 23.9 percent and seven and above floors were 5.5 % (Table 6). There are very few buildings of architectural and historical importance. These include the Mshindo Catholic Church Building, District Court and the former District Commissioner Office.

Table 2.3: Existing building height

Building height	1 - 2 floor	3 - 4 floors	5 - 6 floors	7 floor and above	Total
No. of buildings	27	38	22	5	92
Percent	29.3	41.3	23.9	5.5	100

Source: Physical surveys September 2014

These findings show that the redevelopment plan of (2000-2017) was being implemented slowly. There is a need to support private developers and other institutions to invest more in CBD.

2.10 BUILDING OWNERSHIP

Private developers own most of the buildings in Iringa central area. Very few are owned by public or Parastatal organization. The survey conducted in September 2014 revealed that 90.6 percent of houses were privately owned, while Public sector owned only 6.3 percent of the total housing stock. Parastatal Organisations owned 3.1 percent of the total stock. Public owners were mainly National Housing Corporation.

Table 2.4: Existing building Ownership

Building ownership	Public	Private	Parastatal	Total
No. houses	87	1260	44	1391
percentage	6.3	90.6	3.1	100

Source: Physical surveys September 2014

2.11 PROPOSALS FOR URBAN RENEW

The plans and recommendations presented in this section have been considered after an objective study and a thorough analysis of the Central Business District's multifarious characteristics. They are long-term development proposals projecting to a 20 period. It is expected that considerable long-term benefits will be achieved through appropriate implementation of the proposed plans and recommendations. After analysing the existing situation of the Central area and working on the current land use policies, goals and objectives set for the redevelopment plan, the proposed CBD will be extended from 212 hectares to 729.95 hectares due to increased need of central area functions. The central area will stretch to seven wards of Miyomboni - Kitanzini, Gangilonga, Mshindo, Mivinjeni and parts of Kwakilosa, Makorongoni, Mlandege and Ilala.

Land uses

The proposed land uses structure for the central area redevelopment plan includes areas under special residential (residence for government officials), commercial/residential, Institutional, commercial, open space, roads and industrial uses (Table 2.5).

Table 2.2: Proposed land use distribution

Land Use	Area In Ha	Percent
Special Residential	24.492	3.355
Residential/Commercial II	368.441	50.475
Residential/Commercial I	136.383	18.684
Institutional	62.178	8.518
Commercial	43.215	5.920
Open Spaces	5.430	0.744
Cemetery	5.888	0.807
Transport & Circulation	72.995	9.999
Industrial	10.932	1.498
Total	**729.954**	**100**

Special residential

This is an area proposed for senior government officials including State House, Regional Commissioners, District Commissioner and Judges Houses. This area is largely situated in Gangilonga Ward and it covers 34.492 hectares which is equivalent to 3.4 percent of the total areas.

Commercial/residential areas I

This is a commercial-residential zone allocated for high rise buildings. Residential accommodation will be available in the upper floors. The residential use in the core of central area has been proposed in order to achieve the necessary mix and make CBD lively throughout the day including weekends. Concentration of this area will be parts of Kitanzini, Gangilonga, Mivinjeni, Makorongoni, Ilala, Mlandege and Mshindo wards. It covers a total area of 136.4 hectares or 18.6 percent of the CBD land.

iii) Commercial/Residential areas II-Apartments

Areas proposed for commercial/residential use are mainly located in the periphery of the Central area, with general concentration in parts of Kitanzini, Gangilonga Mivinjeni, Makorongoni, Ilala, Mlandege and Mshindo wards. These areas are mainly earmarked as immediate overspill areas for CBD expansion. It covers an area of 368 hectares or 50.5 percent of the CBD land.

Institutional uses

Most of the institutional functions have been proposed to remain where they are, with more space as recommended to cope with future needs. Other institutions of CBD character have been recommended in the new satellite centres of Nduli, Mkoga and Igumbilo.

Commercial uses

The current commercial activities have been retained in the CBD with general concentration along main bus stand, Mkwawa II Street, Jamat Street and Uhuru Avenue. Retail services in this area, is proposed to be accommodated in commercial/residential buildings. In order to protect pedestrian from intense sunlight and rain, it is recommended that arcades be incorporated on ground floors of all commercial buildings. All buildings in this zone shall have the minimum of ten floors and maximum of twenty floors. The recommended land coverage for commercial uses is 43.2 hectares or 5.9 percent of the total CBD land.

Industrial uses

Concentration of Industrial establishments has been proposed along Uhuru Avenue and Kwakilosa wards along Kalenga road. These will comprise the National Milling Corporation and a number of service industries and warehouses. The land coverage is 20.9 or 1.9 percent of the CBD land.

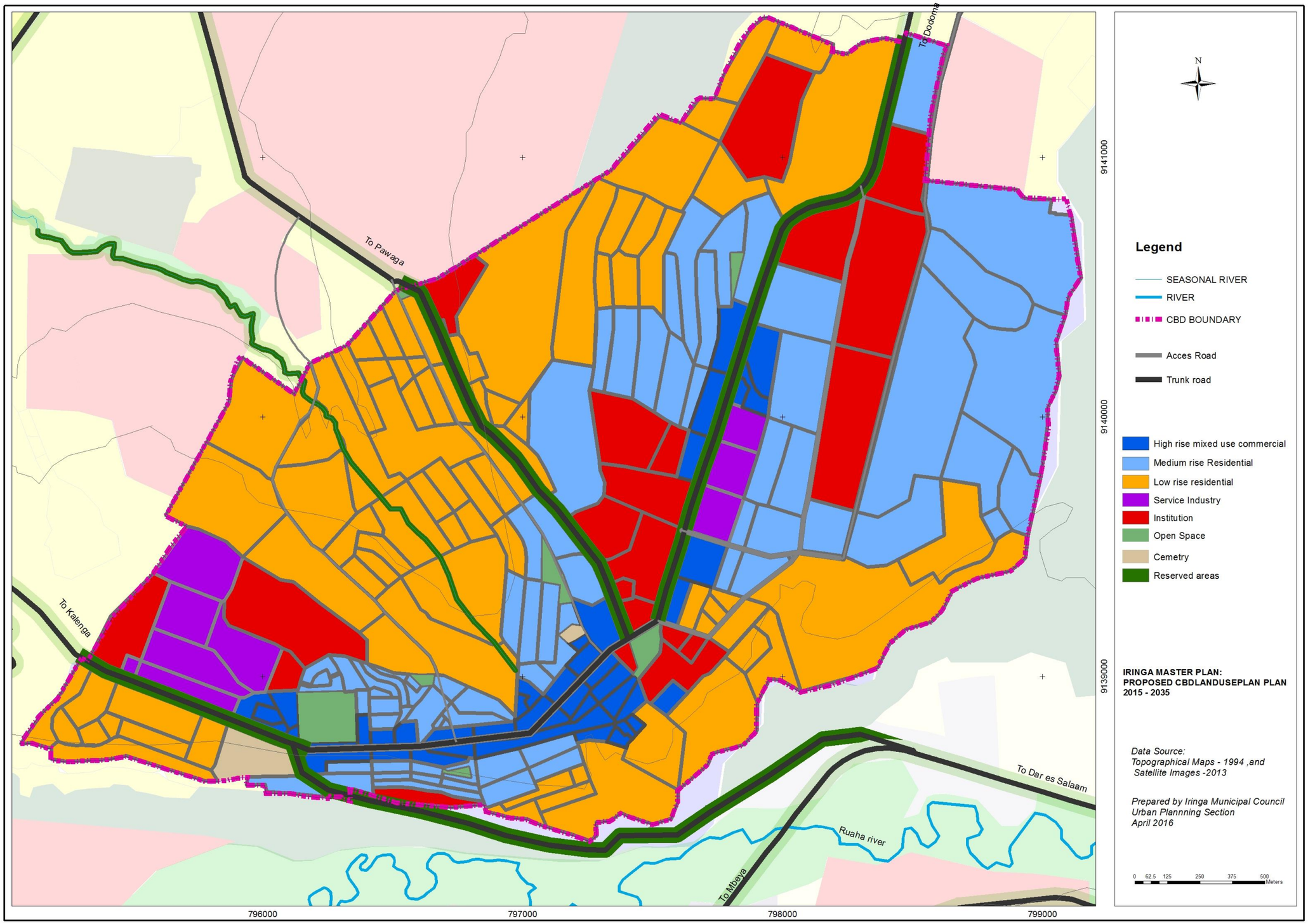
Open spaces

All the available open spaces and recreational facilities have been retained and others included from Gangilonga ward Wilolesi Primary School, Ilala Mosque, Primary Health Institute and CCM Building Regional Headquarter.

Transport and circulation

The proposed area for this use includes that covering the central bus terminus, the central car park and roads. The existing central bus terminal will be used for town buses after constructing a new central bus terminal at Igumbilo area. Car parking has been proposed to be located in commercial storeys building and institutions to have their own staff parking. Pedestrian malls should be established along old Dodoma Road which will be free from vehicle traffic. The remaining area will be covered by all categories of roads including primary and secondary distributors, local and access roads and pedestrian ways.

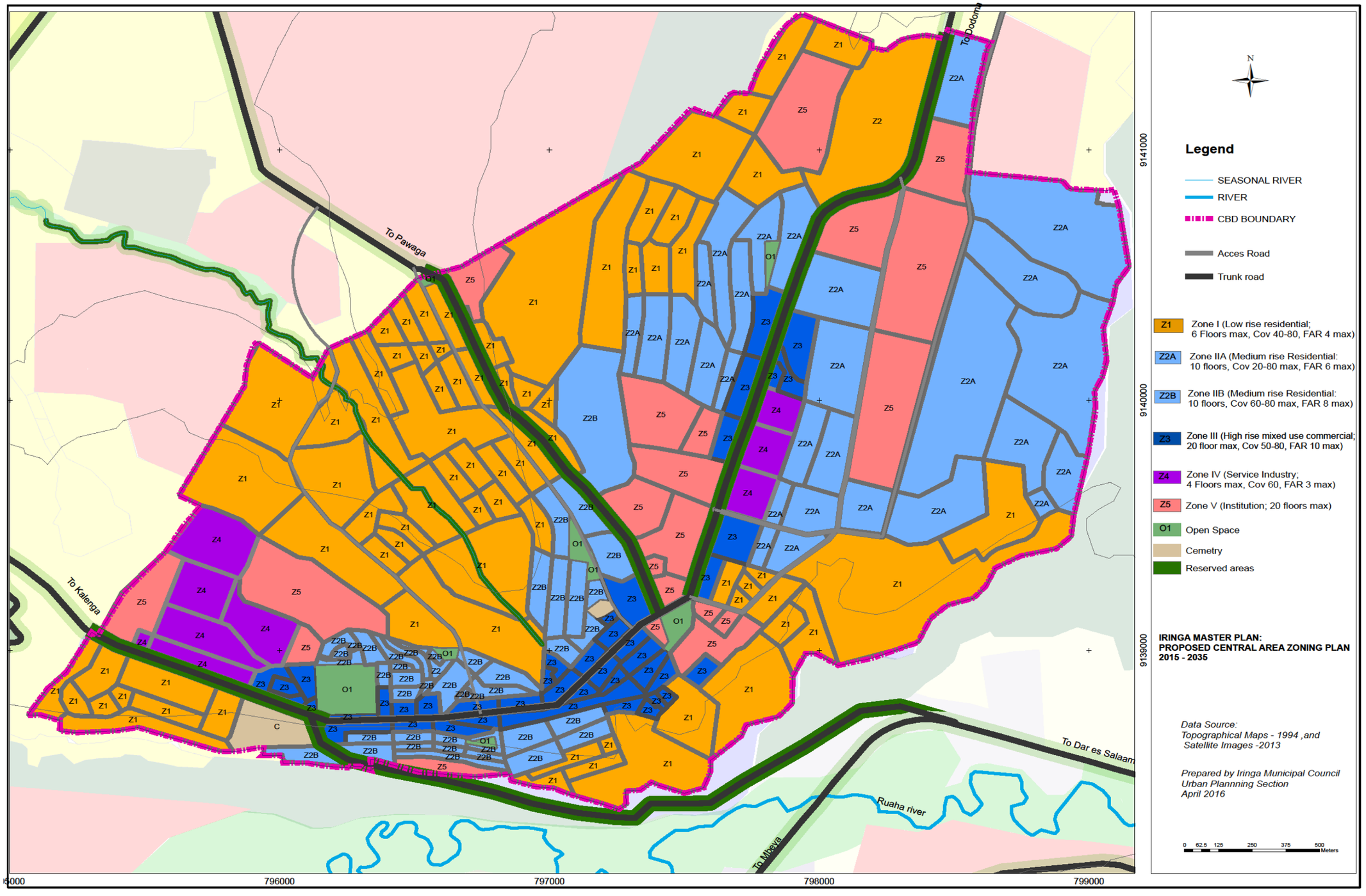
Map 2.3: Proposed CBD land use



2.12 ZONING PLAN FOR THE CBD

The Central area has been zoned into different areas each with a specific building form and development condition. Five distinct zones are recommended in the Plan. Zone I is the low-rise residential zone, located in the periphery of the central area. These areas are mostly found in Mshindo, Ilala, Mlandege, Makorongoni, Kitanzini, Mivinjeni, Kwakilosa and Gangilonga with building height of one to five floors. Zone II is the Medium rise residential zone is located at the centred parts of the central area, where most of buildings will be business and Government offices. In this zone building height will be six to ten floors with ground floor will be used for commercial purposes. Zone III is the high rise mixed zone located at the Main bus stand, Mkwawa II Street, Jamat Street and Uhuru Avenue. This zone is recommended for mixed uses to accommodate services of offices, shops, apartments and hotels to and will have eleven to twenty floors. That particular skyline has been chosen to conform to the existing land terrain. Zone IV is the service industrial zone which is located at Gangilonga and Mlandege areas. This zone recommended for service industrial use with offices attached on them, building with height of one to four floors. Zone V is institutional zone within the CBD. These are government and religious offices. This zone will accommodate public services. The building height will be one to twenty floors *(Map No 2.4).*

Map 2.4: Proposed CBD zoning plan



2.13 ZONING AND DEVELOPMENT REGULATIONS

This section describes the basic development control guidelines for various land uses, including landscapes requirements. Development control guidelines are important elements of achieving the Master plan vision. They are a set of illustrated design rules and requirements which describe and guide the physical development of buildings and spaces.

The Objectives of the zoning and development control guidelines/regulation are;

i. To establish a future envisioned Municipality's image of the built environment which is composed of rich and diverse architecture;
ii. To strengthen citizen awareness about the environment in order to create beautiful Municipality landscape; and,
iii. To create an attractive Municipality landscape with balanced development
iv. To indicate the planning control of the all lands in its administrative area

Zoning regulates the types of uses, the building form, building materials, the setting which will includes coverage, building setbacks, parking and height of buildings on any plot. The Zoning Regulations specifically defines the uses into three categories: Permitted, Conditional and Prohibited uses.

The Zoning Regulations also stipulate the location of a building on any plot, the overall maximum density, as well as the building height. Specific regulations related to overall building form, design, provision of open space and landscaping, parking, fencing and signage are also stipulated in the Zoning Regulations. Zoning Regulations stipulate maximum allowable development for a particular zone, but flexibility in development is ensured by allowing conditional and permitted developments of lower zones in the same category in most cases except for areas where such is specifically mentioned.

Permitted Uses

Uses that comply with the proposed use for the particular zoning area and can be permitted within particular zoning cluster. These developments may have to comply with other context specific additional regulatory restrictions.

Conditional Uses

Conditional uses are usually activities that may create significant traffic, noise, or other impacts on the surrounding neighborhoods. Such identified uses can be permitted "conditionally" within a zone requiring the development to confirm to a set of conditions and standards as per the regulations which must be met at all times. Each zoning district can allow different but compatible developments that are complementary in terms of use and scale. For example, a small-scale commercial development could be allowed in residential districts in order to provide convenience for residents to meet their daily shopping needs. Similarly, civic facilities like schools, day care centres, religious facilities could be allowed in a residential zone, provided the facility meets the parking, noise standards etc. Such conditional uses could be permitted after careful consideration and evaluation by the relevant Planning Authorities City Councils, and may be subject to certain conditions as deemed necessary by the review committee, in order to ensure that the overall planning intention for any particular zoning district is not compromised.

Prohibited Use

These are uses that are deemed prohibited, and include activities that have been found to be incompatible with the particular zoning district. For example, Industrial Uses are prohibited within the residential zones.

2.14 CENTRAL AREA REGULATIONS

Residential development zone

The proposed housing regulations are key tools that should be used when implementing this Master plan. The shape and sizes of the plots will be designed to suit specific requirements of the intended user within the specifications of the Urban Planning and Space Standard Regulations of 2011. Residential zones will include; Low rise residential zone (Zone I) and Medium rised redential zone (Zone II)

Zone I: Low rise residential (ZI)

Zone I (Low rise Residential) is a zone establish in the CBD to provide high-quality, high density living with easy access to city level facilities with commercial at ground level. Provision of adequate Public facilities and optimum well landscaped open spaces shall be encouraged to enhance the quality of living in this high density zone. Any new residential development or renovation within CBD shall comply with this condition.

Table 2.3: Low rise Residential (Z1)

	Regulations	Remarks
Uses		
Permitted uses	Refer zoning plan matrix appendix	
Prohibited uses	Refer zoning plan matrix appendix	
Conditional uses	i. Standalone food outlet with less than 50 seats ii. Hotels (incl. its ancillary uses) iii. Public facilities iv. Convenience stores/ Light Commercial uses with floor area not exceeding 60m v. 2 or commercial use not exceeding 5% of GFA vi. Home Office	
Ancillary uses	i. Car parking garage ii. Servant quarter iii. Outdoor kitchen iv. Store rooms v. Outdoor wash room	
Coverage		
Minimum Plot Size	600m^2	
Maximum Building Coverage	40% - 80%	
Minimum Landscaping Coverage	20% minimum	
Maximum Floor Area Ratio (FAR)	4.0 maximum	
Building Heights		
Maximum Number of Floors	G+5 (Apartments/ Mezzonite) G (ancillary buildings)	
Floor to Floor Height	Ground Floor – 4.5m maximum Other Floors – 3.6m maximum	
Building Form	Apartments	
Building Setbacks (Minimum)		
Building (Above Grade)	Front: 7m (min) Side: 3m (min) Rear: 3m (min)	
Parking		
Location	Should be provided within plot boundary	
Minimum Parking Stores	1 Parking Lot per 1 dwelling unit	
Fencing		
Wall Height	Walls shall not exceed 2m and rear/ side fencing wall shall not exceed 2.5m in height	

Zone IIA: Medium rise residential (Z2A)

Low Rise Residential zone (Z2) is a zone establish in the CBD to provide high-quality, high density living with easy access to city level facilities with commercial at ground level. This zone is for area located at Gangilonga and Wilolesi. Provision of adequate Public facilities and optimum well landscaped open spaces shall be encouraged to enhance the quality of living in this high density zone. Any new residential development or renovation within CBD shall comply with these regulations.

Table 2.4: Medium rise Residential (Z2A)

	Regulations	Remarks
Uses		
Permitted uses	Refer zoning plan matrix appendix	
Prohibited uses	Refer zoning plan matrix appendix	
Conditional uses	i. Standalone food outlet with less than 50 seats ii. Hotels (incl. its ancillary uses) iii. Public facilities iv. Convenience stores/ Light Commercial uses with floor area not exceeding 60m v. 2 or commercial use not exceeding 5% of GFA vi. Home Office	
Ancillary uses	i. Car parking garage ii. Servant quarter iii. Outdoor kitchen iv. Store rooms v. Outdoor wash room	

Coverage	
Minimum Plot Size	1000m^2
Maximum Building Coverage	20% - 60%
Minimum Landscaping Coverage	20% minimum
Maximum Floor Area Ratio (FAR)	6 .0 maximum
Building Heights	
Maximum Number of Floors	G+10 (Apartments/ Mezzonite) G (ancillary buildings)
Floor to Floor Height	Ground Floor – 4.5m maximum Other Floors – 3.6m maximum
Building Form	Apartments
Building Setbacks (Minimum)	
Building (Above Grade)	Front: 7m (min) Side: 3m (min) Rear: 3m (min)
Parking	
Location	Should be provided within plot boundary
Minimum Parking Stores	i. 1 Parking Lot per 1 dwelling unit
Fencing	
Wall Height	Walls shall not exceed 2m and rear/ side fencing wall shall not exceed 2.5m in height

Zone IIB: Medium rise residential (Z2B)

Low Rise Residential zone (Z2B) is a zone establish in the CBD to provide high-quality, high density living with easy access to city level facilities with commercial at ground level. Provision of adequate Public facilities and optimum well landscaped open spaces shall be encouraged to enhance the quality of living in this high density zone. Any new residential development or renovation within CBD shall comply with these regulations.

Table 2.5: Medium rise Residential (Z2B)

	Regulations	Remarks
Uses		
Permitted uses	Refer zoning plan matrix appendix	
Prohibited uses	Refer zoning plan matrix appendix	
Conditional uses	i. Standalone food outlet with less than 50 seats ii. Hotels (incl. its ancillary uses) iii. Public facilities iv. Convenience stores/ Light Commercial uses with floor area not exceeding 60m v. 2 or commercial use not exceeding 5% of GFA vi. Home Office	
Ancillary uses	i. Car parking garage ii. Servant quarter iii. Outdoor kitchen iv. Store rooms v. Outdoor wash room	
Coverage		
Minimum Plot Size	1000m^2	
Maximum Building Coverage	60% - 80%	
Minimum Landscaping Coverage	20% minimum	
Maximum Floor Area Ratio (FAR)	8 .0 maximum	
Building Heights		
Maximum Number of Floors	G+10 (Apartments/ Mezzonite) G (ancillary buildings)	
Floor to Floor Height	Ground Floor – 4.5m maximum Other Floors – 3.6m maximum	
Building Form	Apartments	
Building Setbacks (Minimum)		
Building (Above Grade)	Front: 7m (min) Side: 3m (min) Rear: 3m (min)	

Parking	
Location	Should be provided within plot boundary
Minimum Parking Stores	ii. 1 Parking Lot per 1 dwelling unit
Fencing	
Wall Height	Walls shall not exceed 2m and rear/ side fencing wall shall not exceed 2.5m in height

Zone III: High rise Mixed Use commercial Zone (Z3)

High rise mixed use commercial (Z3) intended to establish CBD core, prime offices area and regional financial hub.

Table 2.6: High rise Mixed Use commercial Zone III (Z3)

	Regulations	Remarks
Uses		
Permitted uses	Mixed use developments Shopping centres Offices Hotels Apartments Galleries Multi-family housing	
Prohibited uses	Industrial use	
Conditional uses	Petrol stations	
Ancillary uses	Electric substation Refuse area	
Coverage		
Minimum Plot Size	400m^2	
Maximum Building Coverage	60%	
Minimum Landscaping Coverage	10% minimum	
Maximum Floor Area Ratio (FAR)	2 maximum	
Building Heights		
Maximum Number of Floors	G+20 (Apartments) G (ancillary buildings)	
Floor to Floor Height	Ground Floor – 5m maximum Other Floors – 3.6m maximum	
Building Form	Apartments	
Building setbacks (Minimum)		
Building (Above Grade)	Front: 1,5 m (min) Side: 3m (min) Rear: 1.5m (min)	
Parking		
Location	Should be provided within plot boundary	
Minimum Parking Stores	i. Commercial – 2 Parking Lot for the first 200 m^2 commercial space and 1 Parking Lot per subsequent 200m2 commercial space shall be provided ii. Apartment – 1 Parking Lot per 1 dwelling units iii. Food Outlet -1 Parking Lot per 10 seats shall be provided iv. Hotel - 1 Parking Lot per 200 m2 shall be provided	
6.0 Fencing		
6.1 Location	i. Fencing and walls are not permitted along the front setback ii. Fencing and walls in the side and rear yards shall be at the perimeter of the lot	
6.2 Wall Height	2.0 m high solid perimeter fencing wall is allowed at the side and rear of the lot	

Zone IV: service industrial zone

These are small scale industries scattered in the central area. These shall not generate large quantities of trade effluent or solid waste. They shall also not generate excessive impulsive or continuous noise. They shall also not use large quantities of hazardous substances such as solvents, acids and other chemicals or toxic elements.

Table 2.7: service industrial zone

	Regulations	Remarks
Uses		
Permitted uses	Refer zoning plan matrix appendix	
Prohibited uses	Refer zoning plan matrix appendix	
Conditional uses	i. warehouses ii. Community Hall / Multi-Purpose Hall iii. Primary school iv. Government Offices v. Religious Site	
Ancillary uses	Electric substation Refuse area	
Coverage		
Minimum Plot Size	1500m^2	
Maximum Building Coverage	80%	
Minimum Landscaping Coverage	10% minimum	
Maximum Floor Area Ratio (FAR)	1.6 maximum	
BUILDING HEIGHTS		
Maximum Number of Floors	G+2 (industrial operations) G+4 (Office operations) G (ancillary buildings)	
Floor to Floor Height	Ground Floor – 5m maximum Other Floors – 4m maximum	
Building Form	Attached Building	
Building setbacks (Minimum)		
Building (Above Grade)	i. Front: 5m ii. Side: 3m (min) iii. Rear: 3m (min)	
Parking		
Location	Should be provided within plot boundary	
Minimum Parking Stores		
	Parking shall be hard surfaced and provided with adequate drainage	
Fencing		
Location	i. Fencing and walls are not permitted along the front setback ii. Fencing and walls in the side and rear yards shall be at the perimeter of the lot	
Wall height	3.0 m high solid perimeter fencing wall is allowed at the side and rear of the lot	

Table 2.8: Iringa Master Plan; Zoning Plan Matrix

ZONES	LAND USE	SPECIFIC USES																																									
		Residential				Commercial																		Public Facilities																			
		Residential				Commercial																		Education							Health			Other Facilities									
		Detached	Semi-Detached	Row House	Apartment	Convenience Store	Market	Retail Shops	Shopping Centre	Shopping Mall	Hyper Mart	Super Mart	Banks	Small Office	General Office	Corporate Office	Show room	Restaurant	Exhibition Hall	Discotheque	Private Recreation	Convention	Guest House	Hotel >1200m2	Nursery School	Primary School	Secondary School	Polytechnic	Education Centre	College	University	Health Centre	Hospital	Referral Hospital	Library	Community Hall	Cinema Hall	Cultural Centre	Museum	Police Station	Embassy	Government	Religious Site	Abattoir
General Residential	**R1** Medium Density Residential	√	√	√	C	C	√	√	√	√	C	C	C	C	X	X	X	√	X	X	√	X	√	X	√	√	√	X	X	X	X	√	√	√	√	C	C	C	C	√	C	√	C	X
	R2 Low Density Residential	√	√	√	C	C	√	√	√	√	C	C	C	C	X	X	X	√	X	X	√	X	√	X	√	√	√	X	X	X	X	√	√	√	√	C	C	C	C	√	C	√	C	X
General Commercial	**CC** Community Centre Commercial	X	X	C	√	√	√	√	√	√	√	√	√	√	C	C	C	√	√	√	√	√	√	√	√	√	√	C	C	C	C	√	√	√	√	√	√	√	√	C	√	C	X
	DC District Centre Commercial	X	X	C	√	√	√	√	√	√	√	√	√	√	C	C	C	√	√	√	√	√	√	√	√	√	√	C	C	C	C	√	√	√	√	√	√	√	√	C	√	C	X
	CR Commercial residential	X	X	C	√	√	√	√	√	√	√	√	√	√	C	C	C	√	√	√	√	√	√	√	√	√	√	C	C	C	C	√	√	√	√	√	√	√	√	C	√	C	X
Central Area	**Z1** Low Rise Residential	X	X	C	√	√	√	√	√	√	C	C	C	C	X	X	X	√	√	√	√	√	√	√	√	√	√	X	X	X	X	√	√	√	√	C	C	√	√	√	C	√	C	X
	Z2A Medium Rise Com/ Residential	X	X	X	√	√	√	√	√	√	C	C	C	C	X	X	X	√	√	√	√	√	√	√	√	√	√	X	X	X	X	√	√	√	√	C	C	√	√	√	C	√	C	X
	Z2B Medium Rise Com/ Residential	X	X	X	√	√	√	√	√	√	C	C	C	C	X	X	X	√	√	√	√	√	√	√	√	√	√	X	X	X	X	√	√	√	√	C	C	√	√	√	C	√	C	X
	Z3 Mixed Use Commercial	X	X	X	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	C	C	C	C	√	√	√	√	√	√	√	√	√	C	√	C	X
Industrial	**SI** Service Industrial Zone	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√	X	√	X	X
	LI Light Industrial Zone	X	X	C	C	√	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√	X	√	X	X
	HI Heavy Industrial	X	X	X	X	√	C	C	C	C	C	C	C	C	√	√		√	C	C	C	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√	X	√	X	X
Open Area & Parks	**O1** Urban Agricultural	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	C	C	C	C	C	X	X	X	X	X	X	X	X	X	X
	O2 Active Recreation	√	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	X	X	X	X	X	X	X	X	X	X	X	X
	O3 Passive Recreation Zone	√	X	X	X	√	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	X	X	X	X	X	X	X	X	X	X	X	X
	O4 Reserved Zone	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

ZONES		LAND USE	SPECIFIC USES																						
			Industrial									Open spaces													
			Industrial									Other Facilities					Active Recreation					Passive Recreation			
			Petrol Station	Car Wash	Automotive repair shop	Workshops	Dry Cleaning	Logistics Centers	Bakery	Warehouse	General Industry	Housing Cluster Open Space	Neighbourhood centre	Community Park	District Park	CBD Park	Play Field	Sports Field	Sports Complex/ Stadium	Golf Course	Zoo / Theme	National Reserve park	Green Belt	Picnic / Camping	Reserved land
General Residential	**R1** Medium Density Residential		C	C	√	C	√	X	√	X	X	√	√	√	√	√	√	√	√	X	X	X	√	X	X
	R2 Low Density Residential		C	C	√	C	√	X	√	X	X	√	√	√	√	√	√	√	√	X	X	X	√	X	X
General Commercial	**C2** Community Centre Commercial		√	X	X	X	X	X	√	X	X	√	√	√	√	√	√	√	√	X	X	X	√	X	X
	DC District Center		√	X	X	X	X	X	√	X	X	√	√	√	√	√	√	√	√	X	X	X	√	X	X
	CR Commercial residential		√	X	X	X	X	X	√	X	X	√	√	√	√	√	√	√	√	X	X	X	√	X	X
Central Area	**Z1** Low Rise Residential		√	X	C	C	√	X	√	X	X	√	√	√	√	√	√	√	√	X	X	X	√	X	X
	Z2A Medium Rise Com/ Residential		√	X	C	C	√	X	√	X	X	√	√	√	√	√	√	√	√	X	X	X	√	X	X
	Z2B Medium Rise Com/ Residential		√	X	C	C	√	X	√	X	X	√	√	√	√	√	√	√	√	X	X	X	√	X	X
	Z3 Central Business District		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	X	X	X	√	X	X
Industrial	**SI** Service Industrial Zone		√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√		X	X	X	√	X	X
	LI Light Industrial Zone		√	√	√	√	√	√	√	√	√	X	X	X	X	X	X	X	X	X	X	X	√	X	X
	HI Heavy Industrial Zone		√	√	√	√	√	√	√	√	√	X	X	X	X	X	X	X	X	X	X	X	√	X	X
Open Area & Parks	**O1** Urban Agricultural Zone		X	X	X	X	X	X	X	X	X	√	√	√	√	√	√	√	X	X	X	X	√	X	X
	O2 Active Recreation Zone		√	X	X	X	X	X	X	X	X	√	√	√	√	√	√	√	√	√	√	√	√	√	X
	O3 Passive Recreation Zone		√	X	X	X	X	X	X	X	X	√	√	√	√	√	√	√	√	√	√	√	√	√	X
	O4 Reserved Zone		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	√	√	√	√

Key

√=Allowable uses

C=conditional use

X=not allowable /prohibited use

TECHNICAL SUPPLEMENT

3

HOUSING CHARACTERISTICS

3.1 Introduction

3.2 Housing types

3.3 Housing density

3.4 Housing condition

3.5 Housing ownership & occupancy characteristic

3.6 Housing situation in planned & unplanned area

3.7 Housing demand & supply

3.8 Challenges of housing supply

3.9 Housing strategy

3.10 Proposed affordable housing choices, types & regulations

3.1 INTRODUCTION

Housing characteristics in Iringa Municipality consist of important housing aspects such as existing housing stock, types, condition in both planned and unplanned areas, housing density and settlement pattern.

3.2 HOUSE TYPES

Iringa has five housing categories. These are: self-contained detached houses, blocks of flats, row houses, semi-detached and traditional houses while CBD portray a variety of house types. The intermediate zone of Iringa (Mkwawa, Kihesa, Mwangata are dominated with detached single storey houses. Per-urban wards of Nduli, Kitwiru, Isakalilo (Mkoga sub wards) are further mixed with detached and traditional houses.

3.3 HOUSING DENSITY

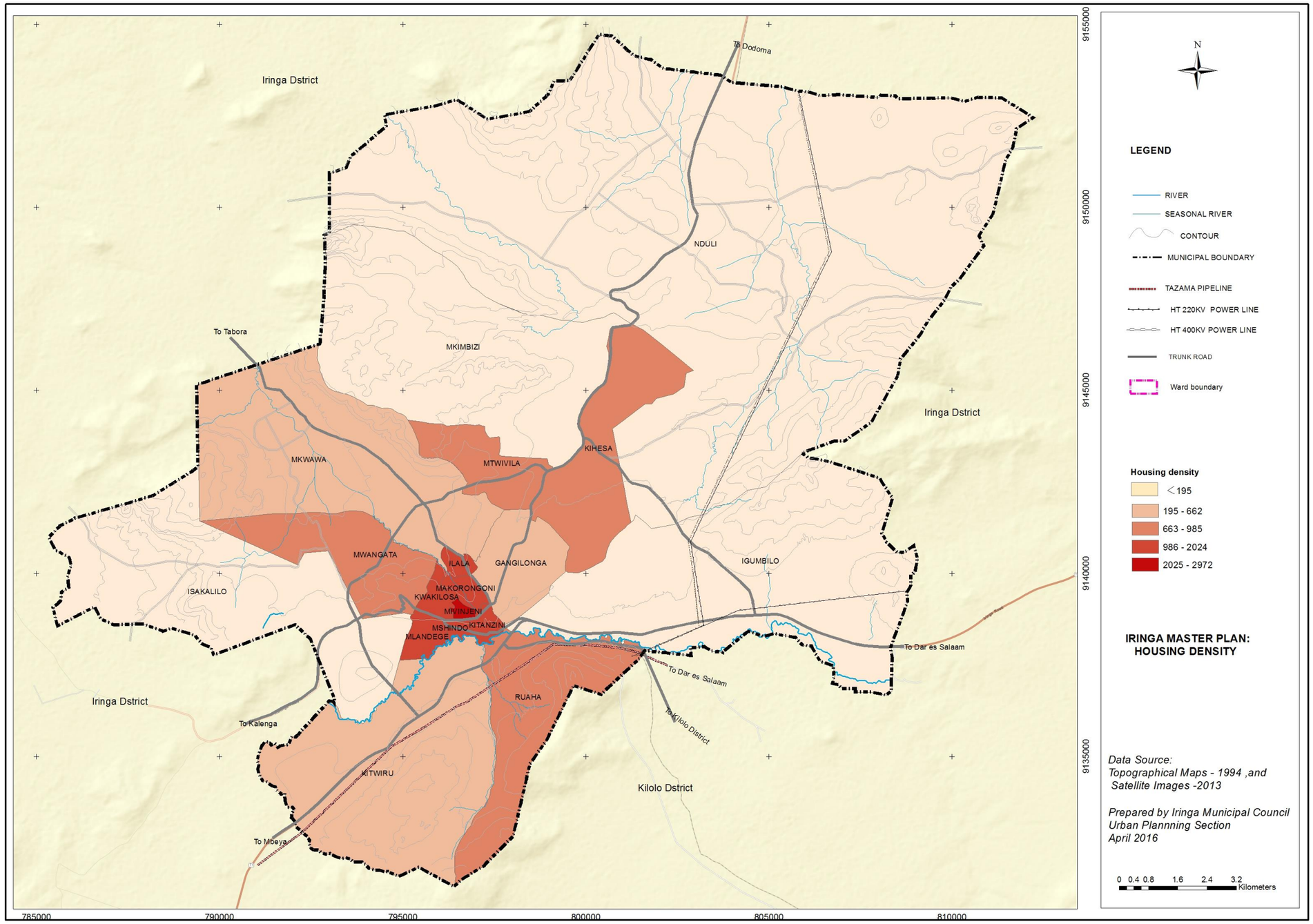
Housing density in Iringa Municipality varies from the centre towards the periphery. More concentration is along the main roads. The inner city of Miyomboni/Kitanzini and Mshindo and other areas of Mivinjeni, Ilala, Makorongoni, Mwembetogwa and part of Mlandege, Mtwivila, Kitwiru, Mwangata, Isakalilo and Kihesa have high density. However, Iringa Central Redevelopment areas like Miyomboni/Kitanzini and Mshindo are used for commercial residential and some business men have started to establish high rise buildings.

Table 3.1: Housing density by wards

S/N	Ward name	Area	Number of houses	Housing density
1	Kitanzini	64	537	8.39
2	Gangilonga	531	631	1.19
3	Kihesa	1124	2,652	2.36
4	Mtwivila	477	1,983	4.16
5	Ilala	52	539	10.37
6	Mivinjeni	27	524	19.41
7	Kwakilosa	86	783	9.10
8	Mlandege	123	972	7.90
9	Mwangata	860	1,972	2.29
10		2803	1,802	0.64
11	Mkwawa	2698	2,483	0.92
12	Makorongoni	79	662	8.38
13	Mshindo	33	194	5.88
14	Ruaha	1229	2,972	2.42
15	Kitwiru	2669	2,348	0.88
16	Nduli	13173	985	0.07
17	Igumbilo	3882	2,024	0.52
18	Mkimbizi	3230	937	0.29
	Total	**33,140**	**25000**	

Source: Iringa Municipal Council, municipal urban planning officer, September 2014

Map 3.1: Housing density by wards



3.4 HOUSING CONDITION

The criteria used to categorize housing conditions included the condition of building materials (such as roofing, walling, foundation, fencing, floor material) and important utilities attached to the house. The categorical values used to classify housing conditions are: good, fair and poor labels. By September 2014, there were a total of 25,000 houses for the entire Municipality. Many buildings within CBD were in fair and poor condition because most of the houses were built from the colonial period. According to household survey conducted in September, 2014, 59.4 percent of the building conditions were categorized as fair followed by good represented 33.5 percent and poor 7.1 percent of all that accounted for buildings.

Table 3.2: Distribution of housing conditions

Building condition	Good	Fair	Poor	Total
Number of houses	8370	14,850	1780	25,000
Percentage	33.5	59.4	7.1	100

Housing production and quality varies considerably especially when comparison is made between houses in the central and those in the peri-urban areas. For example, the wards of Miyomboni/Kitanzini, Mshindo, Kwakilosa, Ilala and Mivinjeni have many dilapidated buildings/houses although some of them are rapidly changing into block of flats. On the other hand, Gangilonga and new planned areas of Mawelewele have high quality houses. This corresponds with the price of land is relatively high in Gangilonga and in CBD as compared to other areas.

3.5 HOUSING OWNERSHIP AND OCCUPANCY CHARACTERISTICS

The provision and development of housing is a shared responsibility of public and private sectors. It is also clear that individual residents own about 95 percent of the residential houses in the Iringa. Public housing is that largely owned by the National Housing Corporation (NHC). Currently, NHC owns two categories of houses in Iringa. The first category of houses comprises those that were nationalised. These add up to 31 units and are found along Uhuru Street, Gangilonga (residential), the CBD (residential and commercial), Mlandege (godowns) and Ipogolo (garage). The second category comprises of small sized residential houses. These houses are occupied mainly by civil servants and have been earmarked for sale to the present tenants. Some of the houses have already been sold to current occupiers. These houses are found in Frelimo, Ilala and Pawaga road areas. The pension fund (PSPF) owns 25 houses in Mawelewele area which are built for sale on loan basis to its members. PSPF also owns 175 Plots Mawelewele area that will be used to construct additional houses. Public institutions including colleges and schools also provide housing to their employees. Most houses which are used for residential purposes are privately owned for either rental purposes or owner occupation.

3.6 HOUSING SITUATION IN PLANNED AREA AND UNPLANNED AREA

Both planned and unplanned areas accommodate a considerable housing stock in Iringa Municipality. Like in many urban areas in Tanzania, plots for planned residential areas vary in sizes categorized as high, medium and low-density. Out of the total housing 25,000 units of which 47 percent are found in unplanned areas. Therefore unplanned settlements play a significant role in housing supply despite the fact that houses in unplanned areas are relatively small and sited in small and irregularly shaped plots. Some unplanned settlements are prone to floods. Most of the unplanned housing areas lack basic services and public utilities including piped water, access roads, storm water drainage channels and solid waste management.

Unplanned settlements include; Isoka, Mwangata, Makanyagio, Kihesa, Mafifi, Mtwivila and Ipogolo. It has been observed that poor land servicing coupled with insufficient surveyed plots are the root causes of accelerated informal settlements development. The informal urbanisation is characterised by; emergence and expansion of unplanned settlements, unplanned development of peripheral villages; and encroachment by house construction on steep slopes, valleys, open spaces and way leaves reserved for basic community infrastructure services.

3.7 HOUSING DEMAND AND SUPPLY

The demand for rental housing has been increasing following the establishment of universities such as Iringa University, RUCU and MKWAWA. A considerable number have been enrolled but this number does not match with the available accommodation facilities. It is notable that the demand for housing is estimated to be more than 1000 units per annum. Currently, the average occupancy is two households per dwelling unit. According to household survey conducted in September 2014 the total houses was revealed to 25,000 the actual requirement was established to be 37,836 houses. This reveals a deficit of 12,836 units. According to demographic projections the total Municipal population will reach 349,895 people in 2035. This population will need a total of 87,474 housing units with the assumption of 4 persons per household. This estimates calls for construction of 62,474 houses in 20 years period.

The expansion of unplanned settlements up to hill slopes is a testimony of the fact that the provision of buildable housing plots is far below the demand. Surveyed plots production is low because of lack of funds to pay for compensation to make land available for housing. In this regard, the Municipal council has

worked out strategies to reduce the problem by securing loans from CRDB Bank and managed to produce more than 1573 surveyed plots in various part of the municipality. From 2009/2010, the Municipal council initiated plots surveying projects to reduce the problem. Financial year 2009/2010, the authority surveyed 360 plots in Mawelewele. 200 plots were allocated to PSPF for house construction. In the financial year 2010/2011, 100 plots were surveyed at Mafifi area. Ten (10) plots were allocated to TBA for construction purposes of government houses. In 2012/2013, 413 plots were surveyed in Ngelewala area. In 2013/2014 a total of 700 plots were surveyed (Table 3.2).

Table 3.2: Plots surveying projects

S/N	Year	Location	Number of plots	Status of project	Remarks
1	2009/2010	Mawelewele	360	Completed	75 percent of the plots for houses construction
2	2010/2011	Mafifi	100	Completed	Residential & Government houses (TBA)
3	2012/2013	Ngelewala	413	Completed	Residential
4	2013/2014	Kitwiru	700	Completed	Residential

Source: Iringa municipal council, urban planning department, September 2014

3.8 CHALLENGES FOR HOUSING SUPPLY

The goal for adequate and decent shelter for all is rather difficult to realize especially in context specific environments like Iringa. The challenges confronting this include large scale informally developed settlements, in accessibility to housing finance urban sprawl, lack of acceptable and affordable building materials, low income for the majority of urban residents, inadequate surveyed and serviced plots and limited financial capacity of the municipality to acquire land for urban expansion. In the context of Iringa municipality, key challenges confronting the housing sector are as follows:

i) Inadequate surveyed and serviced plots for residential development

The demand for surveyed and serviced plots is high still as compared to supply. For example, while the number of plots that were surveyed in Mafifi area were 100, the numbers of applications were 300 similarly, in Kitwiru; out of 700 plots that were surveyed, the number of applications for plots was 2000.

ii) Difficulties in accessing housing loans from financial Institutions

A large percentage of the individuals wishing to secure loans from the financial institutions fail because of high interest rates short recovery period of loans and small amount of loan given for housing development. Many of the banks have been changing interest rates ranging between 15 – 20 percent. Majority of these banks prefer shelter periods of loan repayments of any five (5) years. These conditions have proved to be too stringent to many of the low income people.

iii) High cost of building material

Finding obtained during household survey and consultative meeting with the community revealed that, the cost of building construction was very high contributing to increase in cost of construction. Materials such as timber, iron sheets, tiles and nails were more costly in Iringa compared to cities like Dar es Salaam. Transportation costs also contributed to increased costs of majority of materials especially to inland towns and municipality.

iv) Poor infrastructure services

Development of housing is also constrained by infrastructure development. Indeed, areas which are not surveyed like Nduli, Ugele and Ulonge lack infrastructures services such as road, water and electricity. These services are pre-requisite for house construction and ultimate habitation of the house.

v) Difficulties in acquiring land for urban development.

Prior to the Land Act of 1999; land in Tanzania had no value. Only developments on land (unexhausted improvements) were considered in acquiring land. Following the adoption of this law that recognizes the value of land, acquisition of land has become out of reach of many local government authorities including Iringa municipality. Land has the largest seize in land acquisition for urban development.

3.9 HOUSING STRATEGY

The overall housing strategy is to meet the required demand of dwelling units for the population by 2035 this included the identified units that need to be replaced from the existing stock, which adds up to the total housing supply of 62,474 units. The strategies for housing supply that have been proposed included improvement, redevelopment in the planned areas around CBD, regularizing informal settlements, planning for new residential development, constructing houses for rental and sale.

Improvement, redevelopment and regularization

Iringa CBD covers two wards, which are: Miyomboni/Kitanzini and Mshindo and partly Makorongoni, Kwakilosa, Mivinjeni and Gangilonga. Gangilonga is an old planned area for high income earners with plots of more than 1000 square metres and most of the land owners have changed their building to two storeys. This approach of densintification should be encouraged for the whole area of Gangilonga. However, there is a need of developing infrastructure and services to cater for these new changes. This means sufficient provision of water, electricity, public transport and sewage systems.

Settlement regularization should be carried out in unplanned areas which lack most essential amenities or where facilities are inadequate. These areas include; Isoka, Mwangata, Makanyagio, Kihesa, Mafifi, Mtwivila and Ipogoro. The whole exercise of regularization needs to take into account the land demands as spelt out by the National Programme for Regularization and Prevention of Unplanned Settlements prepared by the Ministry of Lands, Housing and Human Settlements Development. However, more emphasis should be put on continuous maintenance of the facilities and effective development control. With the residents participation in the regularization process. It should be possible to maintain the infrastructure.

There is also a need to increase the number of surveyed and serviced plots in phase one of the implementation of this Master plan this strategy will enhance construction of houses and increasing housing stock in a planned manner. These new residential communities should accommodate the larger portion of the additional population. These new communities will be mostly in the areas of Ugele, Itamba, Nduli, Mkoga, Ulonge, Kitasengwa and Kitwiru.

In implementing housing strategies, one or more of the following approaches can be deployed. In some areas such as the central area, redevelopment and improvement at the same time could be adopted. The old planned area of Ilala, Mtwivila and Ipogoro in filling may be necessary. House for rental and cheap house for sale through different house developers should be straight. It will be in the new areas where only one approach of constructing new houses can be applied. In order to achieve provision adequate housing for all residents up to 2035, there must be a stable institution that will coordinate these initiatives. The coordinating role will include facilitating and empowering the Municipal Council and other key stakeholders to play a greater role in providing housing, reducing administrative delays, formulating access to loans from financial institutions for housing development; strengthening training and housing research and supporting individuals to build houses.

3.10 PROPOSED AFFORDABLE HOUSING CHOICES, TYPES AND REGULATIONS

The aim of these strategies is to lead the majority of the residents in acquiring decent, safe and affordable housing with a variety of housing choices. The proposed densities should allow for opportunities to develop affordable residential typologies that match with the income of that segment. Diverse housing choices within each density group will ensure more socially inclusive communities. The proposed housing and residential plans have considered variety of typologies and their shares as illustrated in table 3.3:

Table 3.3: Residential densities and recommended plot sizes

S/No.	Density	Plot size (M)	Plot area (M^2)	Location
i	High	15x20	300	Ilala, Makorongoni, Mlandege, Mivinjeni, Kwakilosa, Kihesa, Mtwivila, Mkimbizi, Kitwiru, and Ruaha
ii	Medium	20x40	800	Part of Mkwawa, , Mwangata, Mkimbizi, Nduli, Kitwiru and Ruaha,
iii	Low	30x50	1500	Gangilonga, part of Kitwiru, Nduli, Mwangata, and Mkimbizi.
iv	Regularization areas	9x10	90	Ipogoro, Kihesa, Mtwivila, Igumbilo, Mwangata, Isakalilo, Makanyagio, Ndiuka, Mafifi, Lukosi and Semtema

i) **Low density area**: Low density is proposed to house 22 percent of the total population (69,979) and will covers 20 percent (2125.7ha) of the residential land. The largest concentration of the low density houses will be outside the Central Business District. The housing types proposed for this density is semi-detached and detached which will be promoted in the outer ring of each town centre and in

undulating land forms accepted hill sides. Almost 88 percent of housing in this category will cater for high income people.

ii) **Medium density area:** medium density area in the context of Iringa is proposed to house 28 percent of the population (104,968.5) and this covers up to 30 percent (3188.57 hectares) of the land. The largest concentration of the medium density housing is part of Mkwawa, Mwangata, Mkimbizi, Nduli, Kitwiru and Ruaha. The proposed houses in this group are detached and semi detached houses. This area for residential will cater for medium income earners.

iii) **High density area:** High density residential in the context of Iringa proposed to house 50 percent of the population (174947.5) and takes 50 percent (5314.29 hectares) of the land. The largest concentrations of the high density are within Central Business District and nearby area along the development corridors. The housing types envisioned for this density is walk up apartments for CBD and detached housing out of CBD. High density residential areas proposed to save more than 80 percent of the low income earners within Municipality.

iv)**Regularization areas:** these are settlements that have been developed prior to planning or simply unplanned settlements. Areas that have been recommended for regularization are Isakalilo, Ipogoro, Makanyagio, Mtwivila Lukosi, Semtema, Ndiuka and Njiapanda Mtwivila. Even through a mixed category of high, middle and low income people reside in these areas, they largely cater for low income people.

3.11 HOUSING TYPES

The type of houses that are proposed in Iringa Municipality will cater for all density categories. The shape and sizes will be designed to suit specific requirements of the intended user and /or owner. However, such designs must be responsive to technical specifications as provided by Urban Planning and Space Standard Regulations of 2011. Generally, the houses will be in high rise; medium rise; low rise forms and; detached and semi-detached; terraced or in rows and or in cluster forms as recommended in the zoning plans. A variety of housing types for residential purposes which proposed in this Master plan will include: Figure

Figure 3.1: Detached house

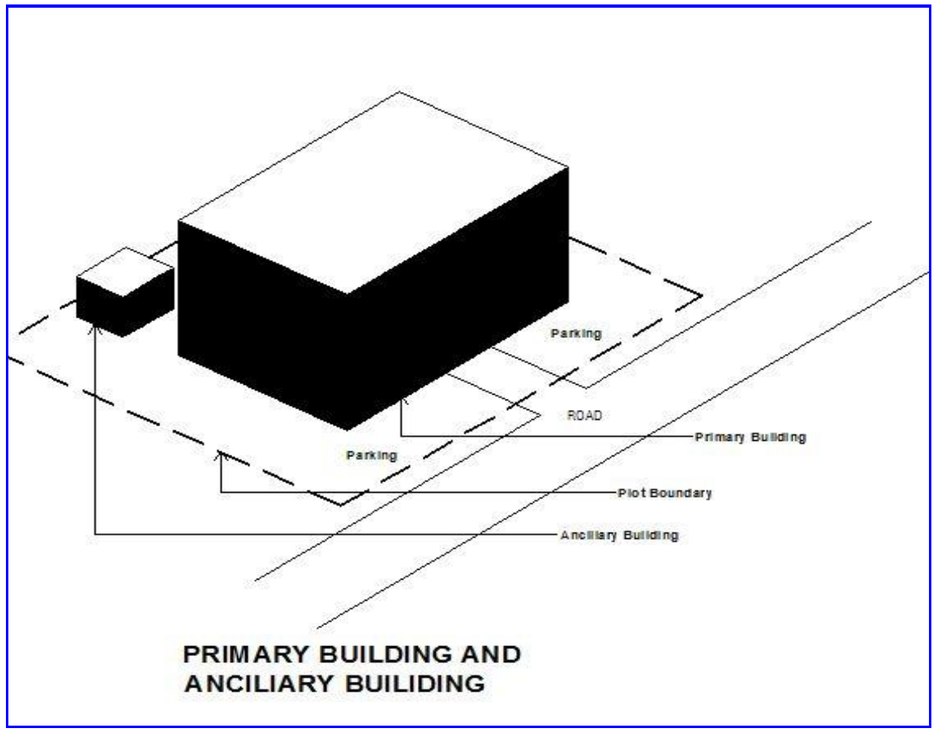


Figure 3.2: Row houses

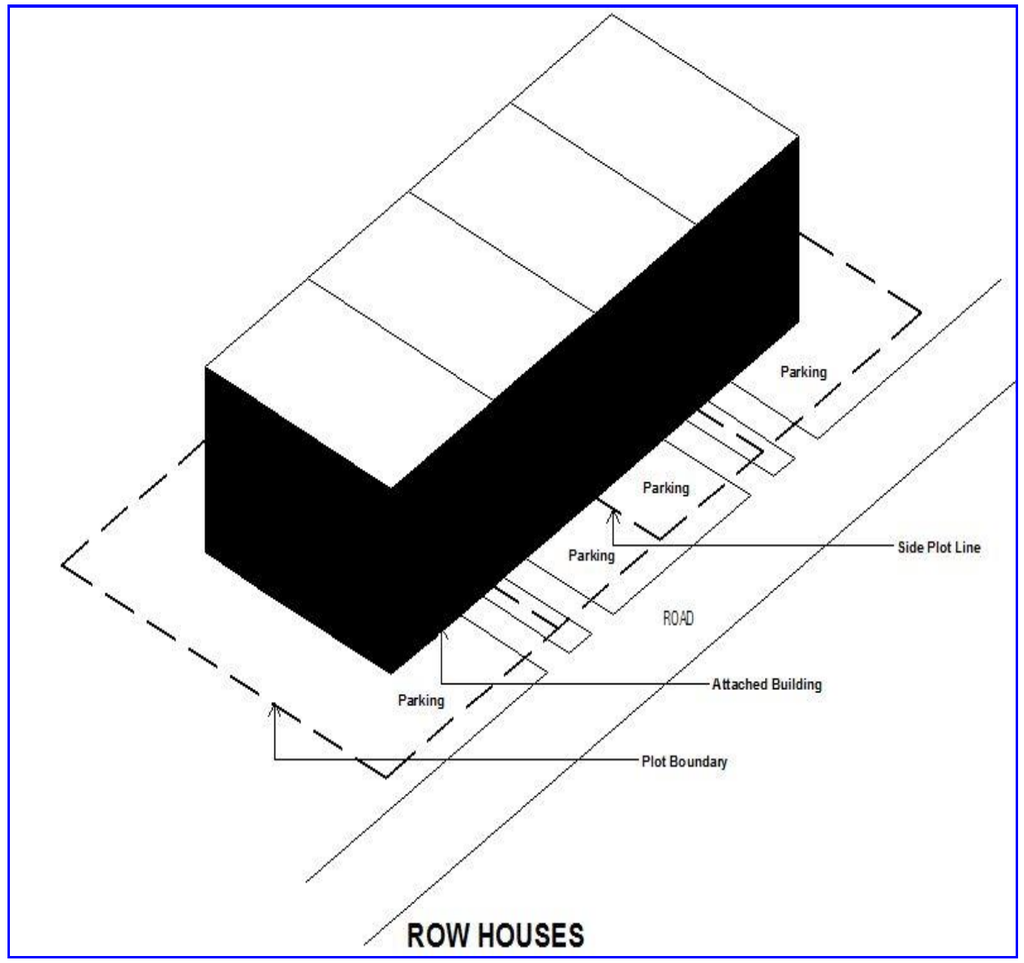
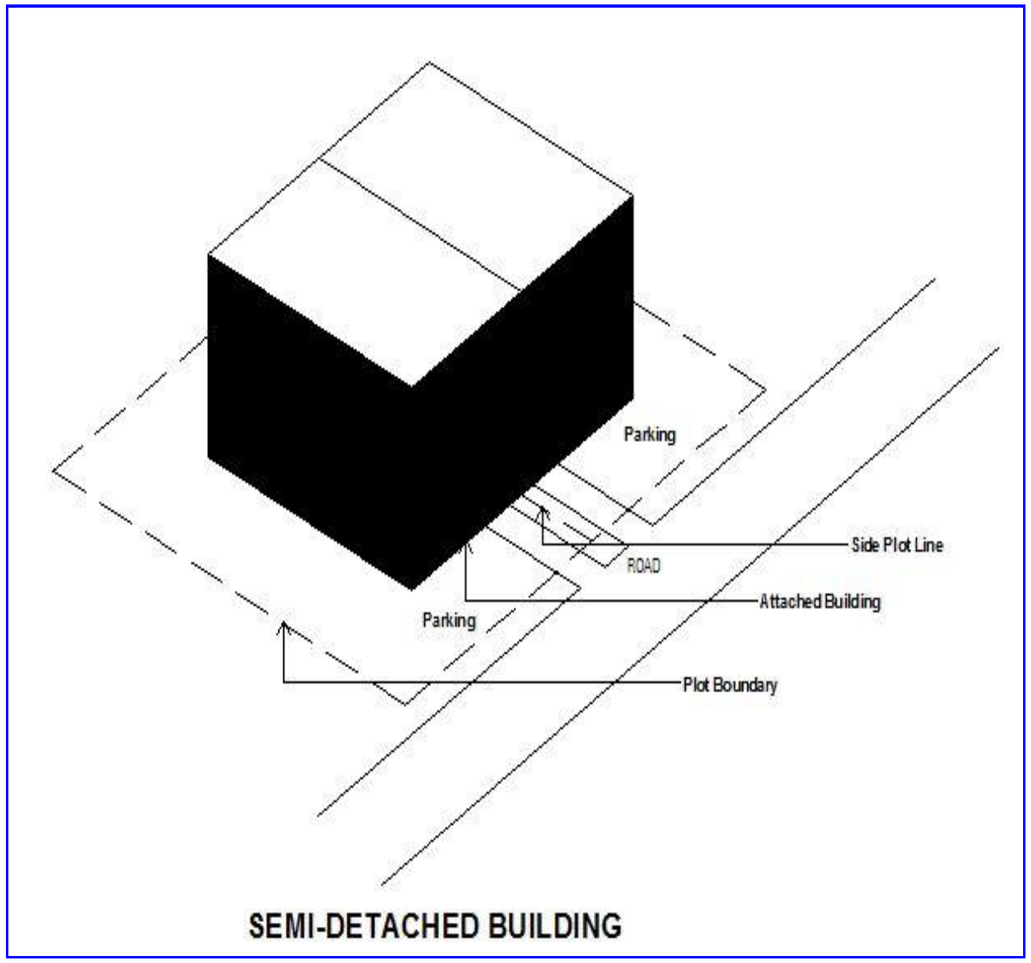


Figure 3.3: Semi detached house



Block of flats

These are mainly proposed in Central Business District (CBD) to meet demands for commercial, medium business and services needed for a larger community included in this category are offices and entertainment activities. Housing estates are encouraged to build block of flats which will accommodate many residents. Commercial buildings shall be designed to ensure that each development initiative is able to comply with parking requirements. All landscaped areas shall be maintained in good condition by the owner / occupier /management committee of the property. For block of flats, 5 percent minimum of the total plot area shall be set open space for recreational facilities.

Figure 3.4: Block of flats

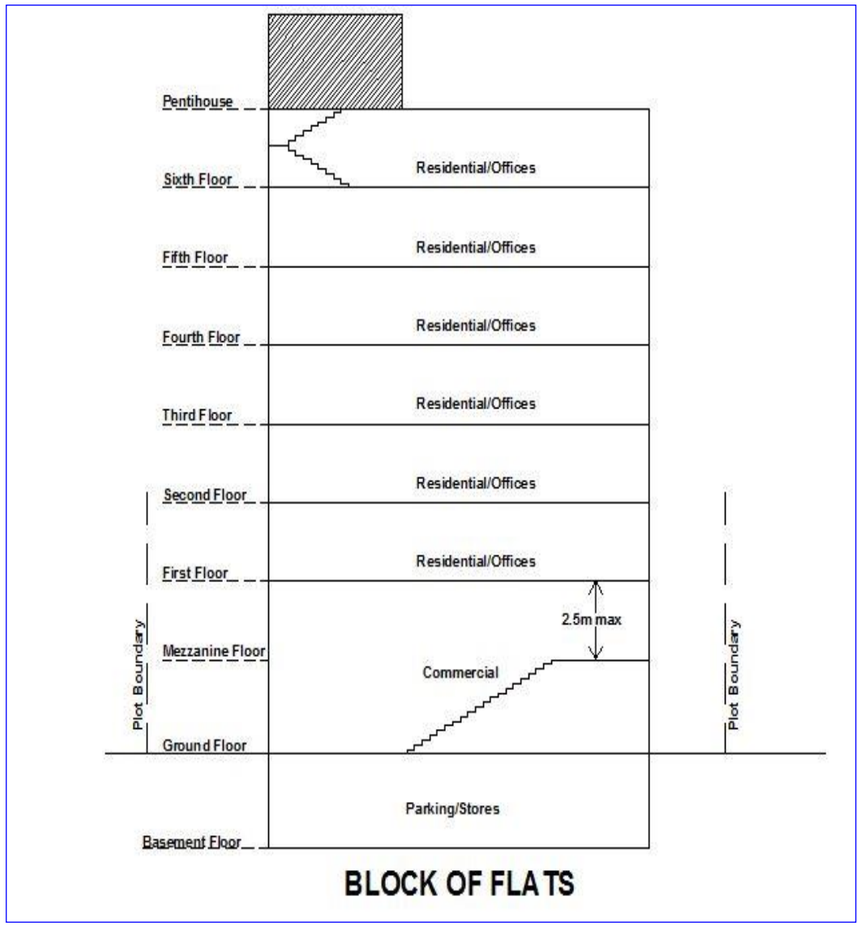
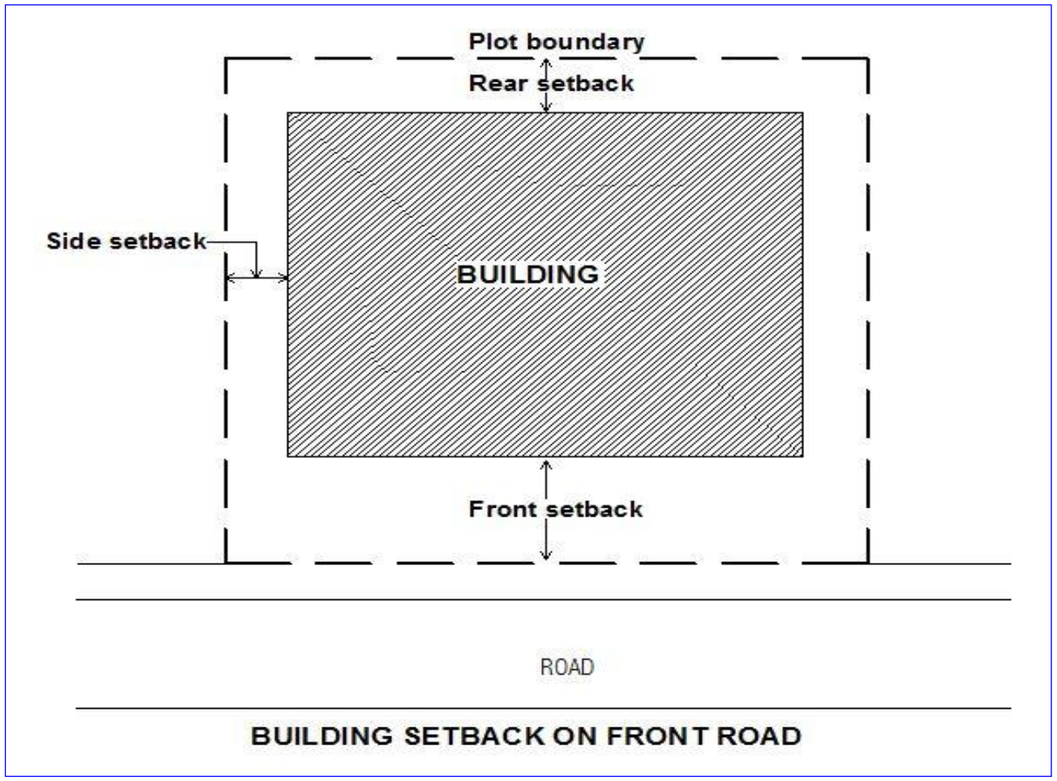


Figure 3.5: Building Setback



3.12 BUILDING REGULATIONS

The proposed housing regulations is one of the key tools that will be used in the implementation of Iringa Master plan. The Table 3.4 represents regulation for housing development and table 3.5 represent regulations for areas of regulations.

Table 3.4: Regulations for housing development

Uses	Regulation	Permitted area
Building		
Building form	Detached villas and single storey buildings	Mafifi, Ngelewala, Nduli, Itamba, Mkoga (only for low and super density plots)
	Block of Flats	CBD
	Detached houses Semi-detached houses and row houses	Throughout Municipality except CBD (for low, medium and high density plots)
Building materials	• Wall Burnt Bricks and concrete blocks and curtain wall especially for block of flats, aluminum, timber for doors and windows • Foundations stones and iron bars • Roofing corrugated Irion sheets and clay tiles • An suitable building material accepted except mud and thatch.	Throughout the Municipality
Existing buildings	• Additions and alterations necessary to retain an existing approved legally and its use in good order and repair will be allowed, subject to: i) No material change in use which does not comply with above proposed building material; ii) further increase in floor area of the existing non-conforming use iii) Any additional floor area required for the non-conforming use will: Be subject to the evaluation and approval of the Municipal engineer;	Throughout the municipality except CBD
	• Repairing and maintenances of the old low rise building are not allowed; rather owners have to build new high rise buildings. • For high rise building repair and maintenances is allowed with building material stated.	CBD
Coverage		
Minimum plot Size	• Detached: 300m^2 • Semi-Detached: 300m^2 • Row houses: 300m^2	Throughout the Municipality
Maximum Building Coverage	80% maximum	Throughout the Municipality
Minimum Landscaping Coverage	20% minimum and 5% for CBD	Throughout the Municipality
Maximum Floor Area Ratio	0.8 maximum	Throughout the Municipality
Building Set back (Minimum)		
Detached, Terraced House and Multi Story/Block of flats	Common plot boundary (urban planning and space standard 2011) will be applied	Throughout the Municipality
Basement Setback	All plot boundaries fronting roads:3m minimum and common plot setbacks	
Ancillary Buildings	In the front setback along the plot frontage, may be allowed at the 1.5m setback provided their width does not exceed 25% of the plot frontage ancillary uses may be allowed within the side and rear setbacks are subject to their overall width not exceeding 25% of length of the boundary within which they encroach	
Parking		
Location	Required parking lots shall be provided within the plot boundary	
Surfacing	Parking shall be hard surfaced and provided with adequate drainage	
Minimum required Parking stalls	Villa (Detached) –2 Parking Lot per unit shall be provided Food outlet -1 Parking Lot per 10 seats shall be provided Hotel - 1 Parking Lot per 200 m2 shall be provided	
Fencing wall		

Location	Fencing and walls in the front shall be at 1.5m to the plot boundary	Throughout the Municipality except CBD
Heights	• Rear and side fencing or walls shall not exceed 2.5min height. • Front boundary wall should not exceed 2m in height. Additional height shall be evaluated on case-by-case.	
Materials	The front boundary wall shall use material that allows 50% transparency	
Landscaping and recreation		
All types of houses	All landscaped areas shall be maintained in good condition (trees, flowers and grasses)	Throughout the Municipality

Table 3.5: Regulations for areas of regularization

Uses	Regulation	Permitted area
Building		
Building form	Detached houses, semi-detached houses, row houses and mult-storeys	Throughout regularizations areas
Building materials	• Wall burnt bricks and concrete blocks • Foundations stones and iron bars • Roofing corrugated Irion sheets and clay tiles • Mud and thatch will not be allowed.	Throughout regularizations areas
Existing buildings	Additions and alterations necessary to retain an existing approved legally and its use in good order and repair will be allowed, subject to: • material change in use which does not comply with above proposed building material; • Any additional floor area required for the non-conforming use will: Be subject to the evaluation and approval of the Municipal engineer;	Throughout regularizations areas
Coverage		
Minimum plot Size	90m^2	Throughout regularizations areas
Maximum Building Coverage	80% maximum	Throughout regularizations areas
Minimum Landscaping coverage	5% minimum	Throughout regularizations areas
Floor area	Ground G+2 floors	Throughout regularizations areas
Maximum floor area ratio	0.5 maximum	Throughout regularizations areas
Building Set back (Minimum)		
Detached, terraced house and multi-storey Setback	Common plot boundary to be shared	Throughout regularizations areas
	All plot boundaries fronting roads:2m minimum and shared sides	Throughout regularizations areas
Ancillary Buildings	Not permitted	Throughout regularizations areas
Parking		
Location	Required parking lots shall be provided within the public area	Throughout regularizations areas
Surfacing	Parking of public shall be hard surfaced and provided with adequate drainage	Throughout regularizations areas
Fencing wall		
Location	No Fencing wall development	Throughout regularizations areas
Landscaping and recreation		
All types of houses	All landscaped areas shall be maintained in good condition (trees, flowers and grasses)	Throughout regularizations areas

TECHNICAL SUPPLEMENT

4

INFORMAL SETTLEMENTS

4.0 INTRODUCTION

The population in Iringa Municipality has been grown from 88,088 people in 1988 to 151,345 in 2012 (NBS 2012). The rate of population growth between 2002 and 2012 has been established to be 4.6 percent per annum. By the year 2015, the population had reached 283,580 people. The rapid population growth is a result of rural - urban migration and natural population growth. The rapid population growth has exceeded the municipality's capacity to provide adequate and affordable housing to the people. The unmet demand for urban land, especially for housing has led to individuals developers to settle in unplanned settlements including hazardous land so these include flood plains and rocky hills. These settlements are characterised by overcrowding, sub-standard housing, and inadequate access to infrastructural services such as clean and safe water, roads, sanitation and insecure tenure rights. Some of the housing have encroached reserved areas especially steep slopes, valleys, open spaces and infrastructure way leaves contributing to environmental degradation and conflicts with regulators.

4.2 MAGNITUDE, CHARACTER AND CAUSES OF UNPLANNED SETTLEMENTS

Unplanned settlements cover an area of 2,990.49 hectares which is equivalent to 55.12 percent of total area planned for residential use. Unplanned settlements include; Ipogolo, Lukosi, Isakalilo, Don Bosco, Kisiwani, Ndiuka, Kihesa Mafifi, Semtema, TRM, Njiapanda Mtwivila, Igumbilo and Isoka. Most of these areas have reached a consolidation stage resulting into poor environmental condition. About 47 percent of the Municipality housing stocks are built in unplanned settlements estimated to accommodate more than 71,132 people in 2012. The total population in unplanned settlements constituted 46.9 percent of the total populations.

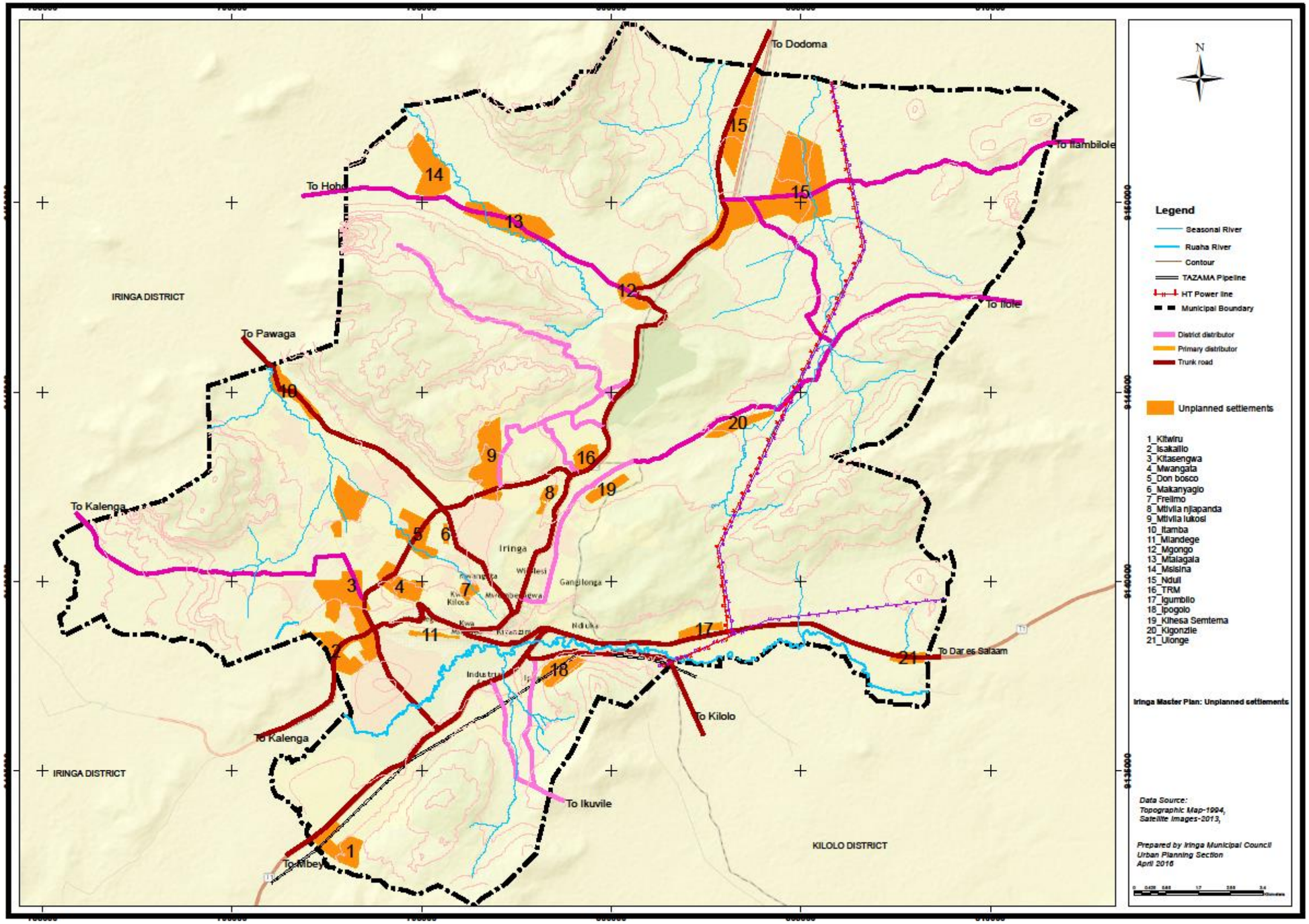
The nature of unplanned settlements in Iringa is not different from many urban centres of Tanzania. These are settlements growing without being regulated by urban land use plans, land laws, or urban development standards. In most cases, informal settlements lack basic infrastructure and public services.

Development of unplanned settlements in Iringa can be linked to three developmental stages which are: settlements at "*Infancy stage*" these are settlements characterised by sparsely built environments like Igumbiro and Mapogoro/Isakalilo areas. "Consolidation stage" which refers to the booming stage which often depicts the intensified subdivision of land and construction of houses. Typical settlements include; Mtwivila, Mkwawa Lukosi, Don Bosco and Mafifi and "*saturated stage*" where further subdivisions and house construction is difficult. These include settlements of Ipogoro, Makanyagio, Kihesa and Semtema.

Different factors have given rise to growth and expansion of unplanned settlements in Iringa Municipality. These include; Low capacity of the Municipality to provide adequate and affordable housing, scarcity of surveyed and serviced land in intermediate zones and areas close to the major employment income generation. Other factors include; inappropriate regulatory frameworks, especially unaffordable formal housing standards and regulations, leading to long approval procedures, frustrating housing development conditions in the formal sector. The expansion of Municipal administrative boundaries which led to incorporation of villages Nduli, Mkoga, Mgongo, Kigonzile and Ulonge. These settlements still maintain the village settlements character. Laxity with regards to land development control especially in the peri-urban areas like Igumbiro and Mapogoro/Isakalilo is also another factor that contributes to continued expansion and consolidation of unplanned settlements.

Over-dependency on public sector recourses and capacities in urban development with little involvement of the private sector has curtailed the limited initiatives of the municipality. Other factors include the low priority given to land sector in terms of resources allocation continuous migration of people from rural to urban areas create continued unmet demand for urban housing.

Map 4.1: Existing unplanned settlement



4.3 ACCESS TO LAND AND HOUSING CONSTRUCTION

Land in unplanned settlements is accessed through inheritance, purchase and in few cases, through appropriation. Access to land in informal areas is through willing seller- willing buyer arrangements. The majority of residents in these settlements obtain land through informal channels, which in most cases are not guided or regulated by the government. Transactions are conducted at grassroots levels; landowners subdivide and demarcate their land using physical features. Mtaa (*sub-ward*) leaders of the respective areas are usually involved in endorsing land transactions. The plot sizes depend on the land seekers willingness to pay and owner's readiness to sell. These procedures are simple and cheaper compared to formal land acquisition processes.

Land owners in the unplanned settlements are not obliged to pay land rent and other charges depriving the public authorities of an important source of revenue. House builders in unplanned areas acquire land and construct houses progressively through individual savings. Some build with temporary materials, but later on improve the same by using permanent materials. Other developers start with construction of outer building and later on extend it or build the main house as financial resources improve. Many times, house construction process is through savings that takes 4-8 years to complete.

The unregulated nature of housing development in unplanned settlements observe no standards for plot sizes, plot ratio, type of buildings to be erected, building orientation and setbacks. This contributes to high housing densities in some areas up to 24 houses per hectare. This is far beyond the recommended standard of 16 – 20 houses per hectare in a high density areas it has further poised environmental and health threats to the residents.

Absence of security of tenure restricts individual land owners/ occupiers from accessing loans for housing. House construction in these settlements depends on personal savings. Most of the housing developments are incremental due to shortage of resources. Very few residents use their land as collateral for housing loans Commercial Banks. Others use non -land assets as collateral in financial institutions to obtain loans for housing.

4.4 ACCESS TO PHYSICAL INFRASTRUCTURE

i) Water Supply

Most of unplanned settlements in Iringa Municipality have access to clean and safe water. According to the Iringa Urban Water and Sanitation (IRUWASA), the coverage of area supplied with piped water in the old Municipality boundary is about 95 percent. Plans are underway to supply water to the peri- urban areas through Rural Water Supply and Sanitation. The approach and types of water supply will be through wells that will cover 29.2 percent of the total urban population. Most of the unplanned settlements are located within the old Municipal boundary where water supply is fairly adequate.

ii) Sanitation

The area served by sewerage system is only 15 percent of the total Municipality land. Unplanned settlements covered by sewerage system are Makanyagio and Don Bosco. According to household survey conducted in September, 2014, approximately 25 percent out residents used septic tank, while the rest used pit latrines. Due to densification reaching saturation stages, in some unplanned areas there are no areas left for pit latrines. Some households have been converting habitable rooms into pit latrines and others share use neighbours pit latrines.

iii) Solid waste collection

Municipal Council uses skip buckets to collect solid wastes in populated areas. The ssustainable Iringa Project (SIP) constructed waste collection chambers in Isoka and Kihesa, Semtema and (TRM). Collection of solid waste in the unplanned settlements is constrained by lack access road network. Scattered waste in unplanned settlements therefore a common phenomenon. Waste is crudely dumped in open areas within these settlements especially along the streets and footpaths. The most commonly used method of waste disposal is by composting in open areas within their plots. A part from polluting undergrounding water, crude dumping leads to surface environmental pollution especially during rainy seasons.

iv) Road and storm water drainage

Most of the unplanned settlements face acute shortage of roads and storm water drainage. A few roads available are in poor condition and usually not maintained. In most areas dimension of access roads and footpaths are below the desirable width; as a result, in some cases, the flow of human and vehicular traffic is constrained. The problem of storm water management is complicated by the spontaneous house construction and extensions. Some of these lead to blockage of natural storm water drains. Poor solid waste management often leads to blockage of a few existing natural storm

water channels. Through the ssustainable Iringa Project (SIP), some roads in Isoka, Kihesa Semtema and Makanyagio were upgraded that included improvement of storm water drainage.

v) Access of land for social services

There is inadequate land for social services in unplanned settlements. Spaces for education, health, recreational (play grounds & open spaces) and religious facilities are lacking. The nature of land access in informal settlements undermines allocation of land for public uses. The majority of the individuals focus on acquiring land for residential and commercial uses without considering other vital public services.

vi) Access to electricity supply

Most of the areas in unplanned settlements lack electricity supply. In some cases, electricity supply lines run haphazardly and on top of roofs threatening public safety.

4.5 LEGAL AND INSTITUTIONAL FRAMEWORKS

There are various policies and legislations that have a direct bearing to consolidate unplanned settlements. These include:- the National Land Policy (1995), the National Human Settlement Development Policy (2000), the National Water Policy (2002), the National Environmental Policy (1997), the Tanzania Housing Development Policy (draft), the National Population Policy (1992) and the Public Private Partnership Policy (2009) while section 4.1.4.2 of the Human Settlements Development policy (2000) provides for regularization of unplanned settlements, the Land Policy (1995) also advocates improvement of the same settlements.

Consistent with policies the Land Act of 1999 sections 56-60, spells out the key steps, including actors and procedures for preparing schemes of regularisation. According to this Act, the powers to prepare, approve and declare schemes of regularisation (section 58 (3)) and section 59, are vested in the Minister responsible for Lands. This is complemented by Government Notice No. 85 of 2001 which provides for procedures and responsibilities of stakeholders in the preparation process of schemes of regularisation. Similarly the section 23 of the Urban Planning Act of 2007 stipulates the procedures for preparation of schemes of regularisation, including declaration of a planning area, preparation of schemes in participatory manner involving the community and approval of the schemes by the ministry of Lands. Section 8 of the Local Government Act of 1982 vests planning responsibilities in the Local Government Authorities. Besides these principle legislations, the Ministry of Lands, Housing and Human Settlements Development also developed and circulated guidelines for preparation of Schemes of Regularisation. These guidelines will be followed in regularizing unplanned settlements identified under section 4.2.

4.6 PAST AND ON-GOING INITIATIVES TOWARDS IMPROVEMENT OF UNPLANNED SETTLEMENTS

The Iringa Municipal Council in collaboration with the Sustainable Iringa Project has been taking measures to alleviate the problem of infrastructure services in unplanned settlement. Infrastructure upgrading and improvements have been implemented in four areas of Dodoma Road TRM, Isoka, Semtema and Makanyagio/ Don Bosco. Upgrading in these areas included construction of solid waste collection chambers, construction of storm water drainage channels, and construction of service roads. Even through these projects were implemented in the mentioned areas, they were limited in scope and issues of tenure rights were not included in these projects.

4.7 REGULARISATION THROUGH MKURABITA

The 1980-2000 Iringa Master Plan proposed Mwangata unplanned settlement area to be upgraded. Through the Property and Business Formalisation Programme (MKURABITA), the settlements of Isoka A, Mwangata A & B, and Kihodombi A & B were regularised in 2012/13. A total of 739 plots were surveyed and issued with Certificates of Right of Occupancy (CROs). Presently the Municipal Council is improving the infrastructure according to the plan. MKURABITA provided the capital which was to be recouped through cost sharing by beneficiaries. Contributions were categorized according to land uses. Whereas Tshs 300,000/= was paid for residential plots; Tshs 400,000/= was paid as a contribution for commercial/ residential plots and Tshs 500,000/= as a contribution for commercial plots. Some of the land owners are still contributing through Mitaa accounts which were opened during implementation of the projects. Those costs are for planning, surveying, and title deed preparations. It was agreed that every land owner should contribute Tshs 100,000/= for infrastructure provision, the latter has not been implemented due to lack of counterpart funding from the Municipal Council.

4.8 VISION

Iringa Municipality without unplanned settlements. The mission is to develop a ten yearS programme that will proactively check further growth and expansion of unplanned settlements. The overall objective is to enhance security of tenure, provide physical infrastructure, services, regularised settlements and improve livelihoods of residents in unplanned settlements.

4.9 STRATEGIC AREAS AND INTERVENTION IN UNPLANNED SETTLEMENTS

Strategies to address the problem of unplanned settlements in Iringa Municipality will base on the nature and extent of unplanned settlements and experience gained from previous regularization projects. The recommended strategies are in two categories: the curative measures that targets existing unplanned settlements and preventive measures that prevention of creation of new unplanned settlements. The improvement measures of the existing settlements will be implemented alongside with preventive measures.

Participatory regularisation based on fair distribution of cost among the community will be applied in existing settlements. The physical approach will involve land reorganisation so as to allow land for provision of infrastructure like roads, storm water drainage, sanitation and water supply; and social facilities including health centres, schools, and public spaces.

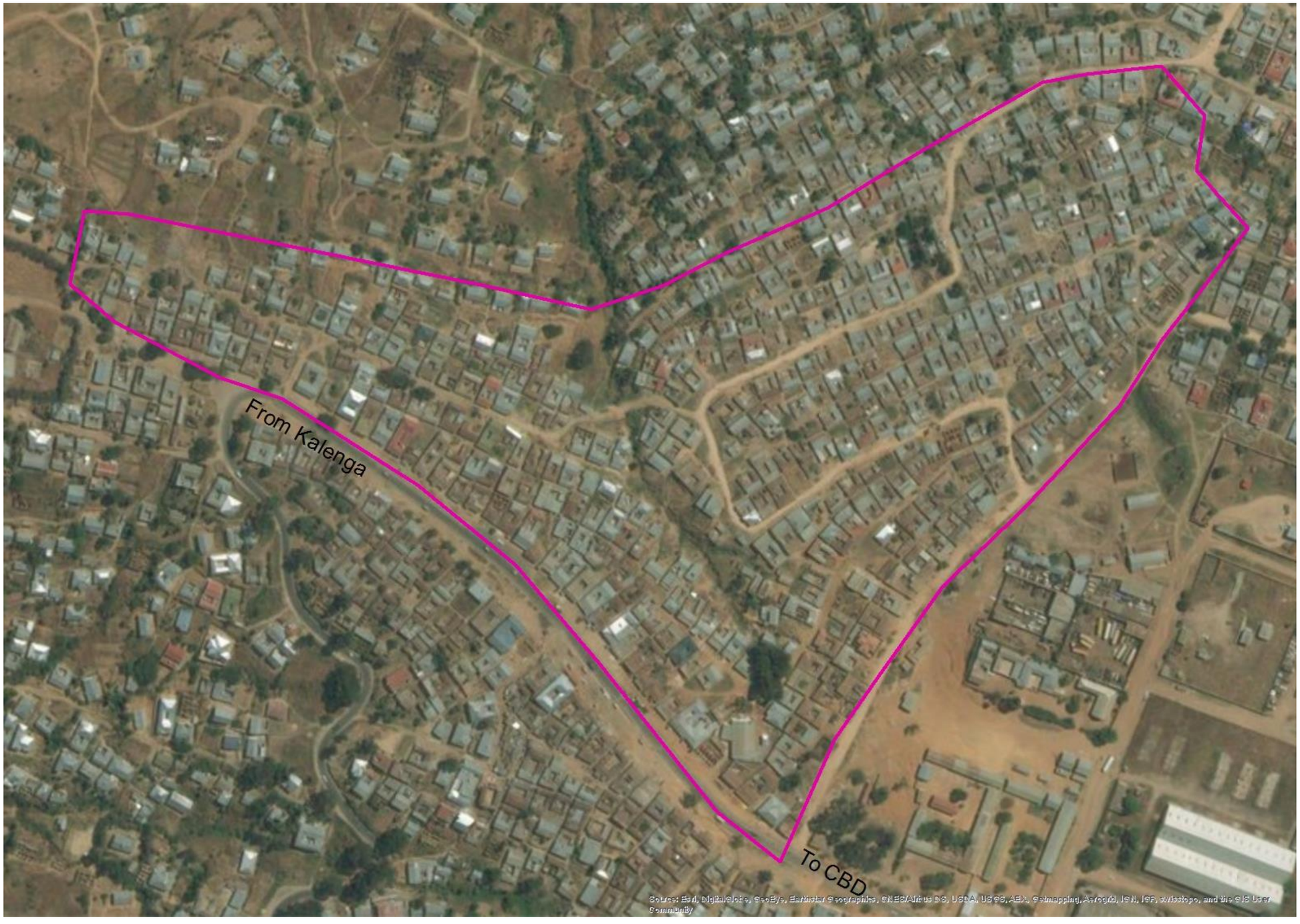
Tenure regularisation will involve registration or certification of individual rights into a land register, combined with a form of cadastral survey. Regularisation strategy is proposed for consolidated unplanned settlements of Ipogoro, Makanyagio, Don Bosco, Mtwivila and Mkwawa, Njiapanda Mtwivila, Kihesa TRM, Lukosi and Mkwawa, Lukosi, Ndiuka, Kihesa Semtema, Mafifi and Isoka. This is because land owners in these settlements are increasingly subdividing their land limiting the possibility of providing line infrastructure in future. These areas are also growing without provision of basic community facilities. Regularisation guidelines recommends for negotiation with land owners to donate part of their land for the provision of public facilities and infrastructure services. The overall goal of physical regularisation is to improve physical conditions of these settlements and tenure security issuing Certificate of Rights of Occupancy.

Specific objectives are:

i) To improve built environment by improving sanitation and solid waste management;
ii) To improve connectivity of the settlement with other parts of the Municipality;
iii) To improve tenure security by issuing Certificate of Right of Occupancy (CROs);
iv) To reduce land conflicts within settlements;
v) To reduce poverty by providing an opportunity for property owners access loans from financial institutions by using titles as collateral;
vi) To rise government revenue through land rent and property tax.

Figure 4.1: Aerial photo of Mwangata before regularization

Figure 4.2: Aerial photo of Mwangata before regularization



Map 4.2: Mwangata Informal Settlement after Regularization

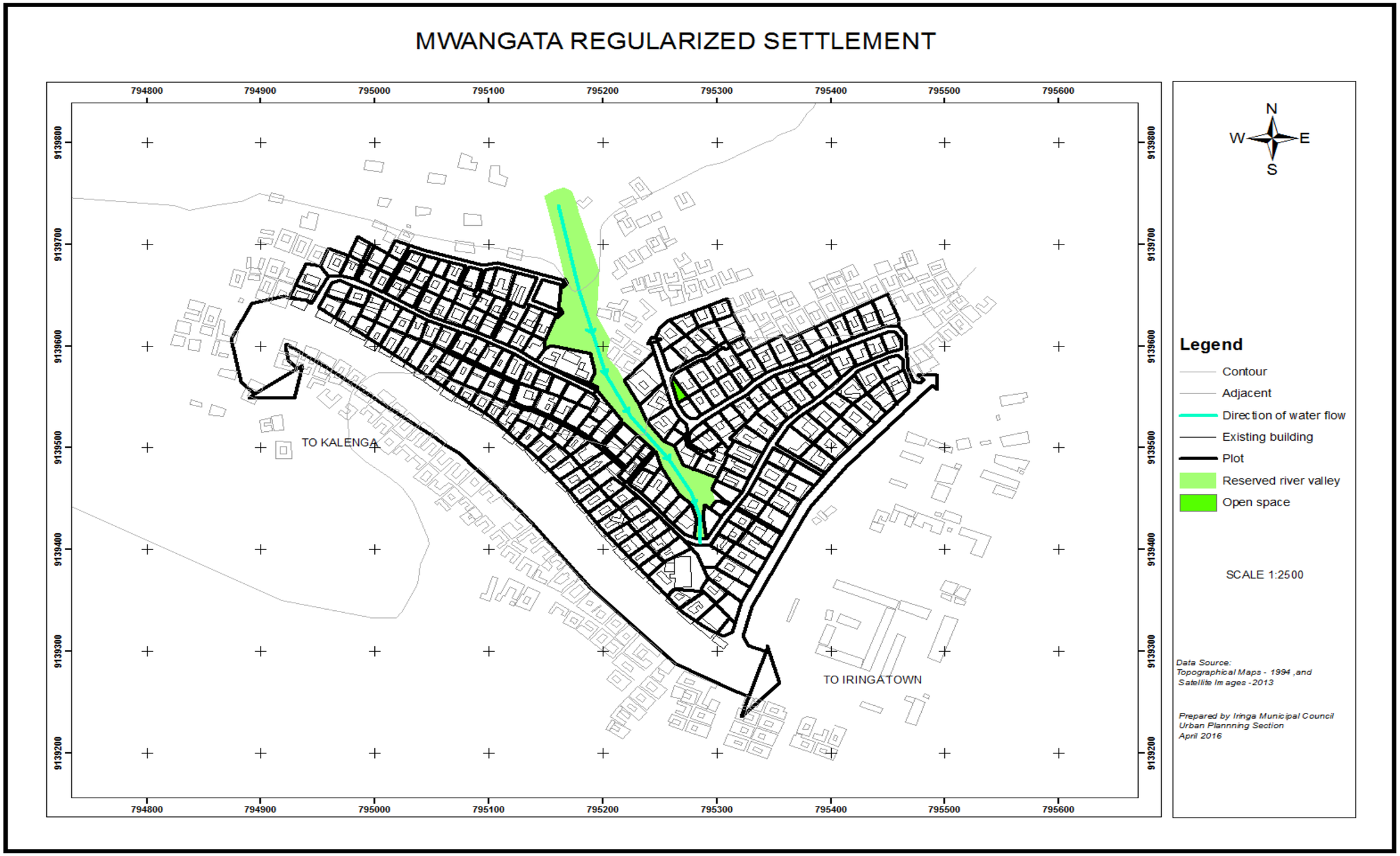


Table 4.1: Action plan for the regularization strategy (2015-2020)

S/N	Area for regularisation	Estimated no. of properties	Indicative cost in TZS. (000,000)	Tasks	Implementation period				
					2016	2017	2018	2019	2020
1	Mtwivila and Mkwawa Lukosi and, Mtwivila Njia panda ya shule, Kihesa Semtema, Mafifi and TRM	3,800	950	Acquire up to-date aerial photographs/satellite image					
				Conduct awareness campaigns and training					
				Mobilize resources and establish regularisation fund at community level					
				Database for land and property register established					
				Land for public use designated and marked;					
				Approved layout plans					
				Approved surveyed plans					
				Certificate of Right of Occupancy issued to land owners.					

Table 4.2: Action plan for Regularization Strategy (2020-2025)

Sn	Area for regularisation	Estimated no. of properties	Indicative cost in TZS (000,000)	Tasks	Implementation period				
					2016	2017	2018	2019	2020
1	Isoka Ndiuka Ipogoro,Don bosco, Makanyagio and Mkwawa Kisiwani	3600	900	Acquire up to-date aerial photographs/satellite image					
				Conduct awareness campaigns and training					
				Mobilize resources and establish regularisation fund at community level					
				Database for land and property register established					
				Land for public use designated and marked;					
				Approved layout plans					
				Approved surveyed plans					
				Certificate of Right of Occupancy issued to land owners.					

Unplanned settlement falling under this category includes Igumbiro and Mapogoro which are wards in the peri-urban area. Currently, there are no regulations, standards, or procedures for guiding land subdivision, transfer or development in unplanned areas including rapidly growing peri-urban areas. Local leaders such as Ward and Sub Ward *(Mtaa)* leaders are part and parcel of land transactions and are acting not only as witnesses but also as authenticators of transfers of property rights.

This is particularly so in the booming peri-urban areas where demand for housing land by middle and high income house builders is increasing. Land development without control is rapidly depleting opportunities to access land for basic community infrastructure services giving rise to overcrowding and slums. It is, therefore, critical to put in place a mechanism to regulate residential land subdivision before land is transferred, sold, developed and housing densities reach prohibitive or overcrowding levels.

For this infancy informal settlement, the best strategy is to combine both regularisation strategy and design for new layout plans due to the fact that in peri-urban areas there are still vacant lands which can be acquired for the public uses, while controlling and regulating land subdivision by preparing schemes in these areas.

Figure 4.3: Aerial photo of Igumbilo before regularization

Map 3.5: Proposed Igumbilo Regularization and Design Scheme

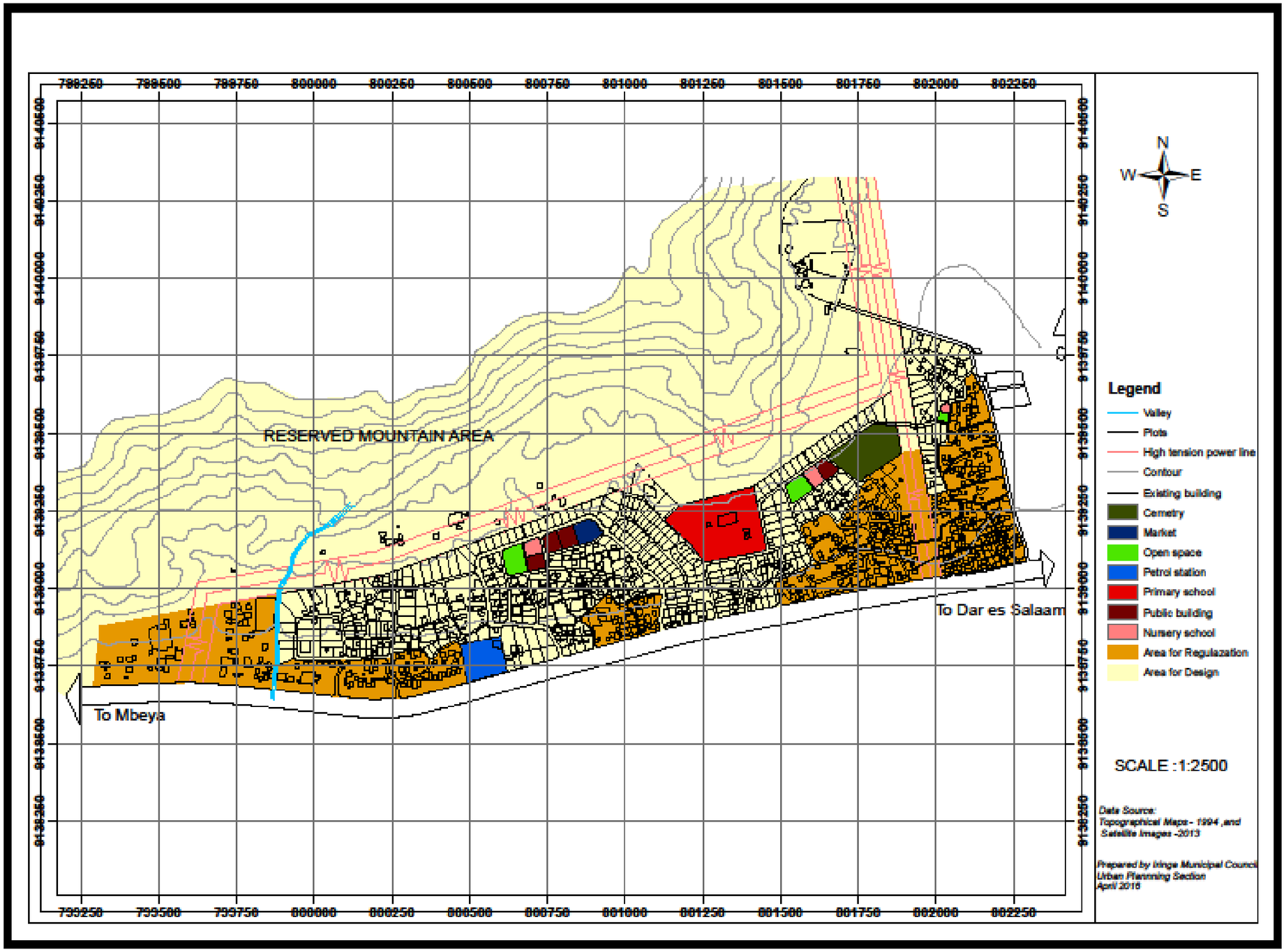


Table 4.3: Action plan for regularization strategy (2015-2020)

Sn	Area for regularisation	Estimated no. of properties	Indicative cost in TZS (000,000)	Tasks	Implementation period				
					2015	2016	2017	2018	2019
1	Igumbiro Mapogoro	3300	825	Prepare up-to-date aerial photographs/satellite image					
				Conduct awareness campaigns and training					
				Mobilize resources and establish regularisation fund at community level					
				Database for land and property register established					
				Land for public use designated and marked;					
				Approved layout plans					
				Approved surveyed plans					
				Certificate of Right of Occupancy issued to land owners.					

Guided land development strategy

The expansion of Municipal administrative boundaries led to the incorporation of villages into urban areas. This move creates a confusion due to conflicting dual land tenure regimes in these areas, namely customary/quasi-customary and statutory land tenure. Many land owners and developers alike are unaware of the importance and value of planning on their land. Individuals' decision to subdivide, transfer or site the buildings should be regulated so as to prevent and control proliferation of unplanned settlements. Demand for land by middle and high income house builders will soon shift to these unregulated areas.

It is imperative for the Municipal Council to create awareness to communities in areas such as Nduli, Kigonzile, Mkoga, Ulonge, Mgongo and Itamba and start planning within 2015-2020 phased implementation plans. Guided land development strategy will be combined with acquisition of land for public use and for land banking for future use and design for new layout plans given the fact that in peri-urban areas still there is vacant lands. This strategy will address the shortage of planned, surveyed and serviced land for building construction while playing a critical role of preventing development of unplanned settlements. Iringa Municipality is expected to prevent formation of unplanned settlements by the year 2020

Table 4.4: Roles and responsibilities of various sstakeholders

Actor	Responsibilities
President's Office-MKURABITA	1. Resource mobilization from internal and external; 2. Technical support and capacity building through training and backstopping; 3. Liaise with stakeholders to sensitize project beneficiaries; 4. Liaise with PMO and MLHHSD in monitoring project implementation
PMO-RALG	1. Put in place policies, legislations and institutional framework for urban development management; 2. Technical support and capacity building through training and backstopping; 3. Mobilise resources internally and externally; 4. Oversee the operations of Local Authorities; and 5. Resource mobilization from internal and external sources 6. Coordinate the implementation, and liaise with Ministry of Lands 7. Development Partners
MLHHSD	1. Put in place policies, legislations and institutional framework; 2. Technical support/capacity building through training and backstopping; 3. Mobilise and make resources available for implementations; 4. Coordination between central and local government; 5. Approval of regularization and planning schemes; 6. Establish Settlements Regularization Revolving Fund (SRRF) to ensure cost recovery

Iringa Municipality	1. Appoint settlements regularization coordinator, 2. Socio-economic data gathering, situational analysis, map and gazette unplanned areas for any intervention as the need arise; 3. Mobilize technical expertise needed for the implementation of the programme. 4. Liaise with ward officials and the communities in implementation of the programme; 5. Prepare work plan and budgets 6. Lead negotiations with land owners for land acquisition and adhere to laws, regulations and set standards; 7. Prepare detailed schemes for new areas of regularization and submit to the Director of Urban and Rural Planning for approval; 8. Mobilise resources internally and externally; 9. Prepare resettlement action plan; 10. Establish Settlements Regularization Revolving Fund (SRRF) to ensure cost recovery; 11. Issue Certificate of Right of Occupancy/ 12. Coordinate different stakeholders in service and infrastructure provision and housing construction.
Public and private Real estate developers	1. Mobilise resources to invest in housing development; 2. To construct houses for outright purchase or rental; 3. Invest in infrastructure and charge user fees; build operate/build operate transfer
Utility agencies (TANESCO, IRUWASA etc).	Provide infrastructure and services
Private Sector	1. Participate in sensitization and mobilisation process; 2. Assist in resources mobilisation for infrastructure provision; 3. Participate in the upgrading and regularisation process
Ward and Sub-ward (Mtaa) Leaders	1. Create awareness to residents (owners and neighbours) for the whole exercise; 2. Present development plans for their area to the Municipality; 3. Receive and implement Council decisions, orders and directives; 4. Promotes economic and social development of the area; 5. Facilitate in solving conflicts emerging during implementation of the exercise 6. Sign and stamp the agreement forms on behalf of the Municipality 7. Resource mobilization e.g. through coordination of property tax collection
Land holder/ property owners	1. Maintain their properties and respect property boundaries; 2. Assist in property boundary conflicts resolution; 3. Participate in project planning and implementation. 4. Contribute part of their land for basic public service/infrastructure e.g. roads, open spaces etc. 5. Contribute to cost sharing and recovery including land -Involve in monitoring and evaluation.

4.10 MONITORING AND EVALUATION

Monitoring and evaluation of unplanned settlement need to be continuous to facilitate timely interventions. Thus, establishment of Geographical Information Systems (GIS) databases and developing indicators for planning, development, management and monitoring purposes should be established. Establishment of a development control system at Mtaa and Ward level to feed into to support Municipal level will promote Capacity building among members of the community to play the role of "land rangers" by reporting on the developments carried out on land without permit. This will help to prevent further growth of unplanned settlement in the peri-urban and densintification in the other unplanned areas.

Monitoring and evaluation will be undertaken at all phases. In this regard, the emphasis will be on the preparation of progress reports and review of the implementation process that will be carried out quarterly.

Since planning, development, management and monitoring purposes are important aspects establishment of a development control system at Mtaa and Ward level to feed into Municipal system is expected to bring about better results. Capacity building at community level to play the role of "land rangers" is crucial to prevent further growth of unplanned settlements.

TECHNICAL SUPPLEMENT

5

TRANSPORT AND COMMUNICATION

5.1 Transport and traffic characteristics

5.2 Accident & statistics

5.3 Parking

5.4 Travel characteristics

5.5 Proposed transport facilities

5.1 TRANSPORT AND TRAFFIC CHARACTERISTICS

Roads within Iringa Municipality have been developed in a radial pattern converging the central area. These include; the Great North Road (Dodoma – Iringa road), Iringa-Msembe (road toward *Ruaha National Parks*), Iringa-Pawaga and Iringa-Idete roads. There are circumferential links roads that link the CBD and other functional areas within the municipality. These are; Zizi – Don bosco-Danish road, Samora - Mashine tatu - Danish roads, Majembe – wilolesi - Mahakama ya mwanzo road and Mtwivila-Lukosi-Mkwawa. The existing road hierarchy consists of primary district, arterial and collector roads. In total there are 50.9 kilometres of trunk road, 8.9 kilometres of districts roads and access road (arterial and collector) connecting neighbourhoods; services and workplace. The entire network in Iringa Municipality is 357.51 kilometres. The road network managed by Iringa Municipal Council cover 16.57 kilometres of tarmac road, 103.71 kilometres gravel and 237.23 kilometres of earth roads. TANROADS is responsible for the 50.9 kilometres of bituminized trunk roads and 8.9 kilometres of gravel roads (Table 5.1 and map 5.1).

Table 5.1: Existing road length by classification

S/n	Road type/Classification	Road length (Km)	Percentage
1	Trunk and Regional Roads	50.90	12.20
2	District Roads	8.90	2.13
3	Feeder roads	215.21	51.57
4	Collector Roads	142.3	34.10
	TOTAL	**417.31**	**100**

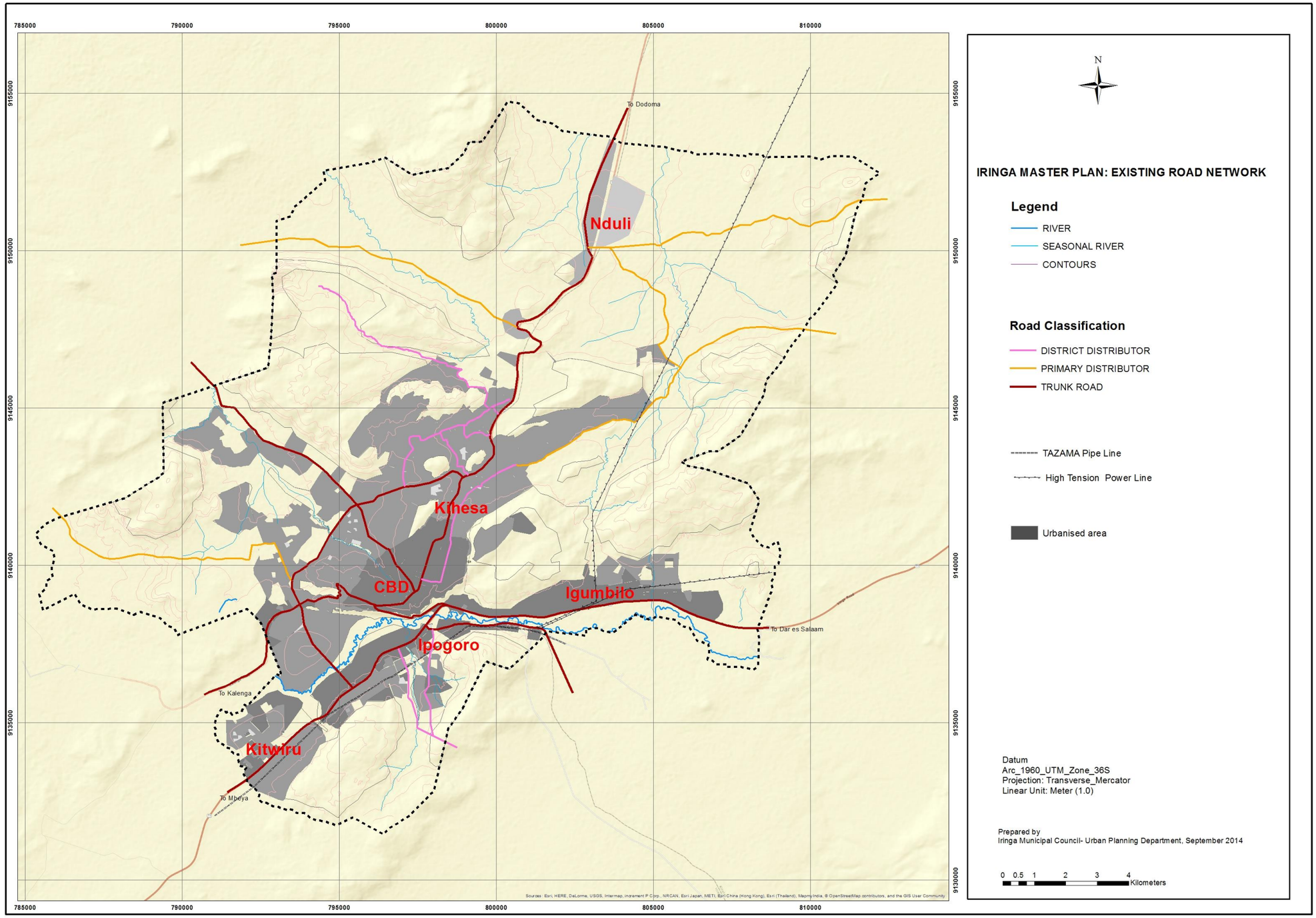
Roads in Iringa Municipality are generally in a good condition. The situation has immensely improved recently compared to the situation 15 years ago. The poor state of roads was attributed to lack of routine maintenance. Generally trunk roads are in a good condition and are passable throughout the year. The Table 5.2 shows the condition of roads as depicted in 2014.

Table 5.2: Road network condition

S/n	Ward	Total Road length (Km)	Passability (Km)		%age Possibility
			Throughout the year	Part of the year	
1	Mtwivila	19.16	9.69	28.85	66.4
2	Mkimbizi	22.98	8.26	31.24	73.6
3	Nduli	37.17	7.08	44.25	84
4	Isakalilo	19.15	7.45	26.60	72
5	Mlandege	3.06	0.0	3.06	100
6	Kihesa	21.25	0.0	21.25	100
7	Mwangata	34.41	0.03	34.44	99.9
8	Mkwawa	20.79	2.83	23.62	88
9	Gangilonga	37.37	0.07	37.44	99.8
10	Ilala	6.72	0.00	6.72	100
11	Makorongoni	9.82	0.01	9.83	99.9
12	Mivinjeni	5.82	0.01	5.83	99.9
13	Kwakilosa	10.19	1.15	11.34	89.9
14	Kitwiru	34.13	0.00	34.13	100
15	Ruaha	23.09	0.03	23.12	99.9
16	Igumbilo	5.03	1.10	6.13	82.06
17	Mshindo	2.36	0.00	2.36	100
18	Kitanzini	5.98	0.01	5.99	99.9
	TOTAL	318.48	37.72	356.23	89.40

Source; Iringa Municipal Engineer Office, September 2014

Map 5.1: Existing road network



Presently 89.40 percent of the road network is passable throughout the year. Some of the roads are earth roads that lead to deterioration especially during the rainy season. Financial resources for the construction and maintenance of road network come from Road Fund and Council's own source. Maintenance of road includes routine maintenance, periodic maintenance and spot improvement. However, due to the limited funds, it is not possible to maintain all roads regularly. The Municipal Council receives only 1billion Tanzanian shillings for road maintenance each year. World Bank through five year programme (2013-2018) has been supporting rehabilitation of infrastructure (roads stand and markets) through the Urban Local Government Strengthening Programme (ULGSP).

In order to quantify the volume of traffic in municipal roads, traffic inventory surveys were undertaken. Traffic counts were conducted at 50 intersections strategically located along cordons and screen lines. Most of the traffic counts and analysis of the existing traffic were limited to the critical roadway peak period, observed to occur during the morning hours between 7:30 to 9:00a.m. These were supplemented by selected observations of the secondary roadway traffic peaks which occurred at noon and during the afternoon between 01:30 to 04:00pm. The traffic volume crossing the outer cordon line through the central area during peak period is presented in Table 5.3.

Table 5.3: Inner cordon traffic volume at peak period (7:30-9:00)

S/N	Classifications	Volume (per type of traffic)	
		Frequency	Percent
1	Taxi/saloon cars	20,974	8.3
2	Trucks/Lorries	7,082	2.8
3	Busses/Coaches	2,521	1.0
4	Mini busses	14,170	5.6
5	Pick ups	8,470	3.3
6	Bajaji	6,263	2.5
7	Motorcycles	29,186	11.5
8	Vans	18,252	7.2
9	Pedestrians	129,048	50.8
10	Cyclists	15,286	6.0
11	Carts	2,538	1.0
	TOTAL	**253,790**	**100**

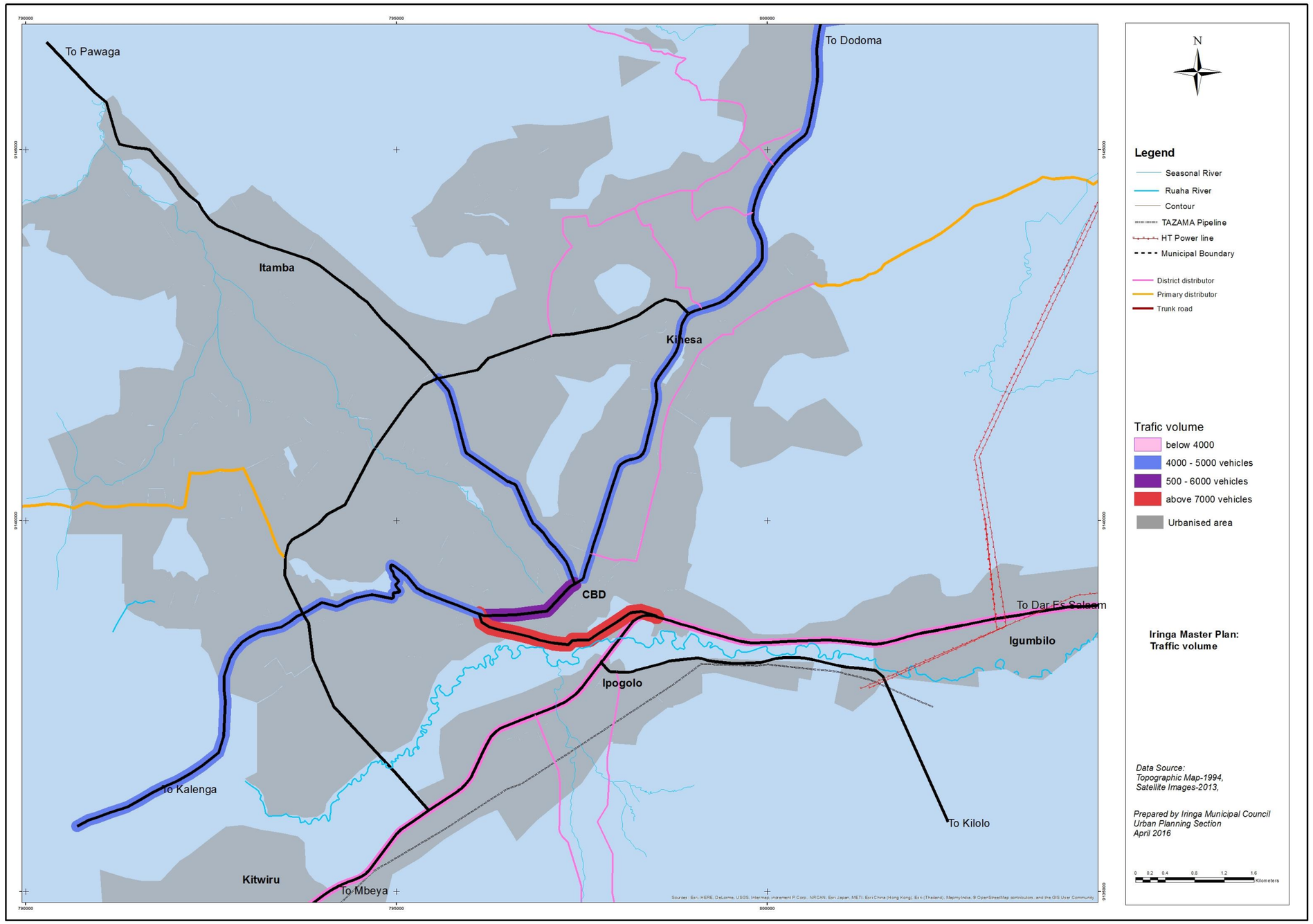
The composition of traffic as observed from traffic surveys indicate that pedestrians volume constitute the largest volume accounting for 50.8 percent of total traffic. This was followed by motorcycles that accounted for 11.5 percent, taxis and saloon cars (8.3 percent), vans (7.2 percent) and cyclists (6 percent). This modal split indicates that walking is still a dominant mode of transport in Iringa municipality

Table 5.4: Outer cordon line traffic volume (07:30-09:00)

Sn	Location	Road name	Number of vehicles			
			Inbound	Outbound	Total	Percent
1	Kitwiru	TANZAM highway (To Mbeya)	813	1,012	1,825	38.5
2	Igumbilo	TANZAM highway (To Morogoro)	525	714	1,239	26.1
3	Tagamenda	Iringa –Idete road	443	142	585	12.1
4	Isakalilo	Iringa - Msembe road	153	89	242	5.1
5	Nduli	GNR (To Dodoma)	515	213	728	15.4
6	Hoho	Iringa – Pawaga road	82	41	123	2.6
	TOTAL		**2531**	**2,211**	**4,742**	**100**

More traffic was observed along TANZAM (Iringa – Mbeya) highway that constitute 38.5 percent followed by TANZAM (Iringa – Morogoro) road which accounted for 26 percent of all traffic. The least was the Iringa Pawaga road (2.6 percent). The latter has low traffic volume apparently because it is a district road which links Iringa and Pawaga and these are no major traffic attractors in pawaga as compared to the others.

Map 5.2: Traffic volume



5.2 ACCIDENT AND STATISTICS

The number of traffic accidents decreased over the two years from 708 in 2013 to 691 in 2014. The fatality rate also decreased from 117 to 103 fatal accidents. Motorcycles were the most affected traffic that recorded a total of 58 fatal accidents in 2013 and 35 in 2014 (table 5.5).

Table 5.5: Traffic accidents

Sn	Mode of transport	2013			2014			TOTAL AV	
		Accidents	Injuries	Death	Accidents	Injuries	Death	Injuries	Death
1	Daladala	19	18	1	17	17	0	17	1
2	Private car	146	12	0	141	10	0	11	0
3	Motorcycle	368	313	58	371	336	35	324	46
4	Bus	0	0	0	0	0	0	0	0
5	Pedestrian	175	102	73	162	94	68	196	70
	TOTAL	708	445	132	691	457	103	548	117

Source: Regional Traffic police, September 2014.

5.3 PARKING

There are two types of car or vehicle parking in Iringa Municipality. Firstly on-street and secondary off-street parking. Off street parking is prevalent in Government premises, institutional buildings and Hotels. This type of parking is exercised at Iringa main bus stand, Miyomboni stand, Mlandege stand, Mwangata stand, Ipogolo stand, Ndiuka, and Iringa Referral hospital.

On street parking is along Jamat, Uhuru, Miyomboni, Mahiwa, Mkwawa II, Sokoni and CRDB-Msikitini roads. On street parking space inventory and utilization survey revealed a high turnover of parked vehicles. 75 percent of all vehicles remained for a durations of more than 6 hours. A few vehicles about 22 percent of vehicles remained for durations of less than 2 hours. On-street spaces in the main commercial areas are used at or above capacity during peak periods. Impliedly, there is a shortage of parking space especially on street parking.

Table 5.6: On-street parking utilization

Sn	Location	Total Parking	Percent utilization		Occurrence of Peak period
			Average	Peak Period	
1	CBD along Uhuru road	325	65	96	4:00Pm
2	CBD along Jamati road	435	87	112	5:00Pm
3	CBD along Mkwawa II road	335	67	89	4:30Pm
4	CBD along Miyomboni road	425	85	125	4:30Pm
5	CBD along Mahiwa road	375	75	83	9:30Am

Source: On street parking utilization survey; September 2014

5.4 TRAVEL CHARACTERISTICS

Existing travel characteristics were estimated from traffic counting programme, cordon counts of selected residential areas and trip distribution surveys at selected industries. Traffic counts and analysis of existing travel characteristics are limited to the critical roadway peak periods that occurred during the morning peak period between 07:30 to 09: Trip generation rate during the morning peak hours was estimated by means of cordon counts conducted at selected residential areas. Pedestrians, bicycles, motor vehicle and respectively vehicle occupancies were recorded. On the basis of information gathered, it was estimated that the existing person trip generation rate during the morning peak hour was approximately 78,713 trip person. The non-motorized modes accounted for approximately 76.57 percent of all travels of which 55.07 percent were pedestrians.

With regard to average work trip length was estimated from the interviews conducted at the major employment centres. This was approximately 4 kilometres by pedestrians and 6 kilometres by vehicles. In terms of future travel forecast it was estimated on the basis of historical trends in conjunction with economic and land use forecast. Formal employment played a significantly effects in trip generation even though employment trends of the formal sector have not been well documented. Trip generation is forecasted to increase only slightly from 46.5 (1975, 1980) to 48.0 (2010) percent of the population during the planned period, trip generation rates are forecasted to remain constant during the Master plan Period.

As result of the projected growth in the population and the eventual geographic expansion of the urbanized area of the Municipality, the average trip length is expected to increase between 25 and 50 percent. Consequently, a significant diversion of pedestrian trips to other modes is anticipated.

Within this Municipality the means of public transport include: buses, mini buses, taxis, motorcycle, bicycles, Lorries/truck and carts. Commuting is done by using public and private transport systems. Many Municipal residents use public transport popularly known as *daladala* and a few use taxis and motorbikes. Very few use private means of transport such as private cars and bicycles. The majority of the residents use the most popular non-motorized means of transport walking and cycling to get to workplace and services.
Public transport is under private operators. The man public routes starts from the CBD at Miyomboni to the out skirts of the town such as Nduli, Kigonzile, Msisina, Isakalilo, Tumaini University, Mkwawa, Itamba, Kitwiru, Cagirielo, Igumbilo, Kihesa Kilolo, Mkimbizi, and Mtwivila, There is an average of 1,300 mini buses with a capacity of 26,250 seats operating between these destinations. Private taxi service is also available for within town trip as well as town centre to out of reach of most residents.

There are three terminals within Iringa namely; Mlandege, Ipogolo and the Main Bus Terminal within the town centre. Where Mlandege stand serve for all buses operating to and from rural areas. Ipogolo stand serves for all buses on transit through Iringa Municipality from or to the regions of Mbeya, Njombe, Songea, Lindi, Mtwara, Sumbawanga, and Katavi. Similarly, towards the regions of Morogoro, Dar es salaam, Moshi, Arusha, Tanga and Mwanza. Main bus stand serves as terminal for all buses that operate between Iringa town and neighbouring regions, such regions include Mbeya, Njombe, Songea, Morogoro, Dar es salaam, Moshi, Arusha and Mwanza. There were 1,204 buses operating daily through Iringa town and between Iringa town and those neighboring regions.

According to traffic count data of 2014 that was collected through 50 nodes for seven days, among all modes of transit, a half of all trips were made by pedestrians followed by cyclist. The existing transportation system does not contain a structured pedestrian way and/or bicycle way system except along Iringa – Dodoma road at the Central area. Bicycle traffic to date has had no reserve lane. Many natural walkways and footpaths have been developed through open fields as shortcuts to major industrial and residential areas. There is a serious safety problem for pedestrians and cyclists which amount to accidents.

The Municipality of Iringa is served by a small airstrip which has an area of 143 hectares with running way of 1.6 kilometres. This airstrip handles small aircrafts. It lacks regular commercial flights compared to other towns in the country. However, of recent days it has acted as a link to travelers going to Dar es Salaam, Mpanda and Sumbawanga where commercial flights are frequent. An average of 56 flights was recorded monthly. The airstrip is situated at Nduli some 15 kilometres north of Iringa CBD along Iringa – Dodoma road.

5.5 PROPOSED TRANSPORT FACILITIES

The main road network in the Master plan will be planned to march in size and hierarchy with the TANZAM Road. The main road network should include lanes for vehicular movement, bus lanes, bicycle lanes, pedestrian paths and landscaping. The bus way system should be connected to all proposed satellite centres and national and regional road through the main road. The road size for trunk roads shall be having right of ways of 60 metres wide, for inter-regional roads connecting the Municipal and other parts of the country. These include Dodoma road to Igumbilo bypass with a total length of 7 kilometres and proposed bypass from Kihesa, Mkwawa, Mwangata, Isakalilo to Kitwiru and join TANZAM highway with a length of 11 kilometres. Primary distributor roads with 45 metres wide for roads connecting the proposed district/satellite centres. The 30 metre and 45 meter roads, for roads connecting planning communities and neighborhoods. The 20-30 metre roads which will act as neighborhood boundaries and 15-20 metre collector roads providing access to properties (Table 5.7).

Table 5.7: Road hierarchy and size

SN	Road hierarchy	Width (ROW)	No of lane
1	Main Trunk	60	4
2	Primary Distributor	45	4
3	District Distributor	30	2
4	Minor Distributor	20	2
5	Local distributor	15	2
6	Access road/ Cul-de-Sac	10	2
7	Pedestrian way/ Bicycle	6	

This master plan recommends construction and reconstructions of existing roads to acceptable standards consistent with the projected population and land use requirements. The recommended road construction costs were based on 2015 unit cost gathered from several construction projects in Iringa Municipality and presented on Table 5.8. The road construction costs are intended to be used as guides only and may not accurately reflect the actual cost of particular construction projects.

Table 5.8: Construction cost for recommended roads

Sn	Road types	Surface type	Construction cost 2015	
			(Shs/m^2)	(Shs/Km)
1	4 lane with storm sewer	asphalt	180,000.00	2,000,000,000.00
2	2 lane with storm sewer	asphalt	150,000.00	1,200,000,000.00
3	2 lane with storm sewer	Surface dressing (DSD)	50,000.00	400,000,000.00
4	2 lane with storm sewer	Granular/gravel	3,750.00	35,000,000.00
5	2 lane with storm sewer	Earth	1,250.00	5,000,000.00
6	2 lane with minor ditches	Earth	625.00	3,000,000.00
7	Pedestrian/bicycles way	Paving block	40,000.00	40,000,000.00

Figure 5.1: Trunk road (60 metres)

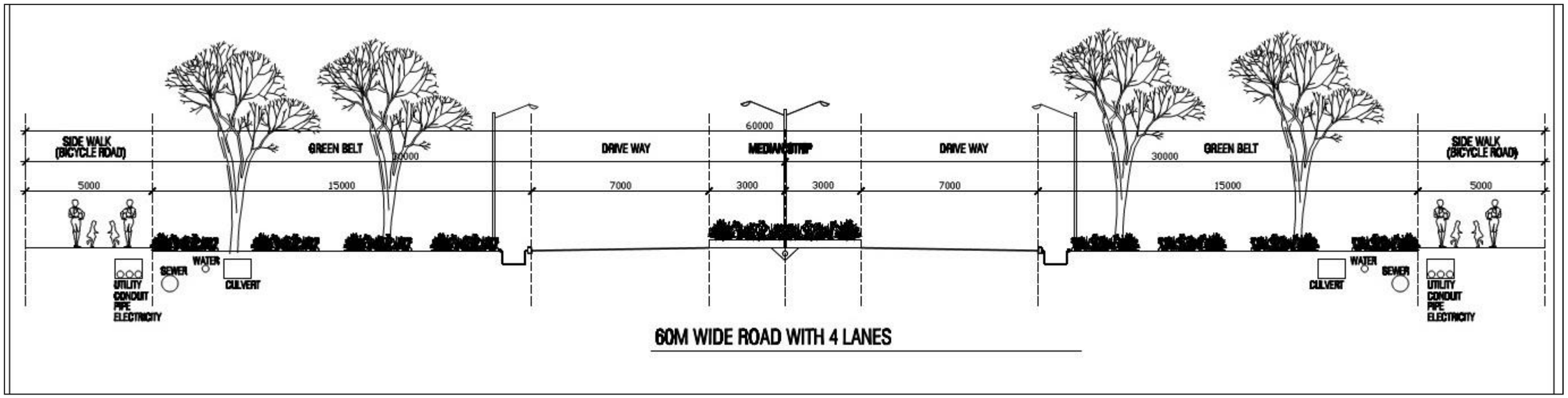


Figure 5.2: primary distributor road (45 metres wide)

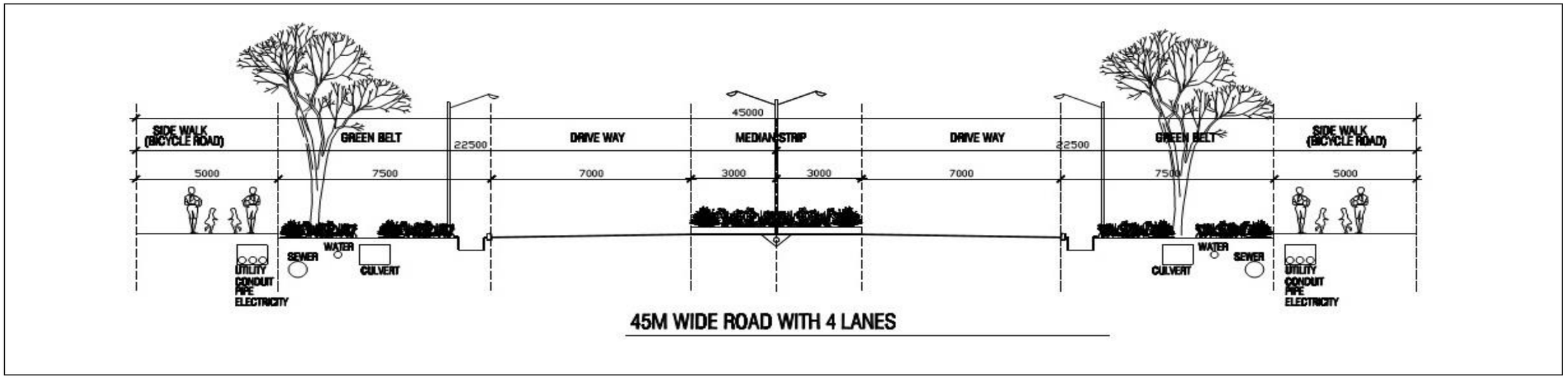


Figure 5.3: Distributor road (30 metres)

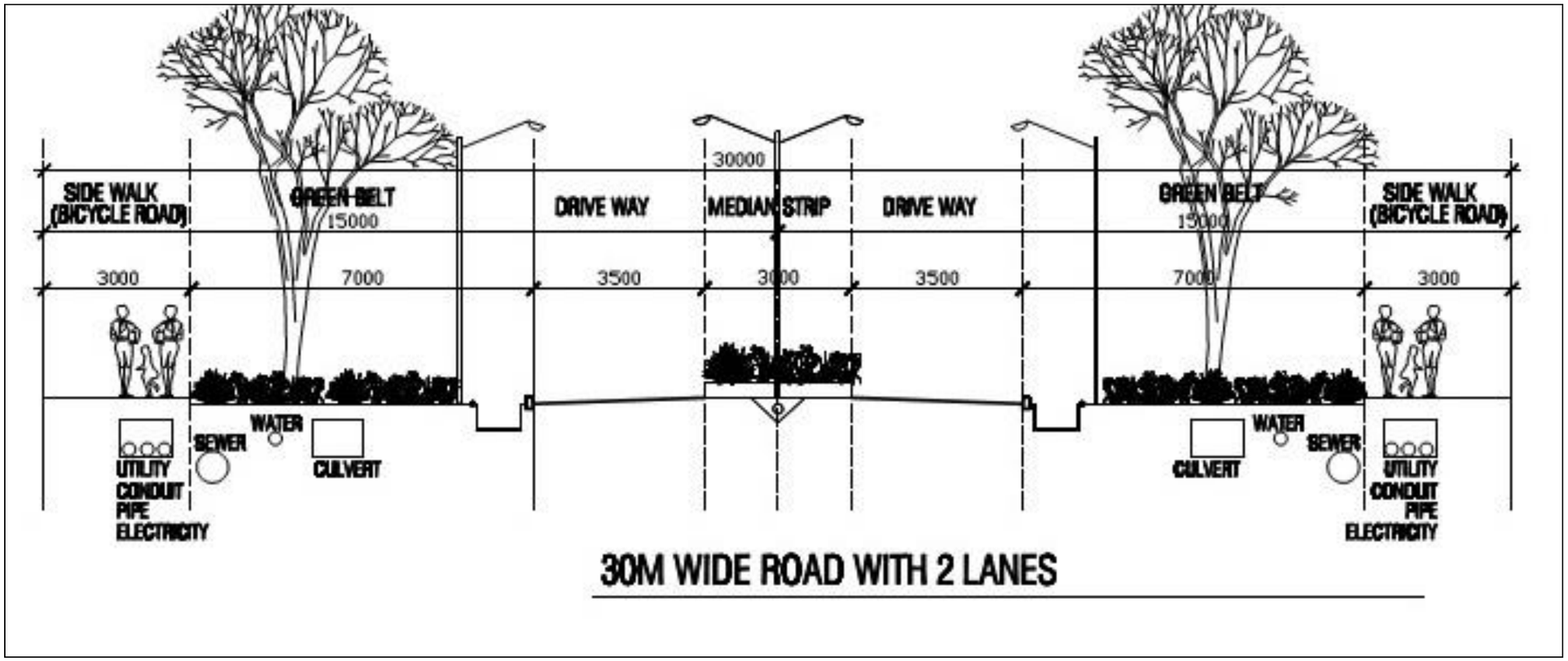


Table 5.9: Unit cost for roadway construction

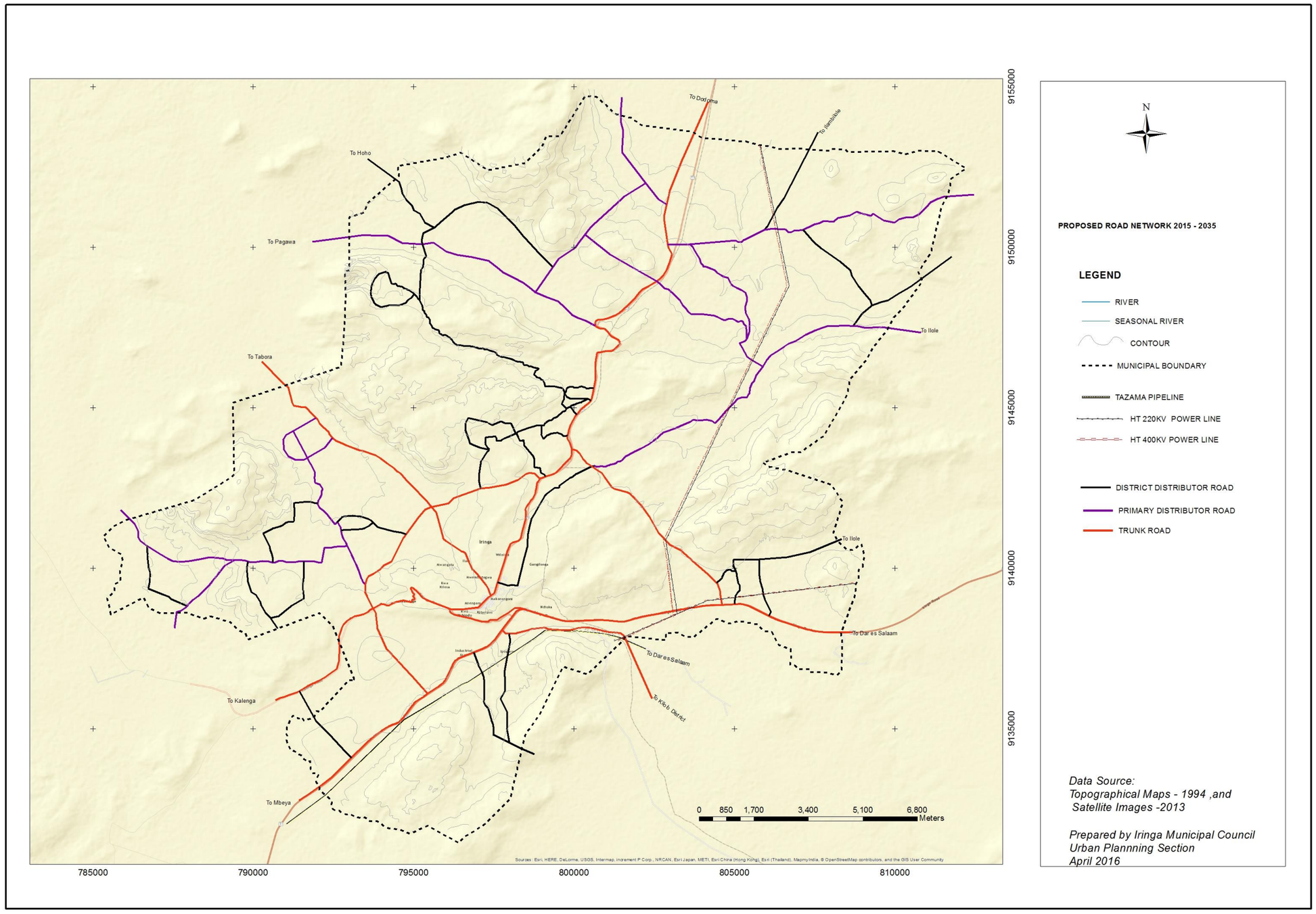
S/N	Components	Units	Rate/cost (Shs)
1	Common excavation	cubic metres	5,000.00
2	Rock excavation	cubic metres	15,000.00
3	Rock blasting	cubic metres	50,000.00
4	Gravel sub base	cubic metres	20,000.00
5	Crush stone base	cubic metres	25,000.00
6	50centimetres thick asphalt surface	m^2	50,000.00
7	20centimetres thick single surface dressing - SSD	m^2	7,000.00
8	30centimetres thick single surface dressing - DSD	m^2	10,000.00
9	Stone masonry drain	cubic metres	150,000.00
10	Concrete grade 15	cubic metres	180,000.00
11	Concrete grade 20	cubic metres	250,000.00
12	Concrete grade 25	cubic metres	300,000.00
14	Concrete grade 30	cubic metres	350,000.00
15	Bridge construction (m^2 deck area)	m^2	1,200,000.00

Bus ridership is expected to increase consecutively as the daily passenger trips increase. To accommodate this increased demand it is anticipated that major improvements in the public transit service will be required. The existing radial route structure will have to be reviewed and perhaps restructured to service town growth objectives satisfactorily. General improvement to the quality of operations will become necessary. The concept of combined regional bus terminal to be located at Igumbilo will serve major improvement in connection to improvement of existing radial route structure which will involve increase/construction of by-pass and ring access roads out of the town centre (Kihesa Kilolo-Igumbilo roads which links between Great North Road and TANZAM highway roads and Kitwiru-Isakalilo roads which also link between Great North Road and TANZAM highway roads through Mwangata, Mkwawa, Mtwivila and Mkimbizi.

To encourage pedestrian movement within the urban area exclusive routes for bicycles and pedestrians will be provided both along the roads network and open spaces. The routes are designed to enable pedestrians and cyclists move freely and safely to their destinations within the city without being exposed to accidents caused by non-separation of motorized and non-motorized modes of transport. The issue of confortability in terms of shades and beauty along these paths has been considered in this proposal by constructing pavements, planting shade trees, street feature and street fixtures. Surface construction may consist of natural ground, paving blocks, crushed stone or concrete depending upon the location and the desired standard (figure 5.2).

A new area for bus terminal and lorry parking has been proposed at Igumbilo area. These cover a total of 4 hectares and 1hactares respectively. Another bus terminal and lorry park is proposed at Nduli area which will cover a total area of 20 hectares. This will serve buses to and from Dodoma and another regions passing through the Great North Road. There is a need at regional level to plan for a rail link between TAZARA rail at Makambako through Iringa to connect with Central Rail in Dodoma. This will improve railway transportation link between the North and South of Tanzania. The existing air strip which is located at Nduli ward is proposed to be expanded in order to meet the present and future demands for aircraft traffic and cargo. The proposed area for airport expansion will be 500 hectares.

Map 5.4: Proposed Road Network



TECHNICAL SUPPLEMENT

6

PUBLIC UTILITY

6.1 Water supply and distribution

6.2 Sewage collections and disposal

6.3 Electrical supply and distribution

6.4 Solid waste management

6.1 WATER SUPPLY

The Iringa urban area is presently served by a piped water distribution system fed by two sources; the Ruaha River and Kitwiru Spring. Water is treated at Ndiuka treatment plant and pumped to the storage tanks that are used to control peak fluctuations. Three levels of service are presently provided to consumers by the current distribution system. These are; full house connection, stand pipe and public kiosks.

The Municipality has three sources of water, namely: the Mawelewele source with capacity of 190cubic metres/day, Little Ruaha River with capacity 21000cubic metres/day and Kitwiru spring with capacity of 3000cubic metres/day. While the Mawelewele source is operated by Iringa Municipal council the other two sources operates under the management of the Iringa Urban Water Supply and Sanitation Authority (IRUWASA).

The Ndiuka treatment plant was rehabilitated in 2012. The plant has a firm capacity of 24000cubic metres per day. The rehabilitation involved construction of new water intake, New sand trap, Rehabilitation of the sedimentation tanks and filters and construction of new pump house and clear water tank. The rehabilitation also catered for the construction of transmission lines and distribution mains with pipes of different types and size. The pipe size ranges from DN50 to DN 500 and the distribution system covered 435 kilometres.

The water from Little Ruaha River is treated by a conventional treatment plant which comprises the sand trap, sedimentation and filtration and finally disinfected to kill germs. Table 6.1 shows the characteristics of raw water as tested by Water laboratory.

Table 6.1: Characteristics of raw water

S/N	PARAMETER	TEST RESULT
1	Turbidity	20-250NTU
2	PH	6.6-7.18
3	Conductivity	35-48
4	Alkalinity	Not tested
5	Hardness	Not tested
6	Calcium	Not tested
7	Magnesium	Not tested
8	Manganese	Not tested
9	Zinc	Not tested
10	Iron	Not tested
11	Copper	Not tested
12	Sodium	Not tested
13	Potassium	Not tested
14	Chloride	Not tested
15	Fluoride	Not tested
16	Total Dissolved Solids	23mg/l

Source: IRUWASA, September 2014

The treatment process used for Little Ruaha River is sand trap, flocculation, sedimentation, filtration and disinfection. The treatment is done by adding Algae loc 19S chemical to speed up the process. Table 6.2 shows results of the water analysis carried out by Water laboratory on samples of water taken from Ndiuka treatment plant and the corresponding WHO standards for drinking water.

Map 6.1: Existing Water Supply Network

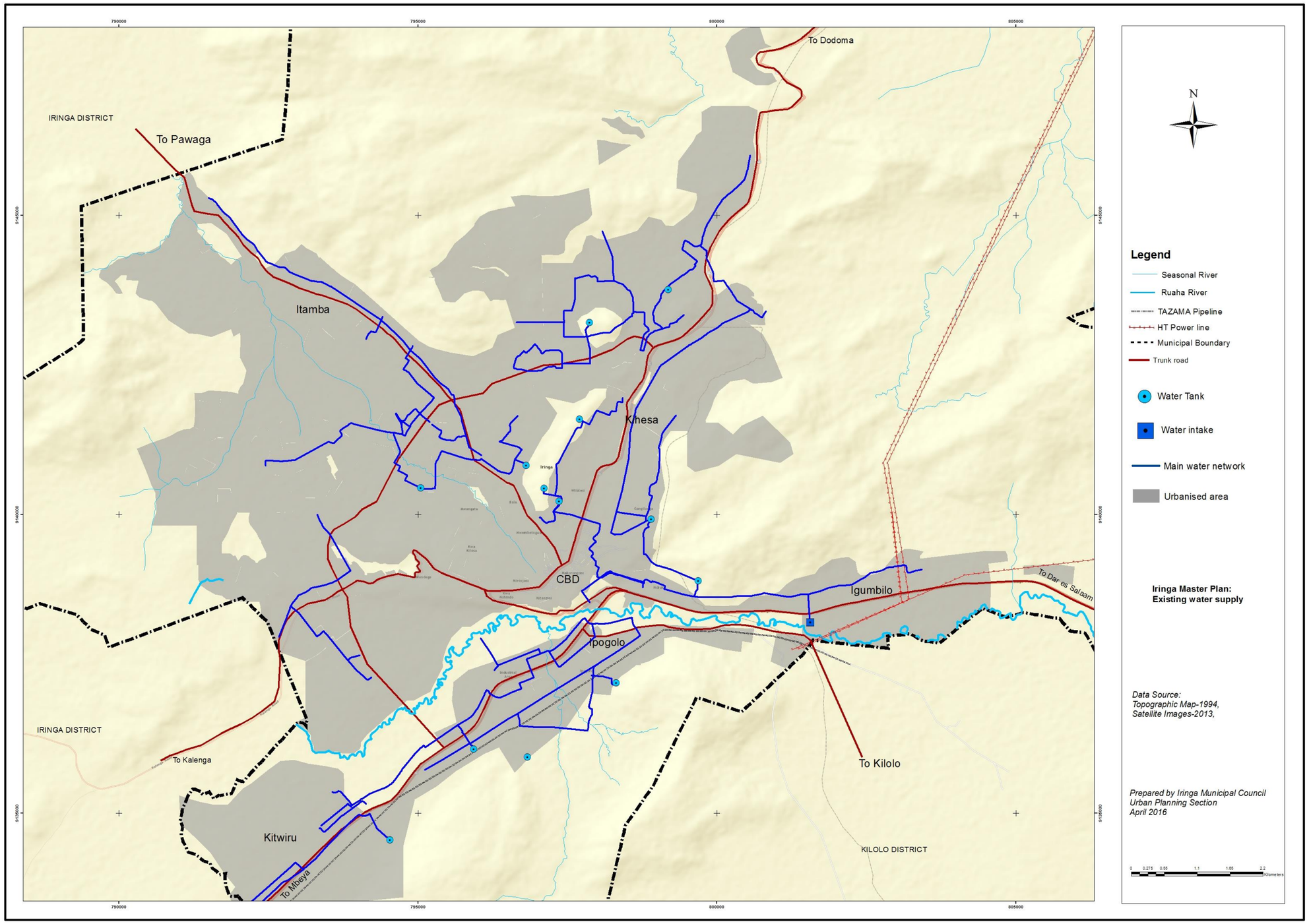


Table 6.2: Result of the water analysis

S/NO	Parameter	Test result	Tanzania Standards
1	Turbidity	2-6 NTU	5-25NTU
2	PH	6.93-7.30	6.5-9.2
3	Conductivity	80-90	
5	Hardness	24	500-600mg/l
6	Calcium	3.2	50-100mg/l
7	Magnesium	1.9	500-1000mg/l
8	Manganese	0.037	0.1-0.5mg/l
9	Zinc		5.0-15mg/l
10	Iron	0.07	0.3-1.0mg/l
14	Chloride	14.18	
15	Fluoride	0.02	1.5-4mg/l
16	Total Dissolved Solids	40.2	500-2000mg/l

Source: IRUWASA, September 2014

The existing water distribution system is comprised of mains of DN 50 up to DN 400mm fed by 4 major distribution tanks. The distribution mains are of different material ranging from HDPEC, UPVC, Cast Iron GS to cement motor lined sheet (Table 6.3). The serviced area is divided into 12 pressure zones where every interconnection valve is being closed.

Table 6.3: Existing water distribution

S/N	Pipe Material	Length (M)
1	HDPE(50-75)	166,723
2	UPVC (90-300)	144,758
3	Cast Iron (100-150)	28,000
4	GS (100-200mm)	4,000
5	Cement mortar lined steel (250-500mm)	29,547

Source: IRUWASA, September 2014

The distribution system presently provides water to 95 percent of the residents of Iringa Municipality. Water serves to four main user groups of residential, commercial, industrial and institutional consumers. There are three levels of service namely full building connection, stand pipe and water kiosks.

The water reticulation network for Iringa Municipal serves 95 percentage of the total population, only a few areas which are not served apparently because of the expansion of the boundaries. Some of the areas like part of Mawelewele, Isakalilo, Igumbilo and Kitwiru which had no pipe supply because development in these areas is still new. The water service cover a population of 143,770 people out of 151,345 as per 2012 national population census data.

Table 6.4: Existing monthly water demand for Iringa Municipal

Category	Monthly water demand
Residential/ Domestic	205,740 cubic metres
Commercial	11,592cubic metres
Industrial	5,796 cubic metres
Institutional	69,552 cubic metres
loses (30%)	289,800 cubic metres

Source: IRUWASA, September 2014

There are twelve (12) major distribution tanks which receive treated water from Ndiuka treatment plant. These are Gangilonga (tank B), Wilolesi (tank B), Ipogolo (tank I) and Kibwabwa (tank J). Tank B distributes water to tank A at Mkwawa, Tank C at Wilolesi, Tank D at Lugalo, Tank E at Mtwivila, tank F at Mkimbizi and Mgongo tank for Mgongo area.

Table 6.5: List of tanks location and their storage capacity

S/No	Tank Name	Capacity (cubic metres)	Location
1	Tank A	1,089	Mkwawa
2	Tank B	592	Wilolesi
3	Tank C	592	Wiloles
4	Tank D	592	Lugalo
5	Tank E	592	Mtwivila
6	Tank F	37	Mkimbizi
7	Tank G	1,089	Gangilonga
8	Tank H	37	DonBosco
9	Tank I	352	Ipogolo
10	Tank J	1,089	Kibwabwa
11	Kitwiru tank	100	Kitwiru
12	Tank Mgongo	150	Mgongo
13	Kitasengwa tank	75	Mawelewele

Source: IRUWASA, September 2014

The 2015water master plan was completed at a time when the major renovation of the water supply system in Iringa Municipality was completed. IRUWASA has permit of extracting water up to 33,000cubic metres /day and Kitwiru spring up to 5000cubic metres /day. The 2015 master plan assumes that the future source of water wills be the same Little Ruaha river and Kitwiru Spring. But the expansion of the water supply network will be done according to strategic and business plan of RUWASA the water master plan recommends further expansion if major expansion of the Municipal boundary will take place. The expansion of water supply system to cover 50 kilometers will be carried out in three years from 2014/2015 to 2017/2018. This will go together with the expansion of water of the water treatment system that will be expanded by constructing additional water treatment facilities. Presently the Iringa Municipal Council is implementing the expansion of the water network in Ulonge peri- urban area are implemented by RJR Company and supervised by NORPLAN Consultant. IRUWASA is implementing the construction of water supply system at Kitwiru which comprises of the construction of new pump house, new water storage tank, installation of two (2) new pumps, construction of transmission line 600 metres and distribution network of 10 kilometres. The extension of the water supply will be done in 4 phases. IRUWASA will proceed implementing the expansion of the water supply facilities guided by its own 3 years business plan and six years strategic plan.

The master plan proposes to allocate an area for construction of water storage tanks. A total of 6 water tanks will be constructed at Kitwiru, Mtwivila, Mafifi, Isakalilo, Ndiuka, Mkoga and Lundamatwe each with an area of 2500 m^2. The expansion of the water network will also be implemented in phases and this will cover areas of Kitwiru, part of Mtwivila and Lundamatwe. In order to overcome the fluctuating flow at the intake as caused by drought conditions, the construction of weir (dam) is planned at Ndiuka intake. The implementation of the construction of the weir will be in the phase I of the Master Plan. All sources of water for the Iringa Municipality shall be capable of being treated and the necessary treatment facilities shall be installed to produce drinking water which conforms to Tanzanian standards for drinking water. In accordance to the policy of abolition of the water kiosks in urban areas, only two levels of service are recommended for the new developments. Full building connection to all customers stand pipes to all new sites and serviced residential areas. In areas where the level of service is water kiosk, IRUWASA will be encouraging residents to be connected with a stand pipe. These areas include Nduli, Mgongo and Kigonzile. Where the current service is a kiosks, will this use converted to residential stand pipe.

The consumption rates are assumed to increase as a result of improved living standard. Full house connection converted from stand pipe will increase consumptions from an average of 70 l/c/d to 120 l/c/day. This will increase the daily demand by 50l/c/day. For the same reason there will be more increase of water demand due to expansion of institutions at Igumbilo. The increase of wet industries will increase the demand of water. A good example is the new industry for tomato canning which demands an approximate of 50cubic metres/day

Table 6.6: Estimated water demand after every 5years

S/N	Year	Population	Water Demand
1	2015	172230	16000cubic metres/day
2	2020	207039	18700cubic metres/day
3	2025	254657	23000cubic metres/day
4	2030	302276	28000cubic metres/day
5	2035	349895	32000cubic metres/day

The demand of water will be fluctuating on day to day as well as on an hour to hour basis. It would be uneconomical to provide source capacity for peak hourly demand only and therefore water to compensate for such short peaks is held in reservoir. It is recommended that the source and treatment facilities have capacity to provide daily demand, while water distribution mains should be able capable the peak hourly flow or peak daily flow and fire flow whichever is greater.

In order that he treatment plant provides the peak daily demand, the surface water source must be capable of proving adequate flow under low flow or drought conditions. Therefore drought frequencies recommended as acceptable for the flow to the plant from the surface water source are; Plant to produce below the peak daily flow for a maximum of one month in 10 year or Plant can produce below the average daily flow for a maximum of one month in 100 whichever is the worst. The trunk distribution system should be designed to provide for fire fighting for all developed areas.

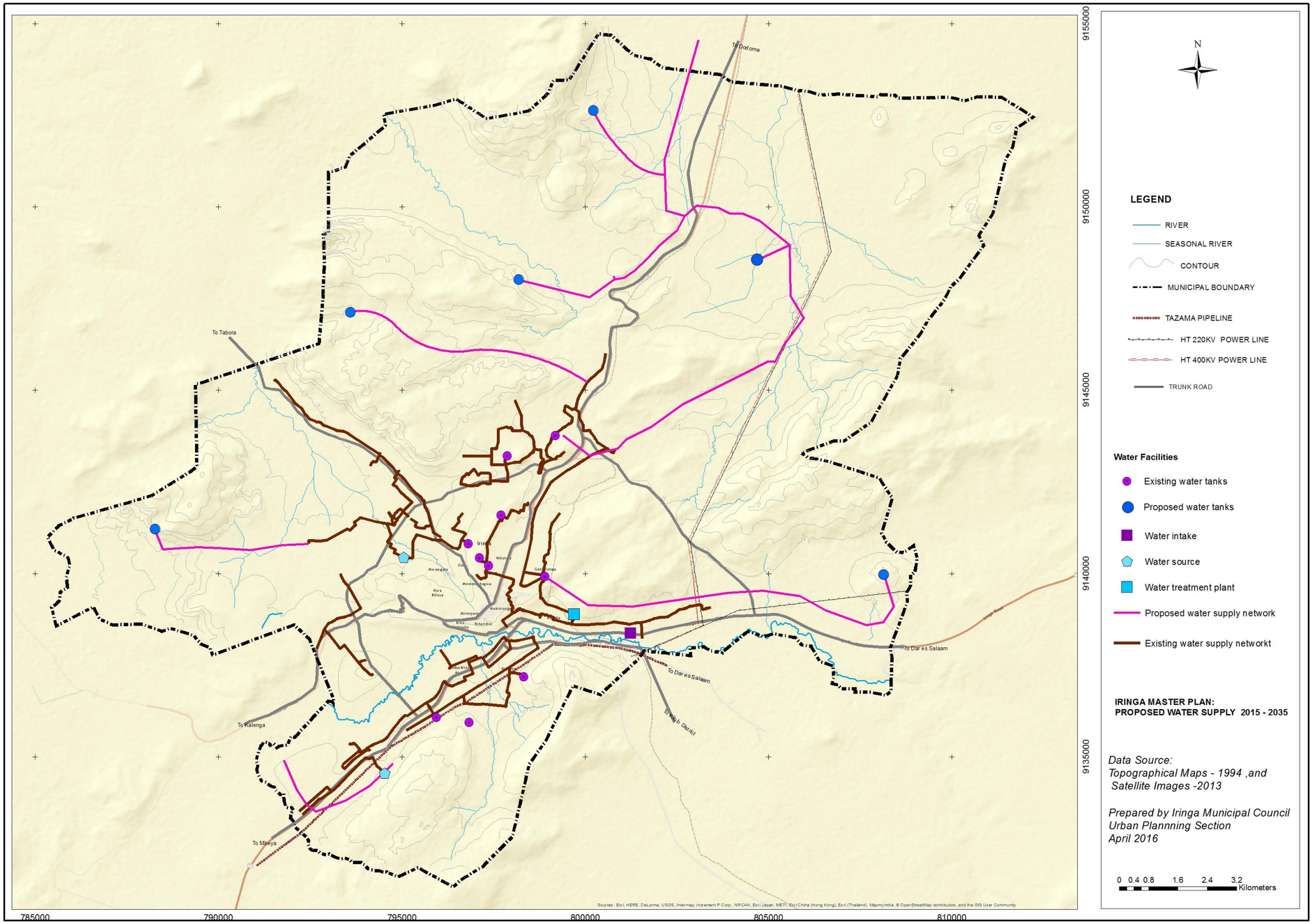
The water storage in the distribution system must be provided, this storage will be for fire fighting, peak hourly fluctuation and emergencies shutdown of sources for limited period and power cuts. The distribution mains are proposed to be made of materials which are readily available and with non-corrosive materials. The quality of materials should depend on the pressure. The distribution network for Iringa has been constructed with the concrete lined steel pipes and UPVC pipes of class ‘C’ and HDPE pipes. The types of materials and size which will be used during the implementation of the master plan are summarized in Table 6.7.

Table 6.7: Types of materials and size

S/N	Material type and Size	Percentage of the material
1	HDPE pips DN63 PN10	50
2	UPVC pipes DN 90 PN10	20
3	UPVC pipes DN 110 PN 10	15
4	UPVC pipes DN160 PN 10	15

The pipe materials will be laid under road reserve areas. The extension will be within 2 kilometres and the population to be served will not be more than 100 connections. The pipe network pattern will looped.

Map 6.2: Proposed Water Supply Network



6.2 SEWAGE SYSTEM

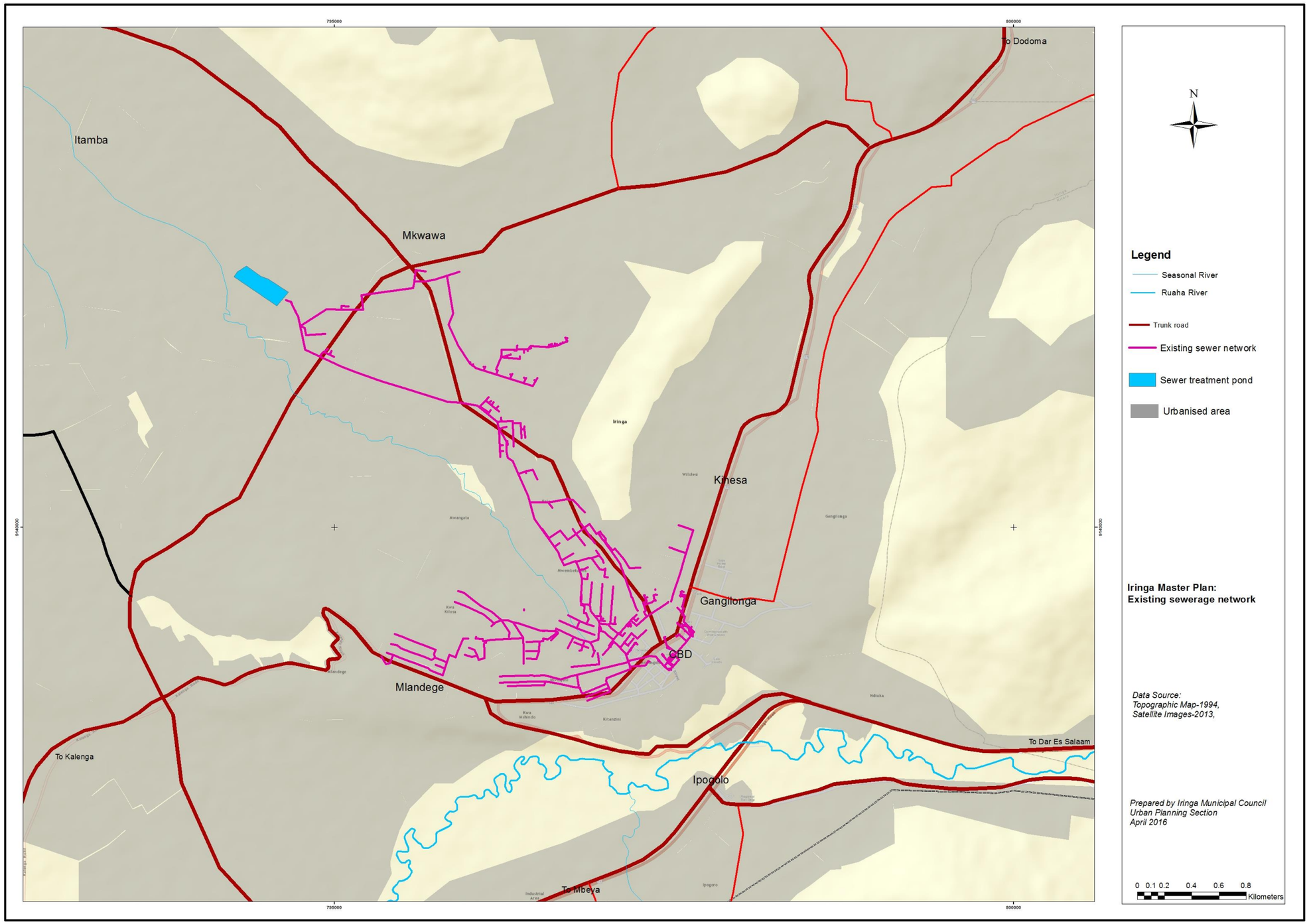
The sewerage system for Iringa Municipality covers the CBD area and some parts of Mlandege, Frelimo Mkwawa and Don Bosco. Areas with no sewerage system are served by cesspit emptier trucks and discharged at Don Bosco waste stabilization ponds. There is a plan to construct treatment pond at Kigonzile which will cover areas along Dodoma road in 2015-2035 master plan and the implementation of the construction is expected to start in the second and third quarter of the master plan.

The present sewerage system collects and transmits the waste water from the CBD to the treatment ponds at Don Bosco. The treated water (effluent) is discharged to Itamba stream. The system is still intact and underutilized. There are few customers who have their premises connected the sewerage system. Sensitization and promotion have been taking place to encourage customers to get connected in the sewerage system.

There are five basic levels of services for the disposal of the sewage. These are; sewer connection to piped system: - this serves the central part of Iringa, including parts of Gangilonga, Miyomboni, Makorongoni, Mlandege, Mshindo Frelimo, Mwembetogwa , Mkwawa and Don Bosco. Septic tanks and soak away system:- which covers most parts of the CBD (those not connected to the sewer system), Ipogolo, Ndiuka , Kihesa, Tumaini, Frelimo, Wilolesi, Mtwivila , Mkimbizi and few to per urban areas. Pit latrines: - these are mostly used in peri urban areas where the population density is still low and have space for making pits after the old one is filled up. These areas include Nduli, Mgongo, Kigonzile, Kitwiru and Ulonge. Cesspits: - these are being used by the people who produce a lot of waste water. These are mainly areas from the industrial area of Ipogolo.

The sewerage collection system and treatment ponds serving the CBD were constructed in 1998 with some modification to improve the treatment process done in 2012. The system comprises sewer pipes of up to 900mm and distribution networks of minimum size of 110mm UPVC pipes. The pipe materials for the sewer lines are concrete pipe, asbestos, cement pipes and UPVC pipes. The system has a length of 43 kilometres and a total of 400 inspection chambers. The coverage of the system is 13 percentage of the municipality area. Onsite sewerage disposal is mainly used in areas where the piped network is not available. This covers 87 percentage of the municipality area. Onsite sanitation includes septic tanks and soaks away pits, pit latrines and cesspits. Septic tanks and cesspits are emptied by the cesspit emptier trucks available at IRUWASA and disposed at Don Bosco treatment plant. (Map 6.3).

Map 6.3: Existing sewerage network



2.2.1 Proposal for expansion

The master plan (2015 – 2035) recommends the extension of sewerage system to various areas. Effects from this subsystem will discharge to the seasonal stream. The treatment ponds at Kigonzile will be permanent and will connect the areas of Gangilonga, Kihesa, Tumaini, Mkimbizi and Kigonzile. Additional expansion will be done in the CBD area where by expansion of the sewerage system will cover 4 kilometres. The planning of the Kigonzile treatment plant has already been done and the area for the ponds has already been identified. The construction activities await compensation of the third part interests in this area. The sewer network pipes shall possess adequate strength, good hydraulic characteristics and resistance to corrosion. The strength of pipes shall overcome the impact load if buried at a depth of 1.0 metres, live load to cover less than 1.5 metres and dead load in both cases.

The pipe materials for Iringa sewerage should be circular in cross-section made of reinforced concrete, asbestos cement and PVC. The material quality shall conform to British Standards (Table 6.7).

Table 6.8: Proposed pipe sizes

S/N	Category	Proposed Size
1	House /customer connection	110-200mm dia
2	Lateral sewer	160-250 mm dia
3	Trunk sewer	250-500mm dia

The roughness coefficient for the various pipe materials selected must be carefully considered in the hydraulic design of the system. The section of the coefficient will vary with different types of material. Care must be taken in selection of the roughness coefficient which is applicable to the particular pipe material after several years of use. It is recommended to use Manning's equation in determination of the velocity and the rate of flow will be determined by the continuity equation.

Manning's Equation:

$V=1/n*R^{2/3}S^{1/2}$

Where V= mean Velocity of flow in meter per second

R= hydraulic radius in meter

S= Slope of energy grade line I meters per meter

n= Manning coefficient of roughness. Ranges from 0.01 to 0.015

Continuity Equation

Q=AV

Where Q= Rate of flow in cubic meter per second

A= Cross sectional area in square metres

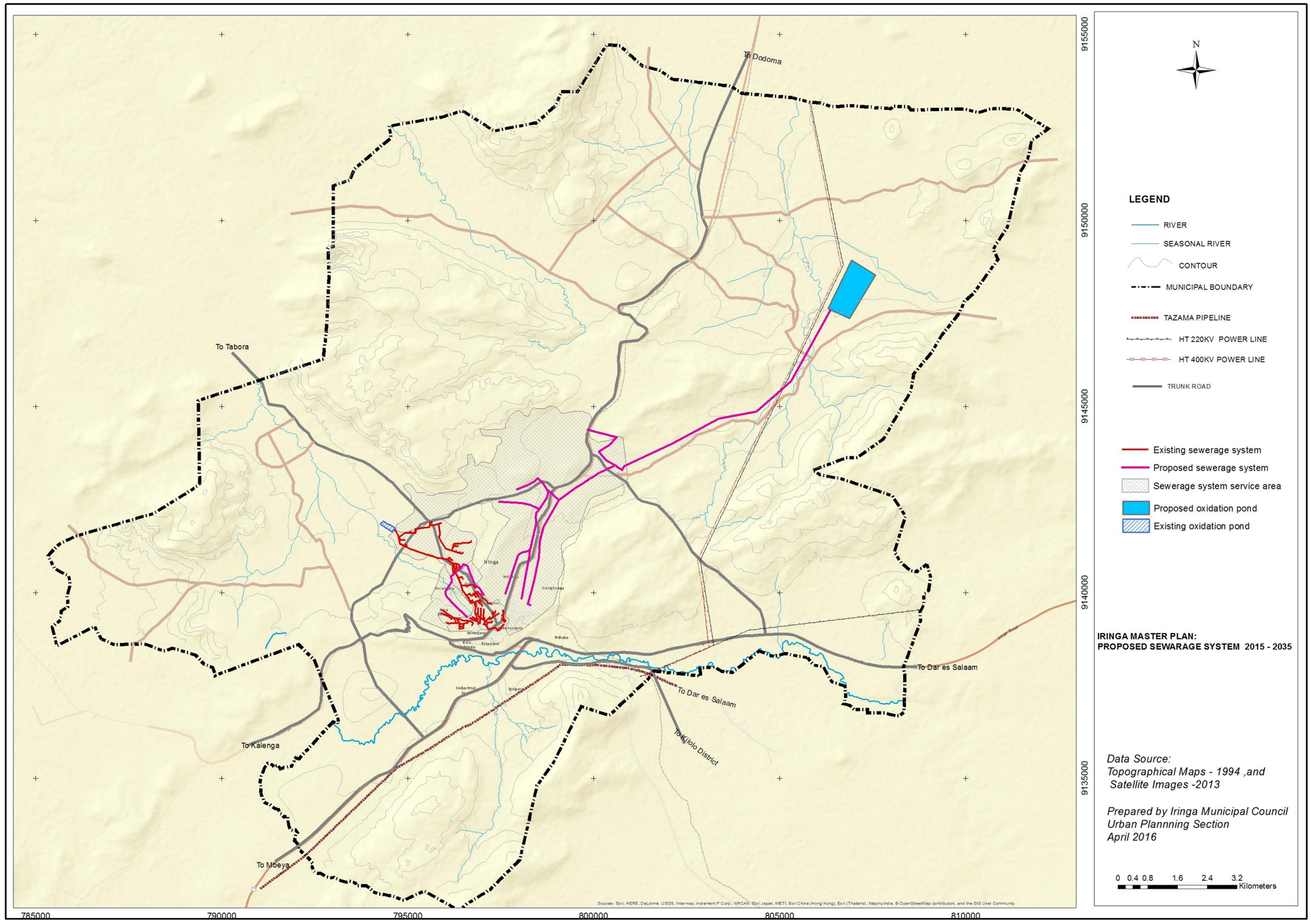
V= Mean velocity of flow in metres per second

In the proposed sewerage system for Kigonzile, the manholes should be of circular precast with an internal diameter ranging from 90centimetres to 120 centimetres for the trunk main with pipes of up to 50 centimetres diameter. Manholes shall be covered with covers made of close-grained grey cast iron and heavy duty covers conforming to international standards for trunk lines along the road (the covers will be subjected to the traffic loading).

Building connection can be either single to serve an individual customer or multiple in which one connection to main sewer serves two or more buildings through the multiple fitting or small local sewer. In multiple connections the inspection chamber must provided to every building connection. Connection with the main sewer line should be made by means of Y-fitting or chamber in the main sewer. In certain areas deep street sewer may require building connection raiser to minimize the depth of connection.

The trunk sewer will be in the utility reserve area, the utility reserve area is along the roads but in densely populated/ build up areas the sewer will be constructed under the road. The depth of the sewer for the sewer under the road will be more than 1.5 metres in order to protect the pipes from direct traffic loading. The lateral sewers will mainly be along the road in the utility reserve area and in some areas will be crossing the road in order to connect to the main trunk sewer.

Map 6.4: Proposed sewerage network



6.3 ELECTRICITY SUPPLY

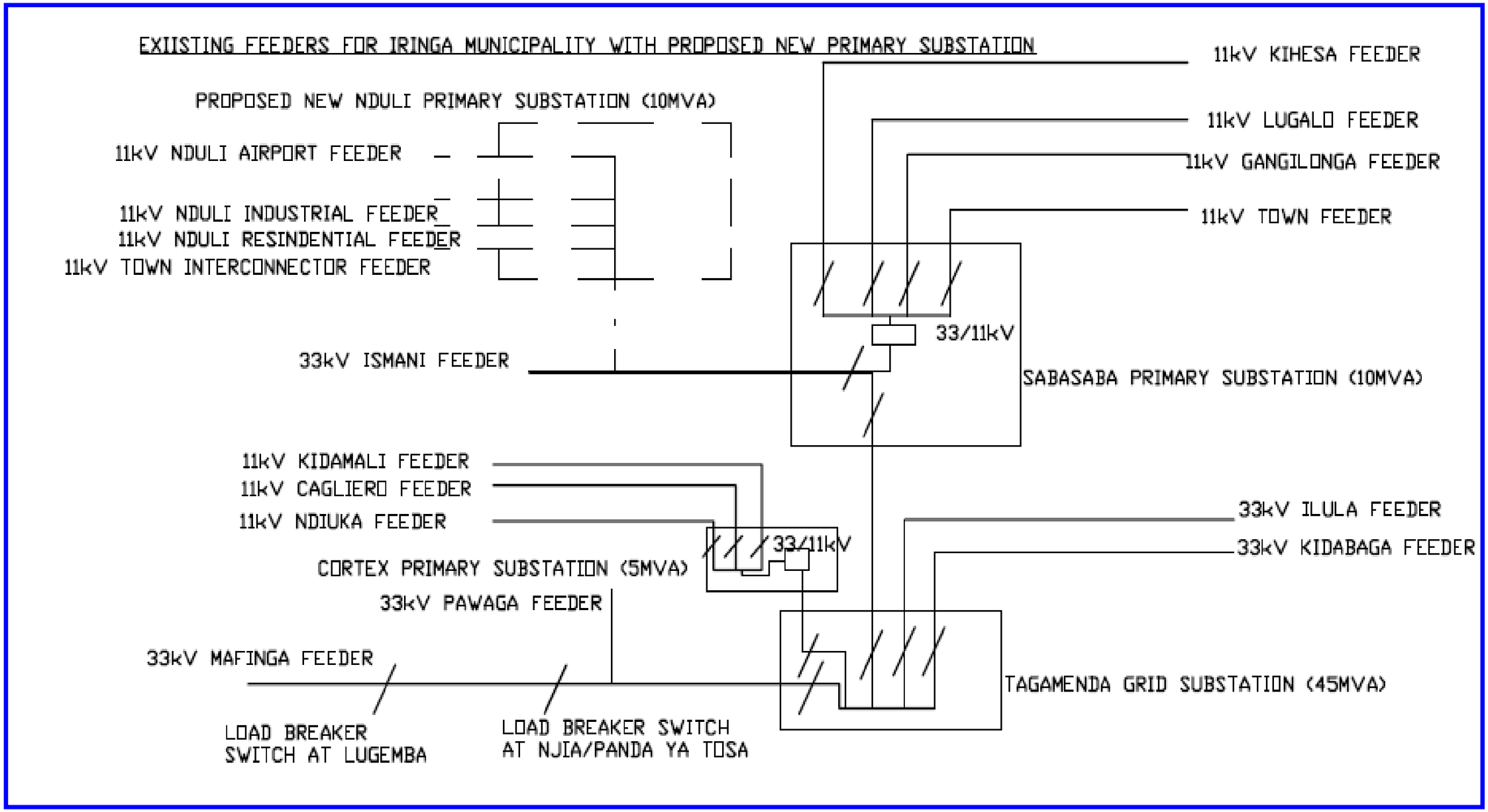
The main source for electricity used in Iringa are sources utilizing hydropower generating units at Kidatu on the Greater Ruaha River (240MW), Kihansi and Mtera hydropower stations. Currently Iringa municipality is estimated to have a total of 47,521 electricity users with the total average monthly unit's consumption being 8,069,169.80 Kwh.

Iringa Municipality is presently served with electricity from the high grid system which serves a major portion of the urban areas. The source of power is the national grid which traverses terminates at Tagamenda switching station. This substation is undergoing going upgrading to accommodate 400kV line constructed from Iringa to Shinyanga. The installed capacity for Tagamenda Grid substation as of now is 36MW (45MVA -220kV/33kV) and another new 30MW (220kV/33kV) is being installed making a total of 66MW (75MVA - 220kV/33kV) once the installation is finished. Iringa municipality is supplied with power from Tagamenda Grid substation (220kV/33kV/0.4kV), Sabasaba Primary Substation (220kV/33kV/11kV), and Cortex Primary Substation (220/33kV/0.4kV). The 33 kV distribution systems and 11kV primary substation are all fed from Grid substation at Tagamenda. Industrial establishments at Kibwabwa area are served with 11 kV supply coming from Cortex. The electricity power is supplied to serve different types of customers categorized as residential, light commercial, light industries, medium and industries.

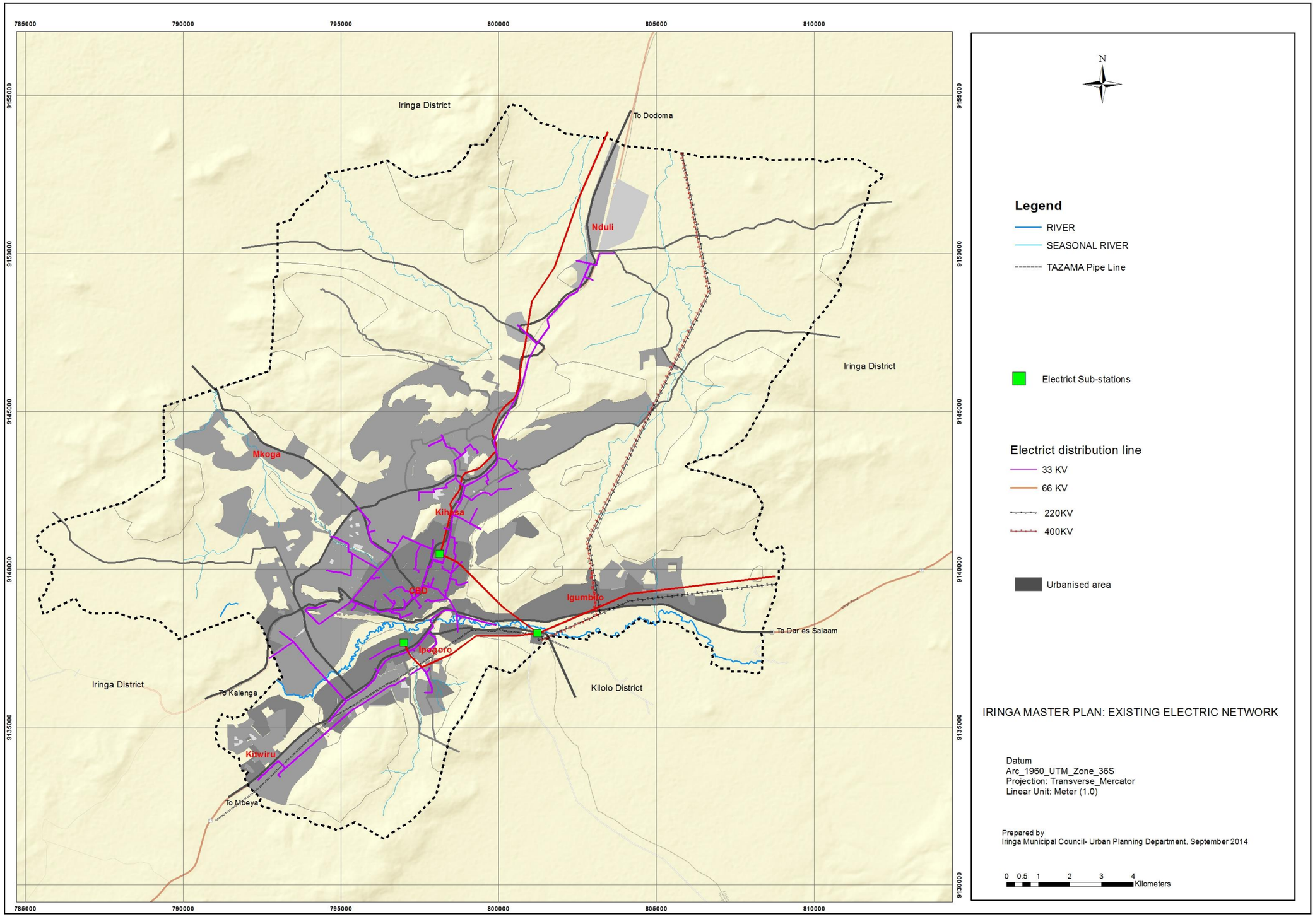
Table 6.9: Generating capacity from High Grid

S/N	Source	Capacity	
		Installed (MW)	**Actual (MW)**
1	Kidatu	240	240
2	Mtera	80	80
3	Kihansi	180	180
	TOTAL	**500**	**500**

Figure 6.1: Existing Sewerage Network



Map 6.5: Existing electric supply network



Iringa regional customer base indicates that there are 47,521 active accounts. All industries are provided with full connections and, where necessary, at 33 kV. It was estimated by TANESCO that by 2015, the industrial demand for electricity was in the order of 8 MW while the demand from the remaining consumers was in the order of 4 MW. The system maximum demands at our stations give an estimated peak demand was in the order of 12 MW. Residential consumers are provided with power at two levels of service. All residential areas, light commercial and light industries are connected at either 400 volt three phase or 230 volt single phase. Distribution within Iringa municipality is handled by TANESCO through their Regional Manager, while the head office of the company is directly responsible for the production of power at sources and its transmission to the town distribution systems. The Regional Manager is thus responsible for the operations and maintenance of the distribution system and for local capital works. Major works and all source development are carried out by TANESCO head office located in Dar es Salaam.

Power sources in 2015 serving Iringa municipality consisted of three hydropower substations namely Kihansi (l80MW), Kidatu (240MW) and Mtera 80MW. The new generating station and sub-station at Tagamenda was then under construction interconnecting these three power sources and branching off to all southern highland regions. The high grid fed Iringa municipality by a 220 kV overhead line to Tagamenda from which the city is fed by overhead distribution at 33 kV/0.4kV or 33kV/ 11kV/0.4kV (Sabasaba/Cortex substation). In order to meet the Master plan projection, extension of Isimani 33kV feeder and construction of new Primary substation at Nduli Industrial area are proposed. Implementation of electrical networks and primary substation will require the participation of all stakeholders especially the land developers.

It is further recommended that the existing levels of service be maintained until 2030 with the possible exception that distribution lines should be constructed with adequate capacity to facilitate full building connections. The average system maximum demand for Iringa Municipality is 12 MW. The total installed supply from Tagamenda substation is 36 MW (45 MVA). This energy is supplied from two 220/33kV transformers each with the capacity of 18 MW (22.5 MVA). Projected peak electrical power demands by 2030will reach 77MW. These demands include losses in the system and have been developed from data given in the recent TANESCO reports. The residential and institutional demand presents an increase of 5 percent per year to account for the anticipated increases in usage of power as the availability and need increases with improved living conditions.

Table 6.10: Electrification projection to match with population / development growth

Year	Extrapolated population increase	Development area / entity	Extrapolated (MW) capacity to be increased	Remarks
2015 to 2020	23,423	Residential area	0.5MW	New installation
		Whole sale and retails shops, supermarket banks, post and telephones, shopping malls and petty trading markets.	1MW	New installation
		The existing Kibwabwa and Mlandenge service and light industry.	1MW	Upgrading
		New light and heavy industries proposed to be located at Nduli.	10MW	Extension of 33kV Isimani feeder straight from Tagamenda Grid Substation and construction new primary substation at Nduli (33kV/11kV) , An area of 4,000m^2 for proposed Nduli primary substation
		New light and heavy industries proposed to be located at Ulonge	0.5MW	New installation
		New service and light industries at Mkoga satellite town	1MW	New installation
		Institutions of higher learning administrative building hospital proposed to cover 3090 hectares	1.5MW	New installation
2020 to 2025	25,359	Residential area	0.5MW	New installation
2025 to 2030	27,450	Residential area	0.5MW	New installation
2030 to 2035	29,725	Residential area	0.5MW	New installation

Table 6.11: Projected power demand

S/N	Land usage	Peak demand (MW)		
		2020	2025	2030
1	Residential:	8	16	24
2	Institutional	4	6	8
3	Industrial	25	30	35
4	Commercial	6	8	10
	TOTAL	43	60	77

New 33/11kV sub-stations should be put in each proposed industrial community with sufficient standby capacity to allow for the largest transformer to be out of operation during peak demand conditions.
If demand is insufficient, the 33 kV lines should be extended right to the end users to relieve the industrial 11kV lines.

The installed distribution system in Iringa Municipality comprises of three levels of voltages namely; 33kV distribution lines with a total length of about 32 kilometres, 11 kV lines with a total length of about 254 kilometres and Low voltage line (0.4 kV) with estimated length of about 220 kilometres. We also have transmission lines of 220KV that extend to about 150 kilometres from Tagamenda to Mgololo.

Power supply should be transmitted to the planning area through 220kV transmission lines and 132kV distribution lines. The proposed overhead power line is mainly laid along the main roads and primary arterial road. Housing connections should be laid along access roads while in CBD area; the power line can be buried underground. Right of Way (ROW) shall be reserved for laying of the overhead power line as indicated in Table 11 for various power line voltage levels.

Table 6.12: Right of Way (ROW) for various power lines and voltage level

S/N	Voltage level (Kv)	Right of Way (M)	Distance from Center line (M)
1	11	5	2.5
2	33	10	5
3	66	20	10
4	132	40	20
5	220	60	30
6	400	60	30

Source: Space and Planning Standards Regulations G.N 395 of 2011

The size of land proposed for substations it is recommended as stated in the Space and Planning Standards regulation of 2011 G.N 395, to cater for future expansion. 400/220kV substation shall be connected to 220/132kV secondary electrical substations. The electricity would be further distributed to 132/33kV distribution substations. Each distribution substation can serve up to 150 MW power demand. Table 6.12 summarized the plot size required for different type of substations.

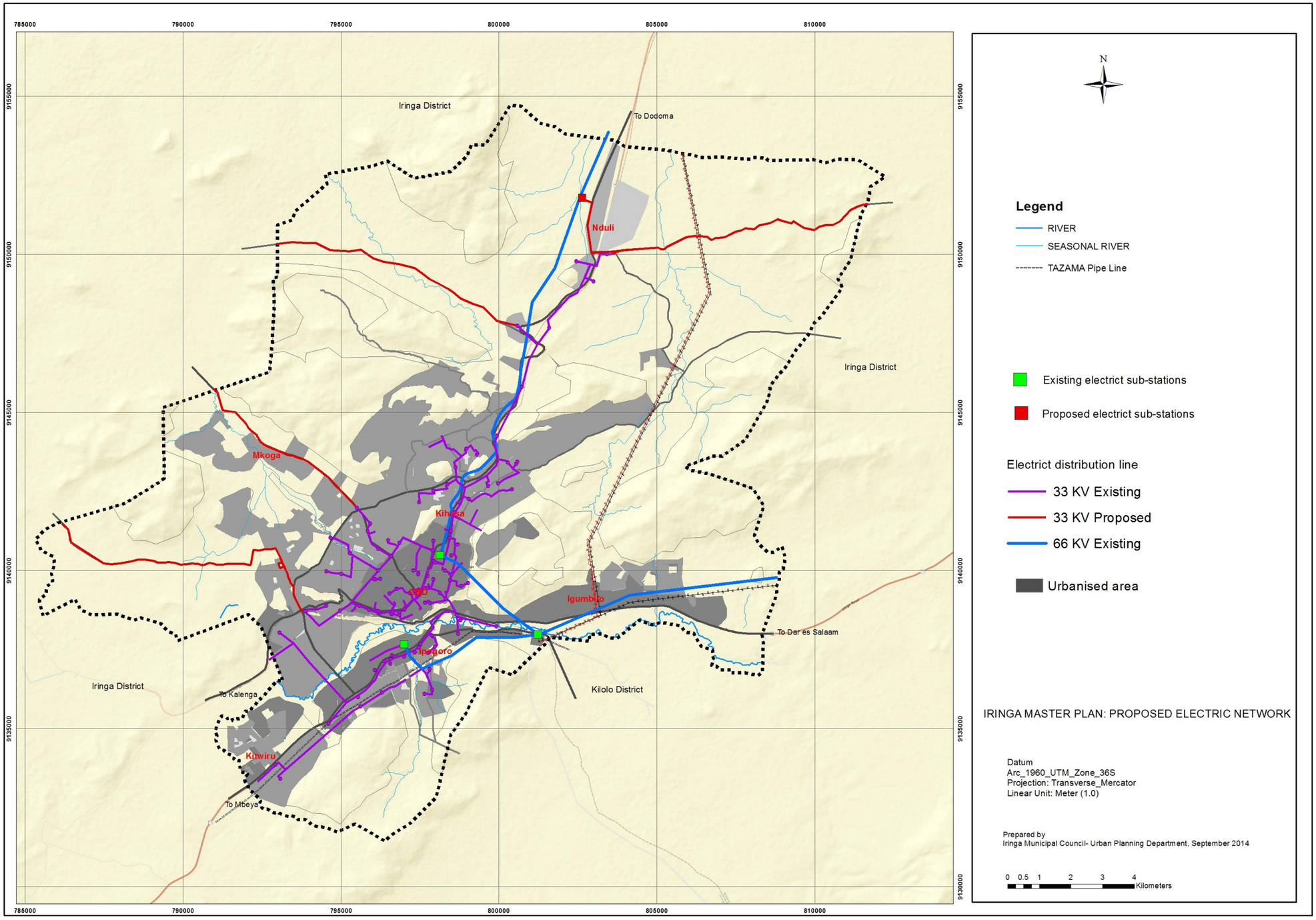
Table 6.13: Plot size for various type of substation

S/N	Voltage level (Kv)	Plot size (Meters)	Recommended ratio
1	33/11	30x40	30x40
2	132/33	40x80	40x80
3	220/132	50x100	50x100
4	400/220	-	200x200

Source: Space and Planning Standards Regulations G.N 395 of 2011

Substation location should determined based on the following considerations; the substation should be located at the optimal location to provide connections to the town's load centers; the surrounding land use should be compatible with substation and the substation location should avoid flood prone area.
The Draft Tanzania Power Sector Study (19) recommended that future power supplies should be generated from thermal plants driven by coal rather than hydroelectric stations and it is understood that this proposal is still being reviewed by TANESCO.

Map 6.6: Proposed Electricity Network



6.4 SOLID WASTE MANAGEMENT

The term municipal waste refers to any material, substance, or byproduct eliminated or discarded as no longer useful or required after the completion of a process. It is material that is not wanted or unusable remains or byproducts of something. Synonymous to municipal solid wastes are terms such as "garbage", "trash", "refuse" and "rubbish".

Municipal solid wastes are from residential (or household or domestic waste), commercial, institutional, street sweeping, construction and demolition, sanitation and industrial wastes. Solid waste management is the "generation, prevention, characterization, monitoring, treatment, handling, reuse and residual disposition of solid wastes". In Iringa municipality solid waste management involves: - storage, collection, transportation and intermediate treatment or disposal.

Table 6.14: Solid waste management extreme flow by year 1967 - 2014

S/N	Year	Population	Amount of waste generated per day (Tons/day)	Amount of waste collected per day (Tons/day)	Amount of waste recycled per day (Tons/day)	Budget allocation to solid waste management (Tsh)	Collection and transport methods	Community participation in solid waste collection (CBOs)	Government policy on solid waste management	Number of workers involved in solid waste management	Casual labors
1.	1967	21,746	8.7	3.8	0.03	12,000,000	open tipper	0	LGAs are responsible for SWM	16	0
2.	1978	57,164	22.9	12.0	0.09	22,000,000	open tipper	0	LGAs are responsible for SWM	18	0
3.	1988	84,515	33.8	18.1	0.1	34,000,000	open tipper	3	LGAs are responsible for SWM	22	10
4.	2002	106,371	42.5	34.0	0.2	61,000,000	Container Haulage system	6	LGAs are responsible for SWM	28	8
5.	2003	111,761	44.7	36.7	0.4	65,000,000	Container Haulage system	8	LGAs are responsible for SWM	30	8
6.	2004	117,315	46.9	38.3	0.3	78,000,00	Container Haulage system	9	LGAs are responsible for SWM	33	8
7.	2005	123,043	61.5	48.9	0.4	98,000,000	Container Haulage system	9	LGAs are responsible for SWM	34	16
8.	2006	128,942	64.5	47.0	0.7	108,000,000	Container Haulage system	12	LGAs are responsible for SWM	38	18
9.	2007	134,840	67.4	49.5	0.5	156,000,000	Container Haulage system	12	LGAs are responsible for SWM	40	20
10.	2008	140,840	70.4	52.9	0.6	178,000,000	Container Haulage system	10	LGAs are responsible for SWM	40	21
11.	2009	146,762	88.1	58.6	0.6	165,000,000	Container Haulage system	10	LGAs are responsible for SWMS stakeholders involvement	43	24
12.	2010	152,649	91.6	62.7	0.8	178,000,000	Container Haulage system	10	LGAs are responsible for SWM	42	23
13.	2011	158,592	95.6	66.3	2	198,000,000	Container Haulage system	12	Stakeholders involvement	46	23
14.	2012	164,415	98.6	68.2	4	209,000,000	Container Haulage system	14	LGAs are responsible for SWM	46	28
15.	2013	170,230	102.2	76.1	3	560,000,000	Container Haulage system	16	Stakeholders involvement	54	42
16.	2014	175,948	107.8	85.7	4	668,000,000	Container Haulage system & Compactor truck	18	LGAs are responsible for SWM	69	48

Iringa Municipality generates an average of 48,180 metric tons of solid waste annually. This is equivalent to the generation rate of 132 metric tons daily with an approximate of 0.87 kg/person/day. The generation rate and composition of solid waste varies from season to season due varying human activities. During rainy season solid wastes are wet and heavy with much organic matters while during dry season solid wastes are dry and lighter. Generally solid waste generated has a high content of vegetables, sand, metal, glass ash, dust, and stones. They have high moisture levels because of high usage of fresh vegetables. These properties make the waste very dense (high weight per unit volume). The consequences of this high density are that vehicles and systems that operate need to be robust and reliable.

Regular Waste Analysis Study is very important as well as Waste Amount Study, because such accumulated data can contribute for future planning, and it is essential data for Solid Waste Management. So, such study should be done continuously, at least once a year. The solid waste composition analysis helps the Municipal Waste Managers to plan proper method for waste management. In Iringa Municipality waste composition are classified as follows; domestic solid waste constitute mainly of food based organic wastes which represent 62.5 percent, Inert matter represent 27.3 percent by weight , whereby paper accounts for 6.2 percent. Metals and textiles accounts for 1.2 percent, bones and glass represent 0.3 percent. Generally all human activities create waste and the way these wastes are handled, stored, collected, transported and disposed-off can pose risks to the environment, public health and eco-diversity.

Table 6.15: Solid waste compositions

S/N	Type of waste	Percentage by weight
1	Vegetable	62.5
2	Paper	6.2
3	Glass	0.3
4	Metals	1.2
5	Textiles	1.2
6	Plastic and Rubber	1.8
7	Bones	0.3
8	Inert Matter	27.3
	TOTAL	100

Source; Municipal Environmental office, September 2014

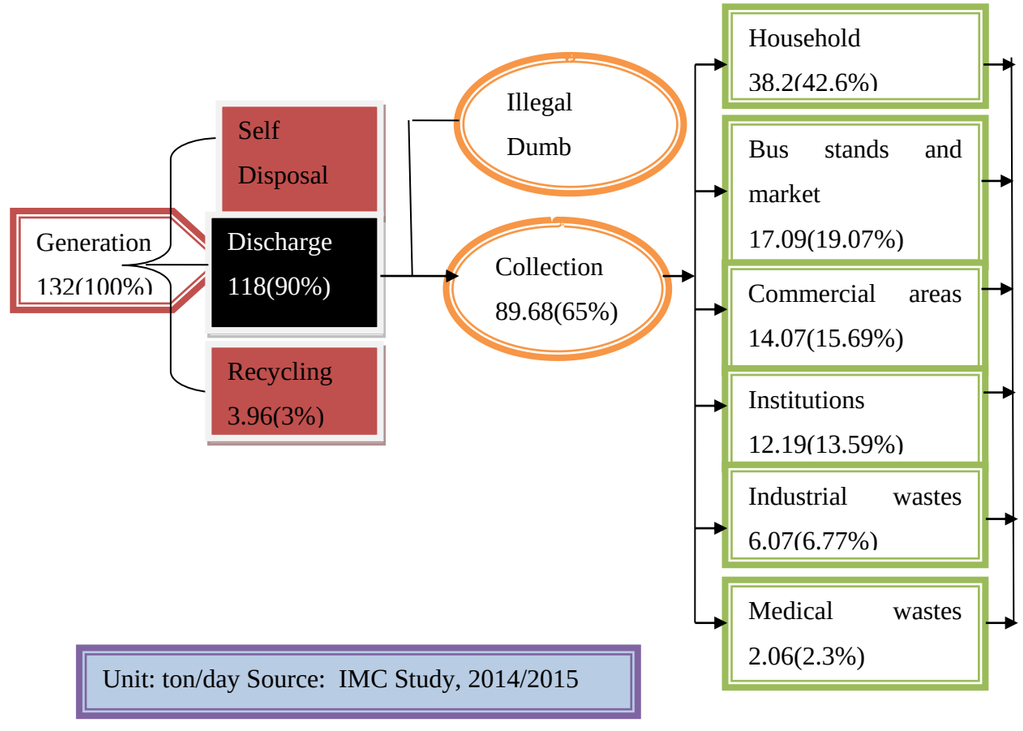
Categorization of solid waste according to their sources enables the Municipal Waste Manager to plan for the type of vehicles required for transportation and the routes for waste transportation. In Iringa Municipality Solid waste are categorized according to their sources as shown in the table 6.15.

Table 6.16: Waste categories

S/N	Solid Waste sources	Tons/day
1	Household level	56
2	Stand and market	24
3	Commercial areas	21
4	Institutions	16
5	Industrial wastes	10
6	Medical wastes	5
	Total	132

Source; Municipal Environmental office, September 2014

Figure 6.2: Solid waste flow

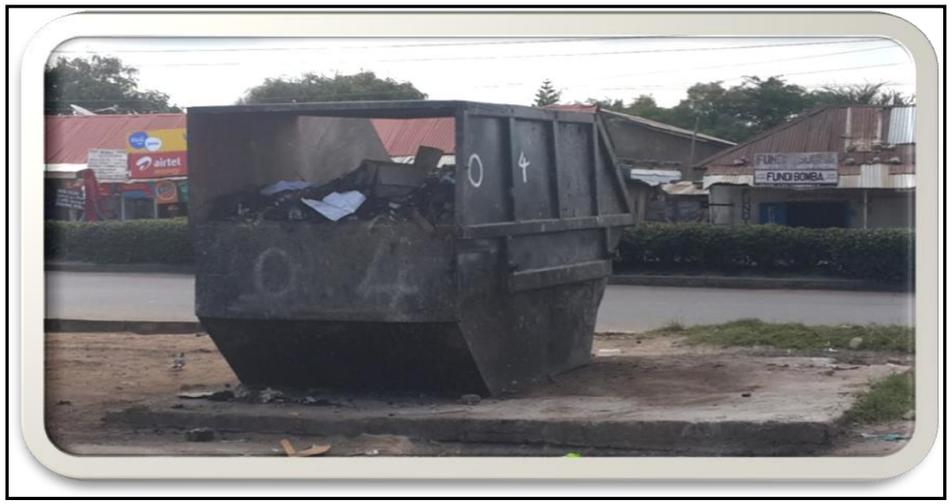


Iringa Municipality has adopted three methods of waste collection; the first method is that the community through small containers namely plastic bag use for use for storage and carriage of waste to waste collection point. The second method is that Community Based Organizations (CBOs) passes house to house to pick out wastes being stationed in front of their house and put into wheel barrow then transfer to collection point. The third is that municipal truck, normally compactor truck pusses house to house to collect waste. In areas such as Kitanzini ward, Makorongoni, Ilala, Gangilonga, Igumbilo and Mivinjeni wards the CBOs are actively performing well. CBOs benefits through revenue collection from the service rendered. The waste collection fee differs from one premise to another based on the type of business and the amount of waste an individual generates. Industries and institutions such as colleges, universities, banks, NGOs offices and Regional Referral Hospital are served with municipal trucks that collect wastes at regular intervals of time.

Solid wastes are collected in 108 waste collection points allocated within the central populated parts, industrial area and peri- urban areas out of this total, 78 are legal collection points and 30 illegal. Again out of 78 collection points, 68 have skip buckers for solid waste storage.

At community level transportation of waste is done by using wheel barrow and carts where households put waste in front their houses. Solid waste in each collection point is removed within 1-7 days depending to the waste generated of that area. Container haulage system is the method which has been adopted. Currently Iringa Municipal Council has 2 Skip Masters for transferring waste to Kihesa kilolo dumping site. In other areas such as Ilala, Mkwawa, Mwangata – Donbosco and Mawelewele, house to house solid waste collection is conducted by using compacter truck in specified days. Other area there are refuse bays where by solid wastes are loaded by causal labourers then transported to Kihesa Kilolo dump site.

Plate 6.1: Skip bucket located at Mshindo ward



Source: Field observation September, 2014

Plate 6.2: Vehicle used to carry skip bucket

Source: Field observations, September, 2014

Solid waste generation depends on population size and economic development. In projecting future generation of waste only population growth was considered.

Table 6.17: Projection of solid waste

Year	Projected population	Projected solid waste generation (Tons/day)	Number of skips required to be transported to landfill per day	Number of vehicles required (Skip master)
2015	158,155	137.5949	20	3
2020	169,506	147.4702	21	4
2025	180,858	157.3465	23	4
2030	192,208	167.221	24	4
2035	291185	253.331	36	6

Apart from population factor other key assumptions for projected waste generation capacity included; that wastes will be collected at designated points (Underground/ skips), medical and other hazardous wastes will be incinerated, transportation Methods/ system will be by Haulage container system or by open tippers. This will depend on the type of waste generated or areas where wastes are collected. The collection frequencies will be supplemented with one compactor truck that will pass through institutions and industries for the years 2015-2030 and doubled for year 2035. the estimation has been calculated using a formula;

$W_n = P_n * 0.00087$ Tons/day

Where;

W_n = Amount of waste generated per day (tons/day)

P_n =Population at year n of specific area

0.00087 Tons/day is a factor

Table 6.18: Refuse bays

S/N	Location	Number
1	Mwangata	4
2	Kihesa	2
3	Mkwawa	2
	Total	8

Source: Municipal Environmental office, September 2014

Table 6.19: Existing solid waste management equipment assessment

S/N	Equipment	Required	available	working	Shortage
1	Skip buckets	192	104	68	124
2	Skip Master	4	2	1	3
3	Wheel barrows	80	24	16	64
4	Dust bins	460	60	60	400
5	Refuse weighing scale	1	0	0	1
6	Refuse bays	16	8	4	12
7	Wheel loader	1	1	1	1

Source: Municipal Environmental office, September 2014

Table 6.20: Existing waste collection points per ward

S/N	Ward	Served Point
1	Kwakilosa	9
2	Kitanzini	9
3	Gangilonga	9
4	Mkwawa	4
5	Mtwivila	4
6	Kihesa	11
7	Mivinjeni	4
8	Mshindo	3
9	Ruaha	5
10	Makorongoni	5
11	Ilala	2
12	Mwangata	5
13	Mlandege	3
14	Kitwiru	4
15	Isakalilo	3
16	Nduli	1
17	Mtwivila	3
18	Igumbilo	2
	Total	86

Source: Municipal Environmental office, September 2014

Incineration is one of the methods for waste management (general and medical waste) in area where land is limited. This method when performs well can kill all infectious organism and reduces the amount of waste that may be transported to landfill. Iringa Municipality health facilities that generate five (5) metric tons per day of healthcare wastes as a result of activities related to the practice of medicine and sales of pharmaceuticals. At health facilities medical wastes are separated in accordance with the type namely infectious waste, sharps general wastes. General wastes that are stored in black/yellow lining

material/containers are transported using wheel barrow to skips where other non-infectious wastes are stored and infectious waste are treated with an incinerator. Ashes produced after incineration is transported to skips. On the other hands placentas are transferred to placenta pit immediately after being produced. These health-care wastes coming from any particular hospital or institution are similar in nature to domestic solid wastes, and may be called “general health-care wastes”. These are infectious due to then physical, chemical or biological nature, and so are known as “hazardous healthcare wastes” they need much care on handling.

In many cases the most dangerous items in health care wastes are needles from syringes and drips, anatomical wastes (teeth and placenta), pathological waste (sputum and test tube containers), because they shield viruses from chemical disinfectants and a harsh external environment. The infected item allows easy access for the viruses into the blood stream of anyone who is handling the infected items without. Most of the health care wastes are taken care in the specific health facilities through construction of incinerators and the waste generated are segregated at the source. All private dispensaries and health centers in Iringa municipality lack incinerators due to limited space for construction. These wastes are transported to government facilities where they are incinerated. Despite of the presences of these incinerators at government health facilities they have poor efficiencies due to poor design and construction causing air pollution.

Plate 6.3: Incinerator at Ipogolo health centre

Source: Field Observation September, 2014

The Council has one waste damping site located at Kihesa –Kilolo about 7 kilometres from the town center. The area of the dump site is 15 acres projected to last for 50 years from 2000. The waste collected from all waste collection points are disposed of in a controlled manner. Solid waste after being offloaded at a dumping site it takes three to four weeks to be pushed into a trench for the compaction. After compaction the waste are covered by top soil and re-compacted.

Plate 6.4: Wheel loader at Kihesa Kilolo dumping site

Source: Field Observation September, 2014

Separation of solid waste materials at household level, waste collection points, and at final dumping site is not common practice in Iringa. Scavengers pick metals and bottle for sale. Organic wastes in peri-urban wards of Nduli, Mtwivila, Mkwawa, Isakalilo, Kitwiru and Ruaha are stored in pits decomposed and used in farms as fertilizer. Carpentry wastes are used for animal nurseries in poultry production and cattle keeping.

Since solid waste management involves several stage such as Waste generation, separation, storage, transportation, intermediate treatment and disposal. During planning the following factors need to be considered for solid waste management; involvement of community in waste management planning, storage methods, road accessibility available, location of land fill site (distance and environmental factors), geological and hydrological setting, potential levels of air and ground water pollution and settlement characteristics especially for planned and unplanned areas.

6.5 PLANNING CRITERIA

It is recommended that that three levels of service be offered in Iringa Municipality, to residential, commercial and institutional by the municipal collection system; The first level is collection from small bins, various bags collected from household and moved to the collection points (Skip buckets); the second is community based organizations (CBOs) collecting wastes at house hold level and thirdly; collection from bulk bins located in the central and other environmental areas.

Table 6.21: Recommended level of service for solid waste collection.

Source of waste	Frequency collection/week	Pick- up location	Responsibility for collection	Remarks
Low Density Residential	1	Roadside/household	CBO	Solid waste producer to pay for service.
Medium Density Residential	1	Road side/household	CBO	Solid waste producer to pay for service.
High density Residential	1	Skip bucket	Individual	Solid waste producer to pay for service.
Squatter sites and service areas	1	Skip bucket	CBO	Solid waste producer to pay for service.
Commercial	daily	Skip bucket	CBO	Solid waste producer to pay for service.
Market	daily	Skip bucket	CBO	Solid waste producer to pay for service.
Institutional	1	Skip bucket	CBO	Solid waste producer to pay for service.
Industrial, construction, demolition and abattoir	As requested	Skip bucket	Municipal Council	Solid waste producer to pay for service.

Two types of collection vehicles are proposed for solid waste transportation to the landfills. One is compactor truck should continue collecting solid waste in CBD area. Two area 6 skip masters to collect refuse from 192 skip buckets located in strategic solid waste catchment areas along road sides at streets. These trucks will transfer solid waste directly to landfill or transfer stations.

Presently, the dump site at Kihesa Kilolo about is not in a good condition. Solid wastes are usually not compacted accordingly; as a result, they spill over, on and off the site. This has led to unsanitary and unpleasant conditions. Therefore, the site is no longer suitable and need to be closed immediately and the remaining refuse should be spread and compacted with adequate cover materials. It is, proposed to designate new sites for sanitary landfills. The proposed land requirement for solid waste disposal in this planning period is 30 hectares, to be distributed into three localities, with 10 hectares each in order to reduce operation cost in terms of transportation.

Site selection is a fundamental step in the development of a landfill. This step has far reaching economic, environmental and public acceptance implications. The landfill site selection process is only complete once the Municipal Council has found a site feasible on the basis of a feasibility study and environmental and social compliance. Everyone has the right to an environment that is not harmful to their health or well-being. The establishment and operation of waste disposal sites must, therefore, not violate the constitutional right of the communities living in the vicinity of the site.

The key aspects that ought to be considered in land fill site selection includes; ensure that the site to be developed is environmentally acceptable and that it provides for simple, cost-effective design which in turn provides for good operation; and ensure that, it is environmentally and socially acceptable, it is also socially acceptable.

Table 6.22: Proposed landfill sites (2020- 2035)

S/N	Location		Distance to the city centre. (km)	Coverage (ha)
	Street	**ward**		
1	Mkoga	Isakalilo	9	10
2	Nduli (Usambusa hill)	Nduli	22	10
3	Mosi	Kitwiru	25	10

The term ‘land filling’ refers to the disposition of waste on land, whether the filling in of excavations or the creation of a landfill above grade, whereby the term ‘fill’ is used in the engineering sense. Essentially, landfill is a method of solid waste disposal involving excavation of long trenches/area which is then filled with solid waste and covered with soil. Landfill construction involves several stages such as construction of landfill access roads, excavation of trenches or area, construction of cell, laying of lining materials, installation of leach ate control pipes, and installation of gases control pipes, construction of leach ate control ponds and landfill operation and maintenances. The waste is spread and compacted by using wheel loader usually into layers covered with soil then re-compacted (Figure 3-6).

Figure 6.3: Sanitary Landfill layout

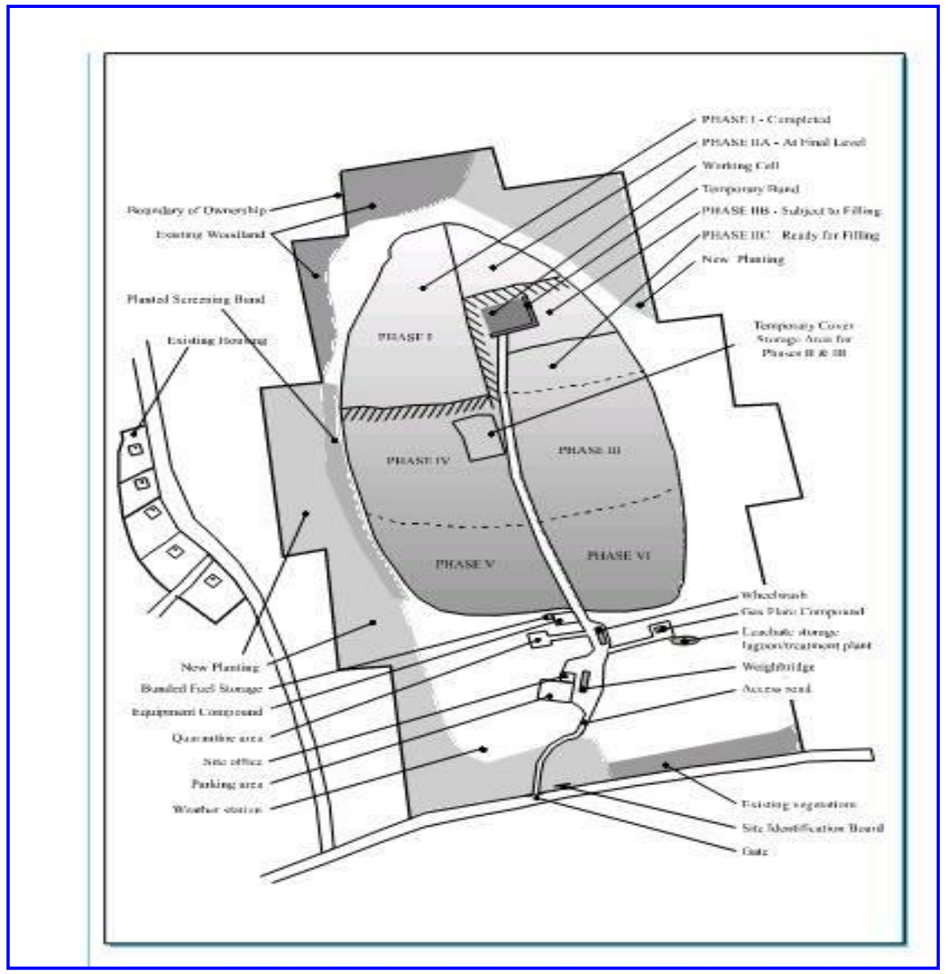


Figure 6.4: Stages of landfill operations

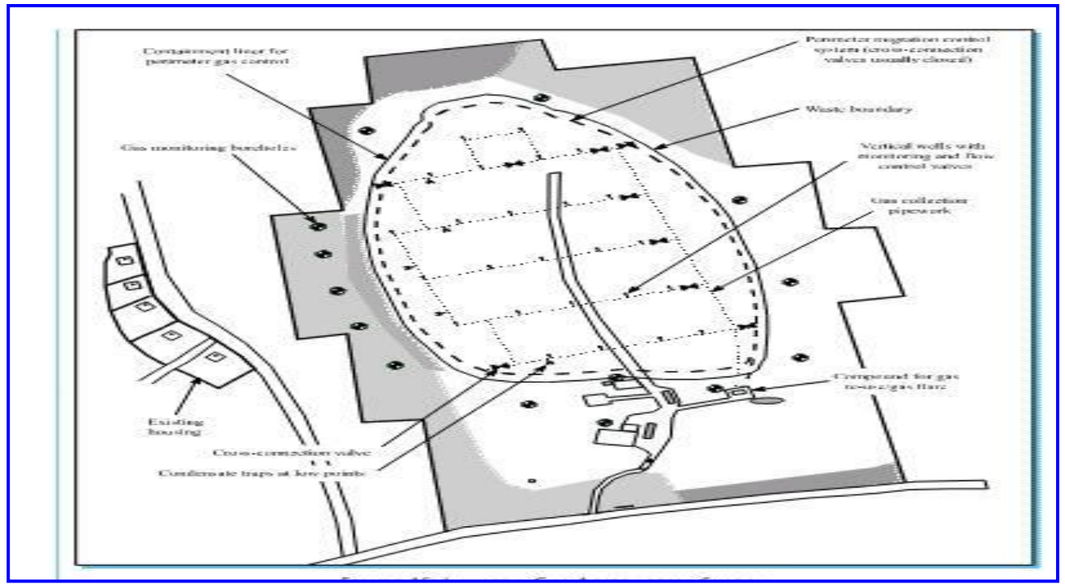
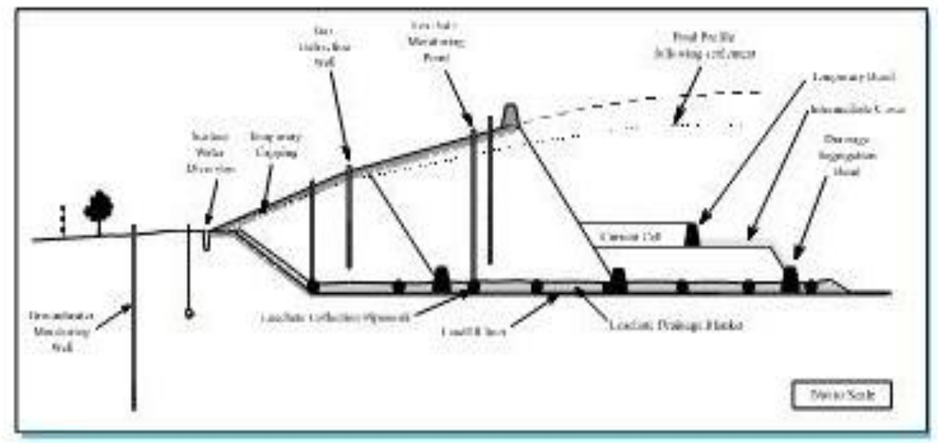


Figure 6.5: Cross sections for landfill



Experience show that in many Solid Waste Management projects there are some difficulties in reach consensus with neighboring people who lives closer to the project site either at collection point or damping site due to the following reasons:

i. Poor project planning

   Pollution of gas, leach ate, foul Odor, flies and other animal that scavenge on waste including human being; contribute towards degrading the locality of the neighborhood.

ii. Traffic congestion of heavy traffic and unsafe driving of waste trucks;

iii. Bad image by virtue of locating this facility to the neighboring areas.

The main steps in designing solid waste management should include planning, land acquisition, Environmental Impact Assessment, contract design and construction. At each of these stages community participation, detailed expertises are important and mandatory. When these procedures are carefully followed "the Not In My Back Yard" altitude (NIMBY) for these projects will be minimized.

Table 6.23: Proposed solid waste management improvement budget (2015- 2035)

SN	Project	Costs (Tsh)			
		Phase I	Phase II	Phase III	Phase IV
1	Procurement of skip master	250,000,000	250,000,000	250,000,000	250,000,000
2	Land acquisition	218,000,000	72,000,000	-	-
	Procurement of skip buckets	150, 000,000	300,000, 000		300,000,000
3	Access road construction to landfill	60,000,000	30,000,000	-	-
4	Fencing	95, 000,000	65,000,000	65,000,000	
5	Construction of office facilities	35,000,000	35,000,000	35,000,000	
6	EIA	40, 000,000	-	-	
7	Procurement and installation of weighing bridge	76,000,000	76,000,000	76,000,000	
8	Construction	600,000,000	600,000,000	600,000,000	
9	Operation and Maintenance/Monitor	240,000,000	240,000,000	240,000,000	240,000,000
10	Procurement of Wheel loader/CD4 Caterpillar	720,000,000		720,000,000	
Total	2,199,000,000	1,368,000,000	1,986,000,000	790,000,000	

6.6 STORM WATER DRAINAGE SYSTEM

Iringa Municipality rises from Ruaha River to the hilltops, and spreads along ridges and valleys to the North. It is situated on a plateau that ranges from 1,500 metres to 2,500 metres above sea level. The Municipality receives seasonal rainfalls ranging between 600mm to 700mm from October/December to April/May annually. Storm water runoff naturally flows from the hills towards river Ruaha via the existing streams and natural drains. It occasionally overflows during rainy seasons though the flash floods normally last for only a few hours.

These are structures constructed to accommodate storm water from rainfall and waste water produced in domestic and car wash areas. These structures comprise the open channels covered channels around the CBD and road crossing culvert. These drains are constructed from stone masonry and a few of them are constructed from mass concrete. In total, storm water drains cover about 218 kilometres in planned storm water drain exists mostly along roads in the central town areas. In peri- urban areas, water finds its way to the natural water courses through natural rills.

The storm water drainage available in the Iringa Municipality is of different types. These include; trapezoidal drains, these are constructed mainly along the TANZAM highway and the Iringa access road. V-shaped drains, these are mainly constructed at road intersection to facilitate ease flow of storm water. U-shaped drains mainly constructed along the streets. They are constructed from stone masonry and many of them are not in good condition. The existing storm water drainage systems can also be categorized into one of the two categories as described as bellow;

The storm water drains along TANZAM highway and Great North Road (GNR) are relatively in good condition, whereas the remaining storm water in other roads needs rehabilitation. These include storm water drainage along Kihesa - Mtwivila road, Mwang'ingo, Ngome Primary school road, Mwang'ingo - Mkimbizi road, and Kihesa Sokoni – Tumaini Road.

In this Master plan, storm water drainage works should consist of upgrading existing systems, constructions of major water courses and upgrading of secondary water courses in existing and proposed development areas. Planned storm water drain is recommended begin along the roads in urbanized areas.

Urban drainage should consist of piped systems and concrete or masonry lined channels either open or covered with continuous grating. Such systems should be installed in all major commercial centre and high density population areas where space for ditches system is limited. To facilitate efficient maintenance, open channels covered with removable grates are recommended. However, when drain depths exceed one metre, buried pipes with gulley should be installed. Ditch drainage should consist of masonry or concrete lined ditches. This is recommended for all development where space is not limited and lots have sufficient frontage to ensure adequate space access points.

Although it is recognized that formal drainage facilities are highly desirable for any urban development, certain areas within the Municipality function satisfactorily with no apparent planned drainage scheme. It is proposed that this level of service be maintained provided the following conditions are met; lots are large enough (>800m^2) and have extensive vegetable cover; soil permeability is good (>0.25m/hr); lots are graded to direct runoff to open lands and thus avoid inundation of adjacent roads and soil can quickly absorb additional runoff from adjacent roads. If these conditions can be achieved then ponding on, and runoff from the lots should be minimum.

Two levels of protections are recommended to govern storm drainage design as follows. First is convenience level which is minimum level of protection provided through several services. The drainage systems will be designed to provide a conveyance system for storm water for storms that can be expected on a fairly regular basis.

Second is overflow level. While it is recognized that excessive rainfall will occur very infrequently, it is not economical to design the system with adequate capacity for these unusually large flows. Thus, the system will occasionally overflow and it is necessary to ensure that the excess runoff is directed in a safe manner to watercourses. This excessive runoff can be directed by careful open area grading and road alignment.

One of the key design parameters of storm water drainage system is the rational method. The components of the rational method are derived from specific conditions relating to land use (runoff co-efficient) and the distance and time over which the runoff has to travel (time of concentration). The following runoff coefficients are recommended for existing and proposed development in the Municipality:

Residential (≤ 400m^2 Lots) 0.60

Residential (> 400m^2 Lots) 0.50

Commercial	0.75
Industrial	0.75
Open space	0.20

Another parameter is time of concentration. For developed land an inlet time of 15 minutes should be used, while the travel time is determined by the system hydraulic. For open space *the Kirpich Overland Flow* method should be used for the time of concentration where;

$$t_c = \frac{5.2L^{0.77}\ 10^{-4}}{S^{0.385}}$$

Where;

t_c = time of concentration (hr)

L = length of watercourse (m)

S = slope of watercourse (m/m)

As most of the cost for storm drainage works will be included in the roadwork project budget; the capital expenditure identified in this section are limited to those required to resolve existing problem areas and the upgrading of secondary watercourses in a new development areas.

The total capital costs to the end of planning period (2015) are given in the Table 6.23. The distributions of these costs cover a 20 year period from 2015 to 2035.

Table 6.24: Total cost of the planning

S/N	Description of cost	Total length (Km)	Rate per Km	Total cost Tsh
1	Resolve existing problem	40	20,000,000.00	800,000,000.00
2	Upgrade secondary watercourse	60	30,000,000.00	1,200,000,000.00
	TOTAL	100		2,000,000,000.00

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