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Murang'a County Spatial Plan 2015 -2030

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Murang'a County Spatial Plan

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In collaboration with:

Maps in this report were prepared with the necessary care to convey the message and detail required. However, the environment is complicated and difficult to show on maps. All the maps in this report are available in a separate Map Book showing all maps in the report similarly numbered in A3 format.

Note on photographs:
All photo used in this report were taken by members of the project team unless otherwise credited.

The Nairobi Municipal Services Improvement Programme (NamSIP)

This project forms part of the Nairobi Municipal Services Improvement Programme (NamSIP) which is a World Bank funded project. Within the framework of the agreement between the World Bank and the Government of Kenya, this project is the result of a procurement by the then Ministry of Land, Housing and Urban Development for "Consulting Services for Preparation of Integrated Strategic Development Plan for Muranga and Kiambu Counties within the Nairobi Metropolitan Region" issued on 24 June 2014. This resulted in an agreement between the then Ministry of Land, Housing and Urban Development (MoLH&UD) Nairobi Metropolitan Development (NMED) with the service providers being ALPEX Consulting Africa Ltd (ACAL) and BC Gildenhuys and Associates CC (South Africa).

According to the World Bank's Project Information Document (PID) Report No.: AB3796, dated October 2011, the Government of Kenya has invited the World Bank to assist with the implementation of the Nairobi Metropolitan Services Project (NaMSIP) as a response to development challenges facing the Nairobi Metropolitan Area through:

- Institutional reform and planning,
- Capacity building and infrastructure investment financing for local authorities, and
- Helping finance critical solid waste, urban transport and sewerage infrastructure at the metropolitan level.

NaMSIP was conceptualised against the background of the implementation of Kenya's new Constitution, which emphasises devolved local government. Many of the uncertainties that existed at the time has been resolved although development is still largely characterised by a very fluid and evolving institutional framework, not necessarily in legislative terms, but rather regarding stabilising institutional and resource allocation processes.

The Project Development Objective

The Project Development Objective (PDO) with NaMSIP is therefore to strengthen urban services and infrastructure in the Nairobi metropolitan region. According to the World Bank, this will be achieved by investing in local infrastructure (roads, markets, street lighting, bicycle and pedestrian pathways, drainage, among others). Equally important is supporting improvements in integrated solid waste management and sewerage collection and disposal. Finally, the project must improve service delivery by strengthening the current and future entities responsible for the provision of services, including the ministry, current local authorities and new county governments, utilities and other service providers, and possible future metropolitan authorities responsible for planning, transport, and other services.

Project beneficiaries

The primary beneficiaries of NaMSIP will be the residents of the Nairobi metropolitan region. They will benefit from better planning and a reduction in the chaotic, unplanned development that has plagued the greater metropolitan area. In particular, they will take advantage of the project's support for planning and public infrastructure in the areas surrounding the commuter rail stations. They will also benefit from increased access to urban infrastructure and services under the project, such as access roads, street, and security lighting, sanitation services, and solid waste collection and disposal.

Project components

The project comprises four elements. These are:

- Institutional reform and planning,

- Local government infrastructure and services,
- Metropolitan infrastructure and services, and
- Project management, and monitoring and evaluation.

Acronyms

CBD	Central Business District
EAPC	East Africa Portland Cement
EMCA	Environment Management and Coordination Act
EPZ	Export Processing Zone
GoK	Government of Kenya
ISUP	Integrated Strategic Urban Plan
ISCDP	Integrated Strategic County Development Plan
KeNHA	Kenya National Highway Authority
KeRRA	Kenya Rural Roads Authority
KFS	Kenya Forest Service
KURA	Kenya Urban Roads Authority
KWS	Kenya Wildlife Service
MDGs	Millennium Development Goals
MoTIH&UD	Ministry of Transport, Infrastructure, Housing and Urban Development
NMED	Nairobi Metropolitan Development
NaMSIP	Nairobi Metropolitan Services Improvement Project
NEMA	National Environment Management Authority
NGOs	Non-Governmental Organizations
NMR	Nairobi Metropolitan Region
NMT	Non-Motorized Transport
PDO	Project Development Objective
SEA	Strategic Environmental Assessment
SWMA	Solid Waste Management Authority
WHO	World Health Organisation
WRMA	Water Resources Management Authority
WSPs	Water Services Providers

Glossary of terms

Corridors: A corridor is a linear strip of land or area, connecting large activity nodes, traversing urban or inter-urban areas, surrounding a major transport facility or facilities providing an appropriate regional level of mobility and accessibility to adjacent areas. It constitutes a high concentration of population and mixed land uses" and "… accommodate major linear transport routes like heavy and light rail and/or freeways, large shopping concentrations etc., social, cultural and sporting facilities as well as a significant amount of residential accommodation".

Density: The number of units per unit of land area, e.g. dwelling units/ hectare. There are five measures of density:

- Population density: people / hectare.
- *Gross dwelling unit density:* dwelling units / total land area of a project or suburb including roads, public open space, and non-residential land uses.
- *Net dwelling unit density:* dwelling units/land occupied by residential plots only.
- *Building density:* area of buildings/hectare.
- *Settlement density*: (dwelling units / total land occupied by settlement) also known as average gross dwelling unit density.

Densification: Densification is the increased use of space both horizontally and vertically within existing areas/ properties and new developments, accompanied by an increased number of units and/or population threshold.

Efficiency: Development that maximises development goals such as sustainability, integration, accessibility, affordability, and quality of living, relative to financial, environmental, and social costs, including on-going and future costs.

Infill Development: Development of vacant or underutilised land within existing settlements to optimise the use of infrastructure, increase urban densities and promote integration.

Kernel density calculates the density of features in a neighbourhood around those features. The result is a smooth surface indicating the intensity of an attribute (buildings, schools, settlement, social facilities, etc.) over the study area.

Land Use Management: Establishing or implementing any measure to regulate the use or a change in the form or function of land and includes land development.

Land Use Management System: A system used to regulate land use, including a town planning or zoning scheme, or policies related to how land is used on a plot-by-plot basis.

Nodes: Nodes are focused areas where a higher intensity of land uses, and activities are supported and promoted. Typically, any given area would accommodate a hierarchy of nodes that indicates the relative intensity of development anticipated for the various nodes, their varying sizes, and their dominant nature.

Spatial Planning: Planning of the way in which different activities, land uses, and buildings are located in relation to each other, regarding the distance between them, proximity to each other and the way in which spatial considerations influence and are influenced by economic, social, political, infrastructural and environmental considerations.

Spatial Development Framework: A Spatial Development Framework (SDF) is a core instrument in spatially expressing the economic, sectoral, social, institutional, environmental vision. In other words, it is a tool for moving towards a desired spatial form for the planning area.

Sector Plans: This refers to plans for different functions such as biodiversity conservation, housing, transport, local economic development and disaster management. They may also be geographically based, for example, a sub-region, settlement within an area or a component of that settlement.

Stakeholders: Agencies, organisations, groups or individuals who have a direct or indirect interest in a development intervention or its evaluation.

Urban –rural transect (continuum): A cut or a path, a gradient or a geographical cross section of a region that can be used to reveal a sequence of environments

Urban Edge: The urban edge describes an indicative boundary within the planning area with the sole purpose of containing physical development and sprawl and re-directing growth towards a more integrated, compact and efficient urban form.

Zoning Scheme: A legal instrument for regulating the use of land regarding county or national legislation (see Land Use Management System.)

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Section 1. The project context

1 Introduction

The Nairobi Metropolitan Service Improvement Project (NaMSIP) is an initiative of the Kenya Government with the support of the World Bank under the Country Partnership Strategy (CPS). The CPS emphasizes the themes of growth, equity, and environment, with a particular emphasis on governance. NaMSIP contributes to the governance, growth, and improved environmental management agendas. It seeks to strengthen structures of governance in the metro area, including the county administration and the new metropolitan authorities. The project is being implemented by the Ministry of Transport, Infrastructure, Housing and Urban Development – Directorate of Nairobi Metropolitan Development.

NaMSIP is intended to improve services in the metropolitan area that are critical for economic development, which include solid waste management, transport systems, storm water management, water supply and sanitation, disaster management, security/street lighting, etc. Additionally, the implementation of the project will give the Ministry an opportunity to build its human resource and technical capacity in carrying out metropolitan-wide activities.

The NaMSIP corresponds with the Government's national development priorities and policies as well as ongoing public-sector reform agenda. The project also supports the strengthening of public sector management and accountability.

The project comprises four main elements:

- Institutional reform and planning
- Local government infrastructure and services
- Metropolitan infrastructure and services
- Project management, and monitoring and evaluation

One of the major problems and challenges facing Kenya is the rapid population growth, against a skewed rural-urban development, favouring urban areas. Urban centres are experiencing rapid growth and development that is unplanned, uncoordinated, and uncontrolled.

County urban centres are experiencing several development challenges, among them;

- inadequate housing,
- mushrooming of informal settlements,
- unemployment, environmental degradation,
- Inadequate infrastructure services, and facilities,
- An escalation in crime and social distress.

Other problems facing these towns include excessive and uncoordinated piecemeal subdivisions of privately owned land without approved planning schemes and uncontrolled developments without requisite expansion of utilities and services.

In light of the above, there is an urgent need to look at urban/county development from a perspective that integrates physical, economic, social, cultural, and environmental as well as institutional aspects in urban/county planning. There is a need to align urban development planning with the on-going socio-economic and political reform and transformation in the country. This process requires a significant shift in planning – "strategic planning approach" which is more flexible and development oriented tool that is desirable to catalyse the government's economic recovery strategy for wealth and employment creation (2003-2007).

The aim is to identify priority programmes that can transform counties and urban centres into vibrant well-planned satellite towns of Nairobi that tap into the advantages of their proximity to the capital city. These benefits should show in the quality of the living and work environment, generation of employment opportunities for the residents, enhanced revenue to the County Governments. The project should also provide for the full exploitation of possibilities for expansion of industrial development and rural-urban linkages. The project will incorporate innovative planning concepts that will give the county unique form and character.

The following challenges presented themselves during the design stage of the project. These issues are general issues and do not necessarily manifest equally strong in all planning areas. The project address to the extent that they are relevant in the local planning area.

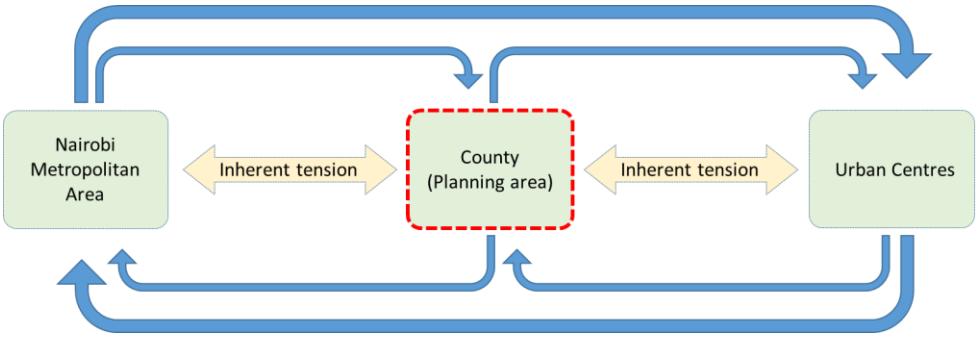
- Land related issues.
- Unplanned and uncoordinated urban/county growth.
- Inadequate serviced land to accommodate urban growth.
- Uncontrolled land subdivisions.
- Misallocation of public land.
- Urban sprawl.
- Infrastructure and service delivery.
- Inadequate infrastructure services and facilities (i.e. narrow roads, sewer, and water supply, waste disposal, drainage, etc.)
- Inadequate community services.
- Poor quality housing.
- Issues related to socio-economic growth and development.
- Unemployment and declining employment opportunities.
- High crime levels.
- Environmental degradation.
- High incidences of poverty.
- Declining agricultural productivity (Subsistence and commercial).
- HIV/AIDs and health issues.
- Institutional and governance.
- Lack of updated development plans that could form the basis for planning decisions.
- Poor coordination among relevant government authorities and NGO's.
- Ineffective participation in planning and development by local communities and the private sector.

2 Purpose of the project

The goal of this project is to develop a Spatial Plan for Murang'a County. The plan addresses the use of land, protection, and use of the environment, public welfare, and the design of the urban environment. The aim is to provide the County government with guidelines to ensure the optimal development of the county and its urban area.

Within the context of NamSIP, the focus is not solely on Murang'a but very importantly on how Murang'a interacts with its broader environment. In the end, the way in which Murang'a responds through its links to the development and growth of Nairobi and also how development in the area impacts on the development in the larger metropolitan area. The purpose of the project is therefore not only local planning and development guidance but also on regional integration and development connectivity to the benefit of Murang'a and the Nairobi metropolitan area.

Figure 1: Planning relationships of the planning area



One should note that the project custodian (MoTIH&UD) and the County Governments operate with different planning mandates which lead to a natural tension regarding demands for the planning outcomes MoTIH&UD has a strategic focus on positioning Nairobi metropolitan area nationally and internationally through NaMSIP which the Counties faces the day to day pressures of local development challenges. In developing the project outcomes, it is important to find the natural balance between strategic objectives Ministry and operational demands of the County Government.

3 Project fit

The project is developed and managed under the auspices of the Nairobi Metropolitan Service Improvement Project (NaMSIP) and focus on planning in Kiambu and Murang'a. The project will constitute sub-elements to meet the unique demands of Kiambu and Murang'a respectively. However, the projects are managed as a single process through NaMSIP.

There are two Project Groups dealing with integrated strategic urban plans under NamSIP. The first is the preparation of Integrated Strategic Urban Development Plans for 12 Towns in 4 Clusters within the Nairobi Metropolitan Region. The towns are in the following cluster groupings:

Table 1: Cluster Grouping for ISUPs (Project Group 1)

Cluster 1	Cluster 2	Cluster 3	Cluster 4
Ruiru Thika Transport Corridor Juja	Karuri Kikuyu Limuru	Kitengela Ngong-Rongai	Mavoko Nairobi-Malili Transport Corridor Tala Kandondo

The second IUSP grouping is the subject of this project that comprises 11 ISUP's in Kiambu and Murang'a as well as a county spatial plan for Murang'a County.

Table 2: Project Grouping 2 for ISUP's

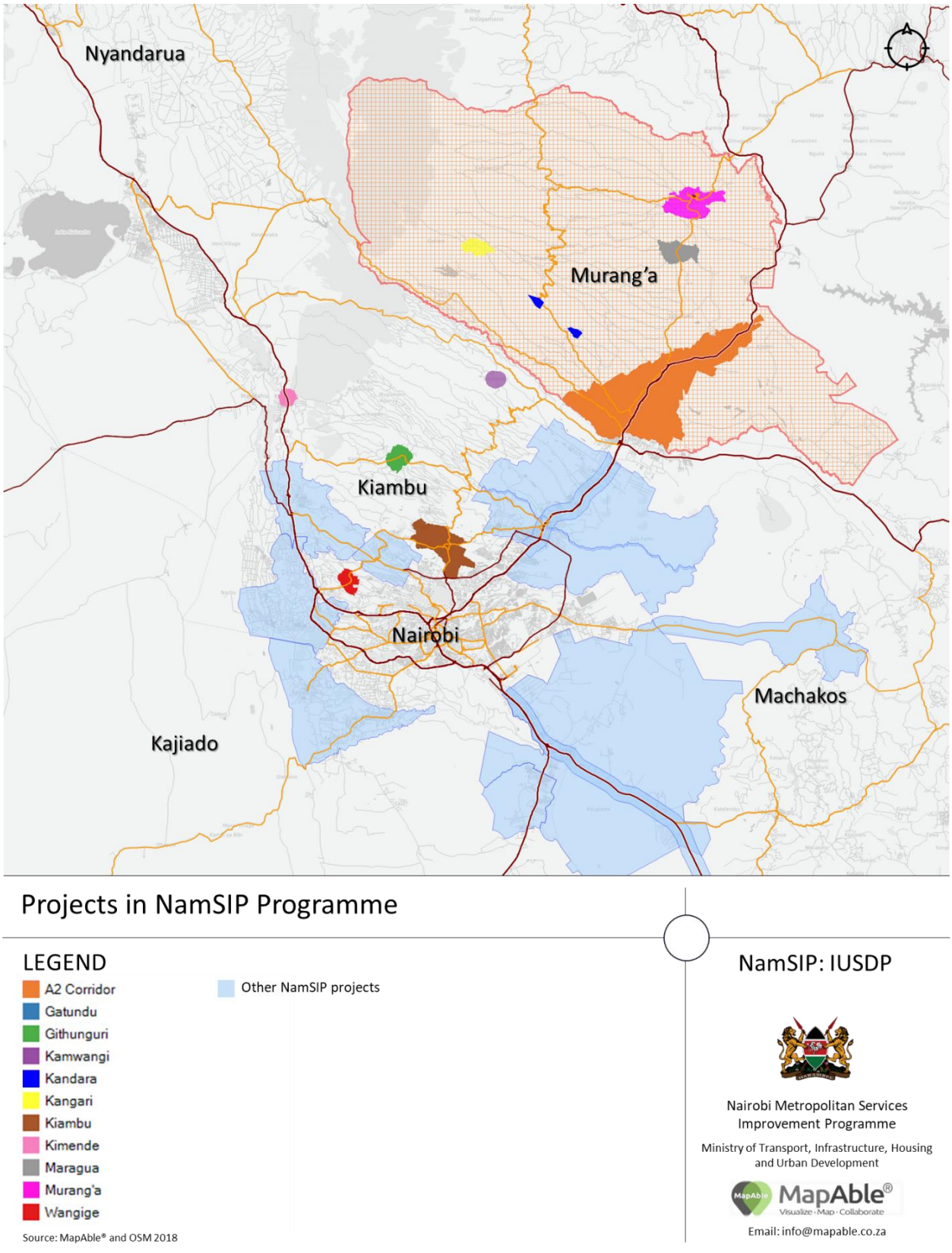
Kiambu County	Murang'a County
Kiambu	Murang'a County Spatial Plan
Wangige	A2 Corridor plan
Kimende	Maragua
Kamwangi	Murang'a
Githunguri	Kandara
Gatundu	Kangari

This project underscores the importance of grounding higher level plans and strategies at the lower levels. The Spatial Planning Concept: Nairobi Metropolitan Region (SPC) embeds the project. The SPC was prepared in close consultation with the Director of Physical Planning, who is mandated by the Physical

Planning Act Cap 286 to among other functions; formulate national, regional and local physical development policies, guidelines and strategies.

The development of the Spatial Planning Concept (SPC) for the Nairobi Metropolitan Region (NMR) is an articulation of Vision 2030 document which is the Country's response to critical development issues such as poverty alleviation, wealth creation, economic growth and employment. It envisages a sustained economic growth of 10%, and high quality of life for Citizens and Visitors of Kenya. It also proposes several flagship projects that are expected to spur development across the country.

Map 1: The extent of ISUP's in NaMSIP



The Nairobi Metro2030 Strategy prepared in 2008 by the Ministry aims at optimizing the role of the NMR in the national development effort in line with its vision of making the Nairobi Metropolitan Region 'A World Class African Metropolis'. The Key Results Areas (KRA's) are;

- Building an internationally competitive and inclusive economy.
- Deploying world class infrastructure and utilities.
- Optimizing mobility and accessibility through effective transportation.
- Enhancing the quality of life.
- Creating better places to live, work and visit.
- Delivering a unique image and identity through effective place branding and ensuring a safe and secure region to support the endeavours of residents, investors and visitors.

Various factors such as strategic location, physical features, urban-rural interface, settlement structure, land tenure system, transport structure, historical perspective and land use structure influence the spatial structure of Nairobi Metropolitan Region. The planning and development approach emphasizes the interrelation and integration of different aspects and actions to prepare an appropriate conceptual spatial plan based on space as a field of activity, space structured for sustainable coexistence and the best Spatial Planning Concept for Nairobi Metropolitan Region quality suitable for different activities within the NMR area.

The spatial planning concept (SPC) provides:

- A conceptual framework for the preparation of detailed local development plans.
- Planning guidelines for preparation of action plans in NMR
- Basis for plan development and implementation
- Policy direction in urban growth and development

The SPC aims at bringing about a desired future within the region by providing a policy framework and shared vision, aspirations and expectations for the future to guide balanced metropolitan development and physical organization of space according to an integrated plan as provided for in the various proposals made in the document.

The SPC, took into account local conditions, the location of different functions, facilities, and amenities of the NMR. Regional and global competitiveness, environmental implications of development. Liveability and identity of the Region were also considered. This plan lays the basis for sustained long-term development.

In relation to this project, the SPC document makes reference to issues at a macro level. However, it requires that other local level plans shall be prepared to step down the proposals for the detailed implementation of the plan. During the preparation of the local level plans, stakeholders at that level shall be brought on board to facilitate the process. It is within this framework that this project will be implemented.

It is important to note that since the completion of the SPC, a reconfiguration of county boundaries took place and that Murang'a was formally included in the metropolitan area. This inclusion has significant implications for this project. Where the project elements in Kiambu will mainly aim at extending the processes of the SPC, the Murang'a spatial plan will become the vehicle of incorporating and integrated long-term development in Murang'a into the metropolitan area and structures.

4 Methodology and approach

The general approach focuses on methods and strategies used to influence the distribution of people and activities in spaces of various scales. In this process, the coordination of practices and policies affecting spatial organization are central to the outcomes of the project. The aim is to geographically express the economic, social, cultural, and ecological policies of society. To achieve this overall objective, the planning

or the County is addressed in terms of a single spatial urban-rural continuum (the urban-rural transect) and, within this continuum, to address development as a system of interrelated components. These relationships are rooted in the movement and interactions of people, goods, and services and the manner in which they spatially manifest in the development environment.

4.1 The Urban-Rural Typology Continuum

In the past, urban and rural areas were treated as mutually exclusive environments. However, in reality, this is not the case. The development of urban and rural areas can only be explained when they are viewed as an interconnected and interdependent network of systems. One way of viewing this network or system is to see it as a continuum or transect of various typologies between which various goods, services, and people flow.

Conceptually, and for the purposes of the plan, the planning environment is a dealt with as a continuum or a transect. A transect can be defined as a cut or a path, a gradient or a geographical cross section of a region that can be used to reveal a sequence of environments. Transects are used as an analytical tool to assess the variations within a region. This concept, however, has been adapted into urban and regional planning as a way to organise and regulate the built environment and its surrounding hinterland[1]. The planning transect, in essence, seeks to take what is and rearrange it to what should or could be.

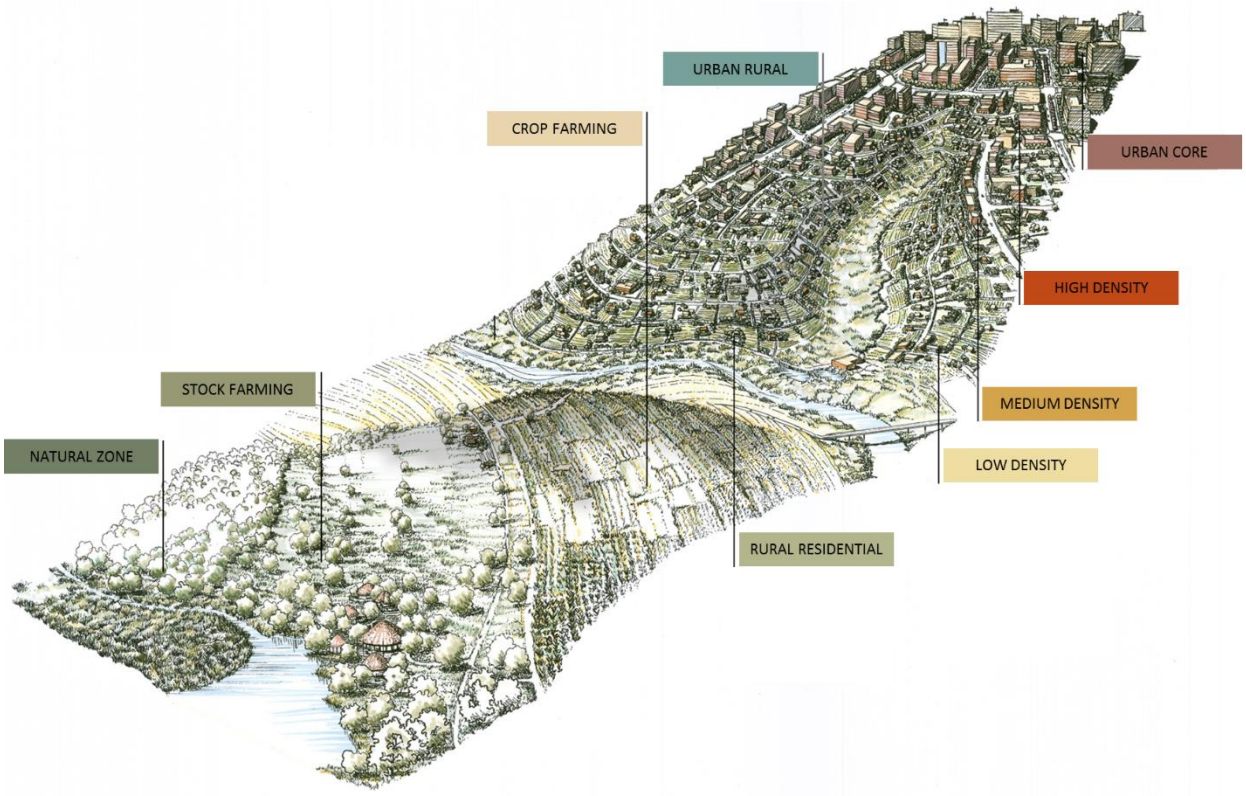
The rural-to-urban planning transect is a conceptual model first proposed by New Urbanist Andrés Duany and DPZ.[2] The transect model defines a continuum from a sparsely populated natural or rural area through to a high-density urban core. While the transect can be thought of as a continuum, it is made up of a series of zones, each of which has their particular characteristics. These features tend to depict the changing ratio of natural to human-made elements and are reflected in the changing density and complexity of the urban environment[3]. For example, natural materials are most evident in rural areas, but human-made elements dominate high-density urban areas. The transect to be used in this project is made up of nine zones. These zones being: Natural Zone, Stock Farming, Crop Farming, Rural Residential, Urban Rural, Low-Density Settlements, Medium Density Settlements, High-Density Settlements and the Urban Core. Each of these zones forms part of an interconnected and interdependent and complex network of settlements and surfaces.

[1] Talen, E. 2002. Help for Urban Planning: The Transect Strategy, Journal of Urban Design, 7:3, 293-312

[2] Duany, A. and Talen, E. 2002. Transect Planning, Journal of the American Planning Association, 68:3, 245-266

[3] Brower, S. 2002. The Sectors of the Transect, Journal of Urban Design, 7:3, 313-320

Figure 2: The Urban-Rural Typology Continuum[4]



Among the fundamental principles of transect-based planning is that certain elements belong in certain environments[5]. For example, some types of roads, land-uses or services belong in an urban environment while others are more suited to a rural area. While the transect may describe how an area should develop based on its current characteristics within a particular zone it, however, does not mean that a settlement will remain 'stuck' within that zone. Rather, as settlements develop they tend to become more complicated (with associated increases in intensity, density, and diversity) and at some point, they may reach a particular threshold or tipping point where they may transition into a different zone, with its characteristics and challenges.

4.2 Systems in development[6]

The essence of development in this system is the movement of people, goods, and services that produce the necessary impetus for developing functional relationships between otherwise independent and unrelated elements. The movement of people, goods, and services are channelled along specific routes that describe a ***network of interaction***. Where networks intersect the opportunity for people, goods and services develop to interact, and this gives rise to ***activity nodes***. The intensity of interaction (a function of accessibility) gives rise to the development of a ***hierarchy of nodes*** of different sizes depending on the level of interaction taking place in a node. This one-dimensional system of networks and nodes are tied together through ***surfaces*** that fill the areas between the nodes and networks. Systems analysis is not

[4] Adapted from the Kigali Conceptual Master Plan AECOM Design + Planning, Denver USA http://www.aecom.com/

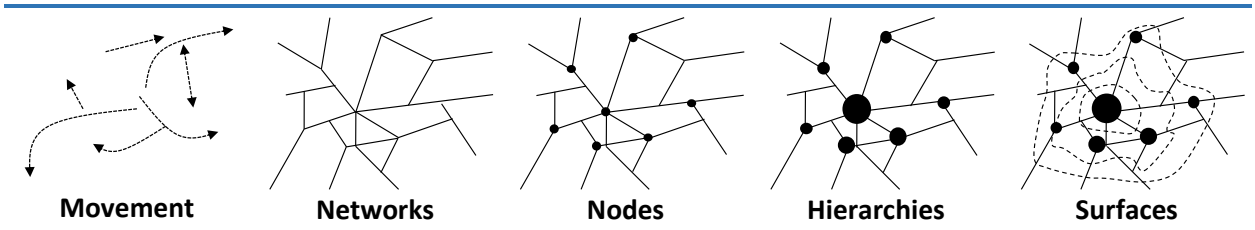
[5] Smart Code Version 9.2 by Andres Duany, Sandy Sorlien, and William Wright. http://transect.org/codes.html

[6] A systems approach to development and planning is rooted in the work of Peter Hagget (1969), *Locational analysis in human geography*, and the complementary work done by Brian Mcloughlin (1969) *Urban and Regional Planning: A systems approach*.

spatially limited and provides an opportunity to assess vertical and horizontal relationships in development in a coherent and integrated manner.

The distinction between nodes, networks, and surfaces leads to an approach where development is not accessed as a sectoral approach but rather an integrated and linked approach that describes the functional linkages and interaction of activities and sectors manifesting as nodes, networks, and surfaces. This approach facilitates an integrated approach to planning and ensures that the emphasis in on relationships between development activities rather than narrowly dealing with the sector as isolated, boxed in development occurrences.

Figure 3: The development concept



A nodal system has the following characteristics with the subsequent implications for the project:

Table 3: A nodal system and the consequences for the ISCDPs

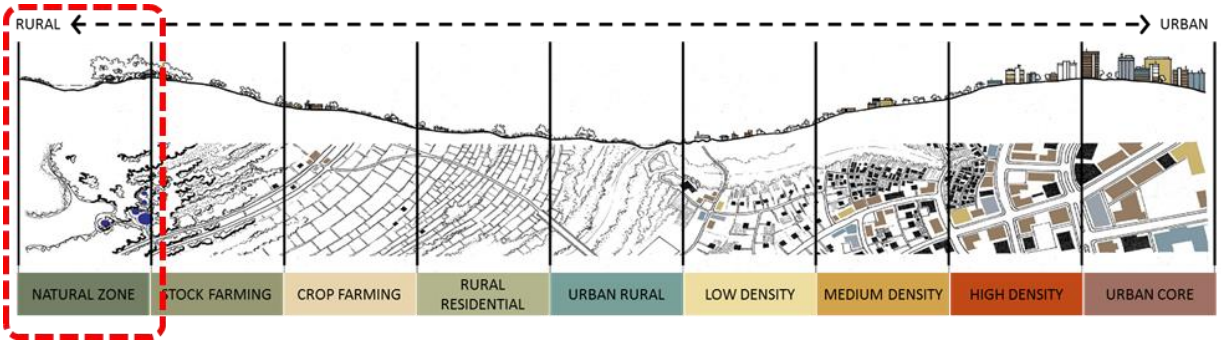
Characteristics of a nodal system	Implications for the ISCDP
Movement sustains the system. If movement stops the system disintegrated, conversely, the better or higher the volume of movement of people goods and services are the more vibrant and viable the system is.	Road networks are the basis for assessing movement. However, A basic network of roads although low movement and intensity of movement have a direct impact on network development. The modes of transport and transport volumes are factors that need to be considered.
A change in the extent and intensities of movement causes changes in the shape and structure of the system. For example, increased road traffic creates the opportunity for better quality roads and business opportunities.	The best prospect for an improved spatial structure is in the planning areas is interventions to encourage higher intensities of movement. This implies understanding the interplay between movement and land uses and how long-term development can affect these relationships.
An open system tends to sustain its structure and form over extended periods of time.	The low energy levels in some parts of the system will make large-scale structural changes difficult to achieve. The approach will rather be to consolidate, optimise, and adjust the functioning of the spatial system within its framework and parameters.
From varying starting points and conditions, systems with more or less the same type of energy inputs and organisation, develop similar end conditions and structures. Urban areas across the world have more or less the same structural characteristics notwithstanding diverse starting points and conditions.	The structural elements of the spatial system are recognised. The relative strength of the system components, business, residential, industrial development, agriculture, etc. is determined by local economic growth imperatives.

The conceptual framework brings together the development concept of movement, networks, nodes, hierarchies, and surfaces. It takes cognizance of the development perspective and preferred scenarios.

4.3 Contextualising the urban-rural transect and the systems approach to planning

By linking the Urban-Rural Transect with the system of nodes, networks, and surfaces, it provides a rationally integrated planning framework. This framework helps maintain consistency in the approach to the seemingly dispersed and unrelated planning areas within the county. This approach leads to the development of set of typologies describing common characteristics between the different settlements and planning areas.

Figure 4: Contextualising the Urban-Rural Typology Continuum- The natural zone



- Largely undisturbed natural habitat with activities focused on eco-tourism and conservation.
- An absence of general habitation with human impact limited.

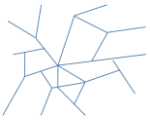
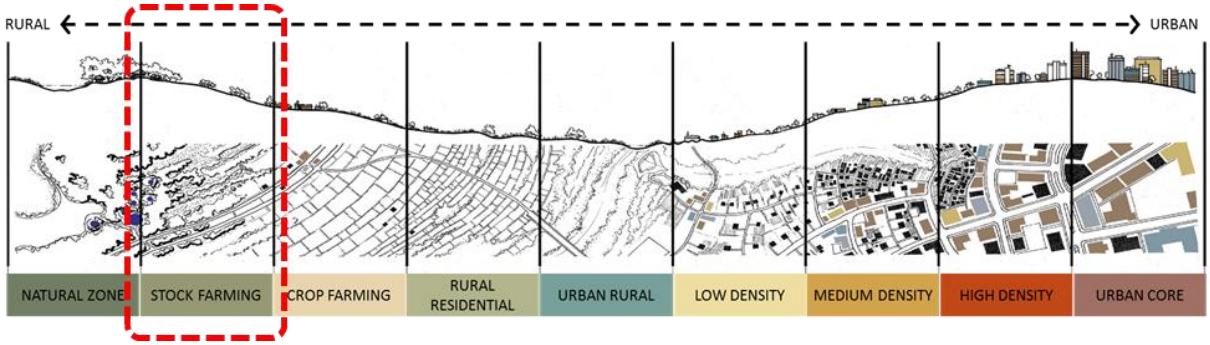
Networks	Nodes	Surfaces
		
Networks informal and linked to lower order systems	Nodes isolated single function service points which directly related to characteristics of the immediate environment	Surfaces are characterised by a single function or purpose that defines its nature and character

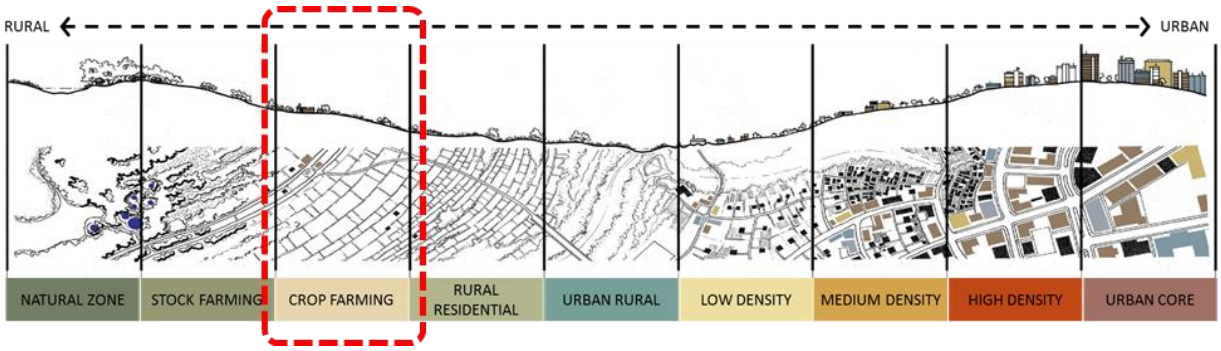
Figure 5: Contextualising the Urban-Rural Typology Continuum – Stock farming zone



- Extensive farming activities.
- Often not more than a homestead or a trading store isolated from other land uses.

Networks	Nodes	Surfaces
		
Networks informal.	Nodes are small and focused on the particular activity that it supports.	The intensity of surface activities (grazing) determined by the grazing capacity of the land

Figure 6: Contextualising the Urban-Rural Typology Continuum- Crop farming zone



- Land cultivation determined by the water and soil conditions.

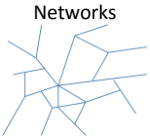
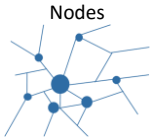
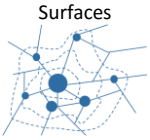
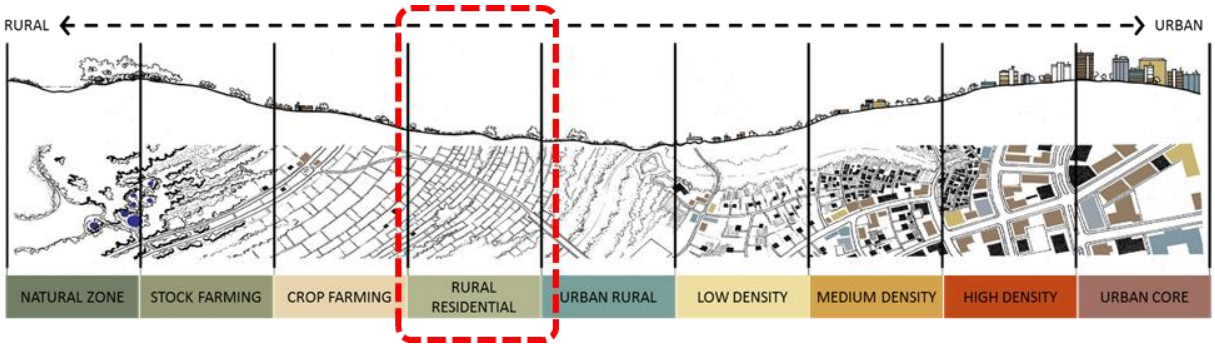
Networks	Nodes	Surfaces
		
Networks are informal but linked to formal systems	Nodes are small on focused on supporting the cultivation activities with settlement limited to people directly involved in the farming activities	Surfaces intensively cultivated. Based on climatic and soil conditions

Figure 7: Contextualising the Urban-Rural Typology Continuum- Rural residential zone



- Settlement not necessarily linked to farming although subsistence farming may occur

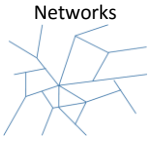
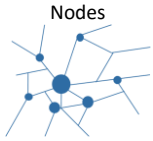
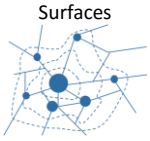
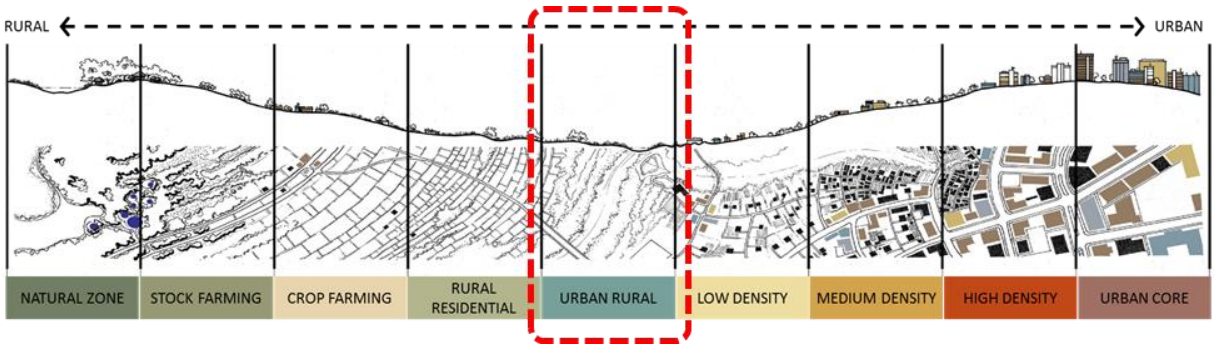
Networks	Nodes	Surfaces
		
Network systems start to develop	Social facilities and limited commercial activities begin to grow as nodal points with limited or no growth potential.	It remains difficult to distinguish clear use zone urban and rural are integrated with no clear zoning distinctions.

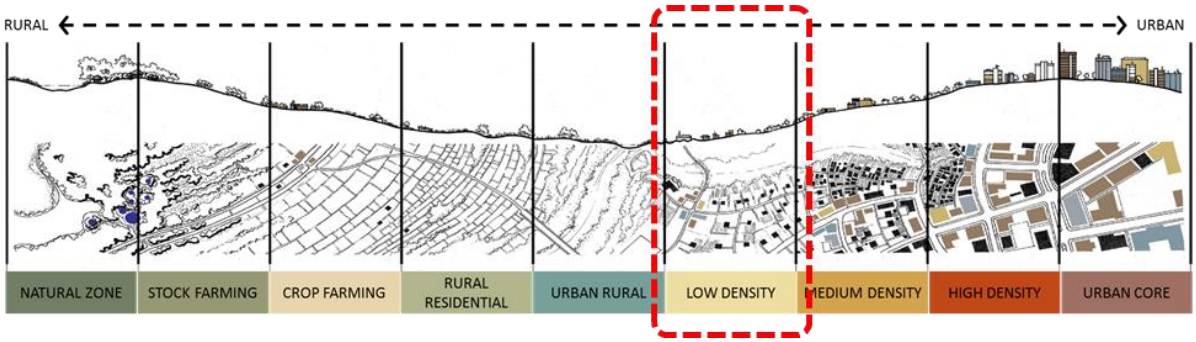
Figure 8: Contextualising the Urban-Rural Typology Continuum- Urban-rural zone



- A zone of transition with often a mix of technically incompatible uses from the urban and rural continuum.

Networks	Nodes	Surfaces
Networks are poorly developed, and the area is fragmented by the network not necessarily servicing the area.	Densities are low and nodes are difficult to identify.	Surfaces exhibit mainly agrarian activities.

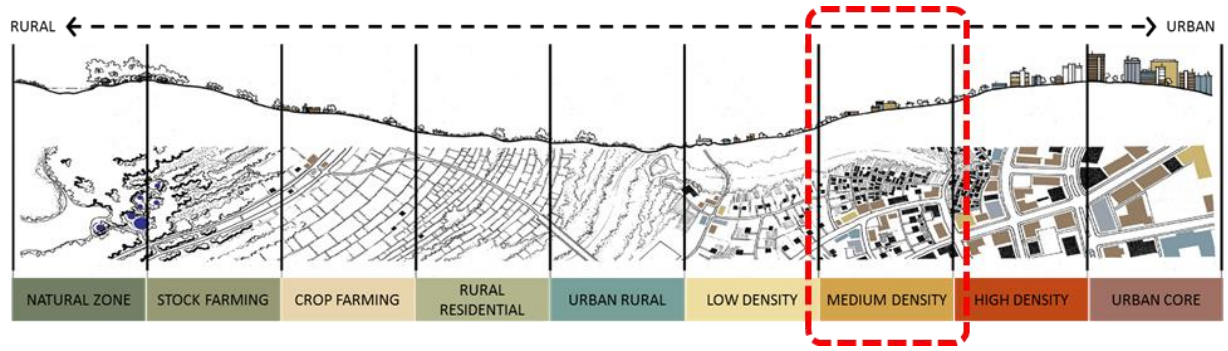
Figure 9: Contextualising the Urban-Rural Typology Continuum– Low-density zone



- Settlement takes on an urban character with increased involvement in secondary and tertiary activities.

Networks	Nodes	Surfaces
Networks are formal, planned and well developed	Nodes form to support the immediate environment. Social amenities are present to serve local needs	Spatial differentiation and use zones are becoming more visible

Figure 10: Contextualising the Urban-Rural Typology Continuum- Medium Density Zone



- Settlement is entirely urban with all supporting amenities present

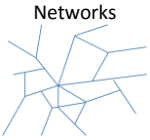
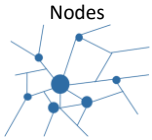
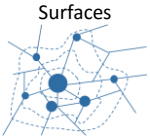
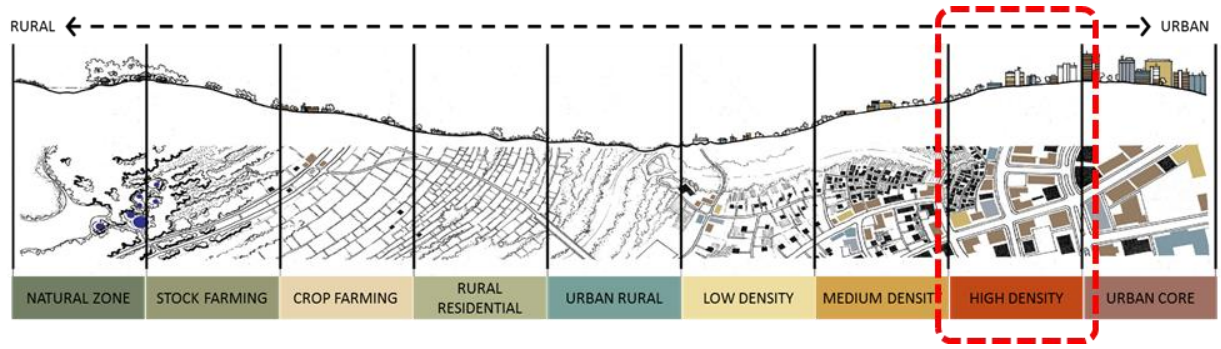
Networks	Nodes	Surfaces
		
Networks start to develop to support public transport	Nodal hierarchies develop within these areas with higher order nodes with good access developing regional functions	Full spectrum of urban use zones exist

Figure 11: Contextualising the Urban-Rural Typology Continuum- High-density zone



- High-density residential development is closely associated with the urban core but not necessarily integrated into it. It often has characteristics of a transitional zone.

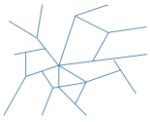
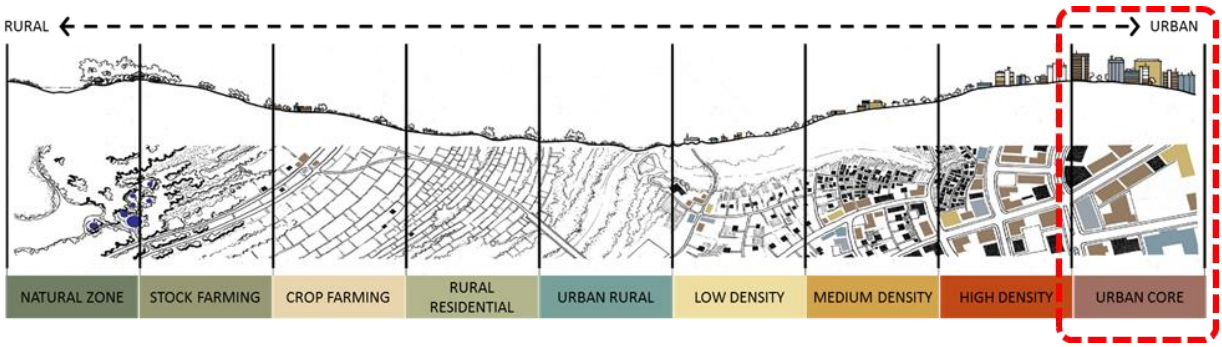
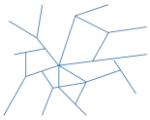
Networks	Nodes	Surfaces
		
Network linkages as well developed	Nodal hierarchies developed within these areas	Full spectrum of urban use zone exists

Figure 12: Contextualising the Urban-Rural Typology Continuum- The urban core

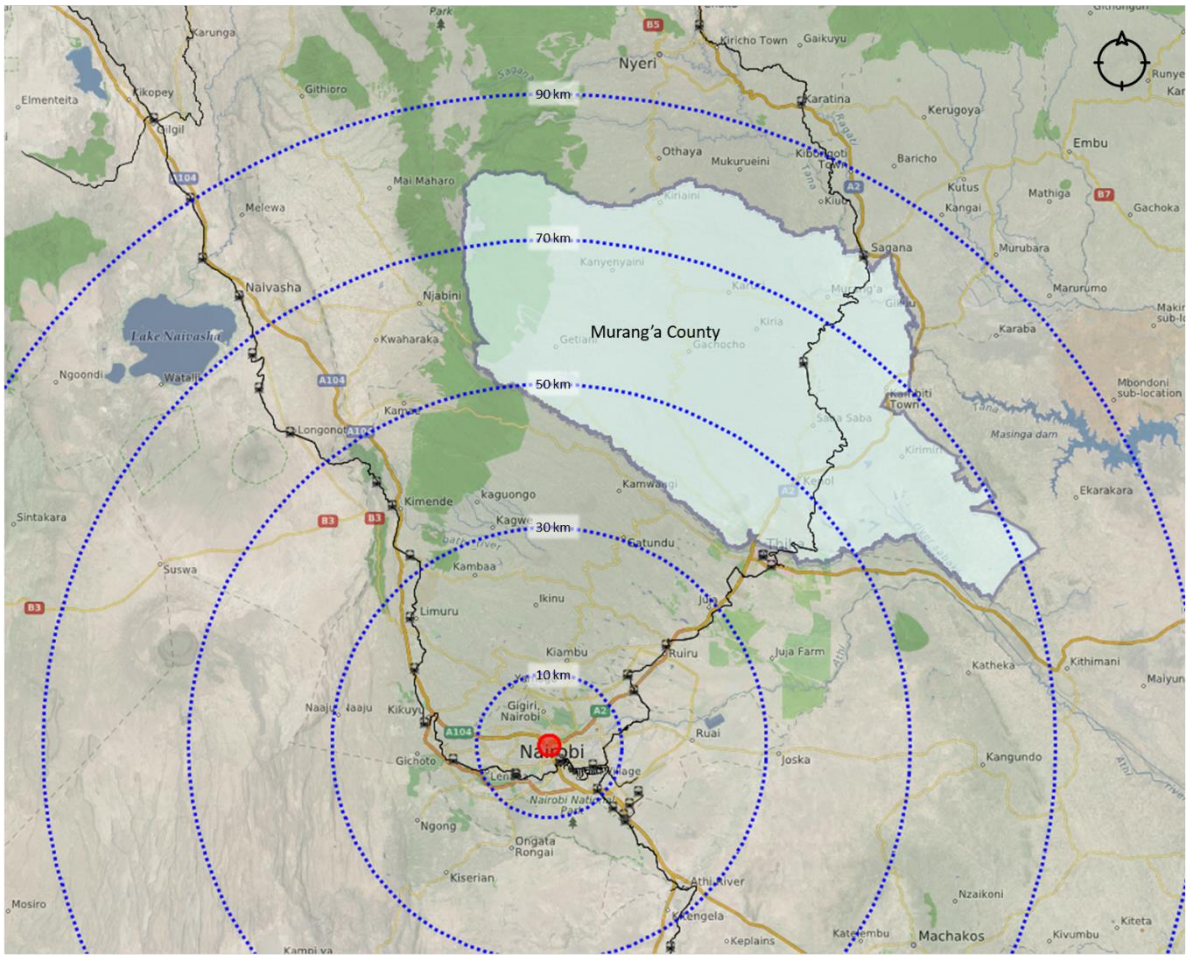


- Non-residential uses dominate but residential remains present.

Networks	Nodes	Surfaces
		
The regional transport networks focus on the core and high levels of accessibility often constrained by congestion.	The core as node fulfils a full range of urban functions	Land rent processes determine land uses and one should not expect to find land with lower bid rent values in the core

5 The project area and its context

Map 2: Project location



Section 2. The strategic fit

The strategic context of this plan is essential, and it guides the approach adopted for formulating the plan. The Murang'a Spatial Plan is not an isolated plan but addresses the long-term development in the County regarding a range of internal issues and external linkages.

6 The planning rationale

Strategically the development of a spatial plan for Murang'a County is not about making planning proposals for the county or dealing with the specific issues of villages and settlements in a predominantly rural county, rather it's about understanding the strategic context of Nairobi's competitive growth environment. The metropolitan setting became the overarching consideration the day Murang'a became part of the Nairobi Metropolitan area.

Africa is on a quest to improve its global competitiveness. With increased investment from China, Japan, and the United States – the latter has hinted at extending its Africa Growth and Opportunity Act – conditions are right for success. However, before Africa can think about trading with these economic giants and being more globally competitive, African nations have to improve relations with each other. For integration to take place, countries in Africa have to create an open environment for business, which would allow goods and people to flow across borders more freely.[7]

The metropolitan link of this project is important. There are three top cities in Africa driving economic development and the globalisation is African. These cities are Johannesburg, Lagos, and Nairobi. These cities form the core of the three major sub-Saharan economic blocks namely, SADC in Southern Africa, ECOWAS in West Africa and COMESA in East Africa. Notwithstanding calls for openness and integration; it implies a greater competition between these cities and regions to attract investment. The competitive environment based on diverse local resources in each region serves as the basis for competing for investment and growth.

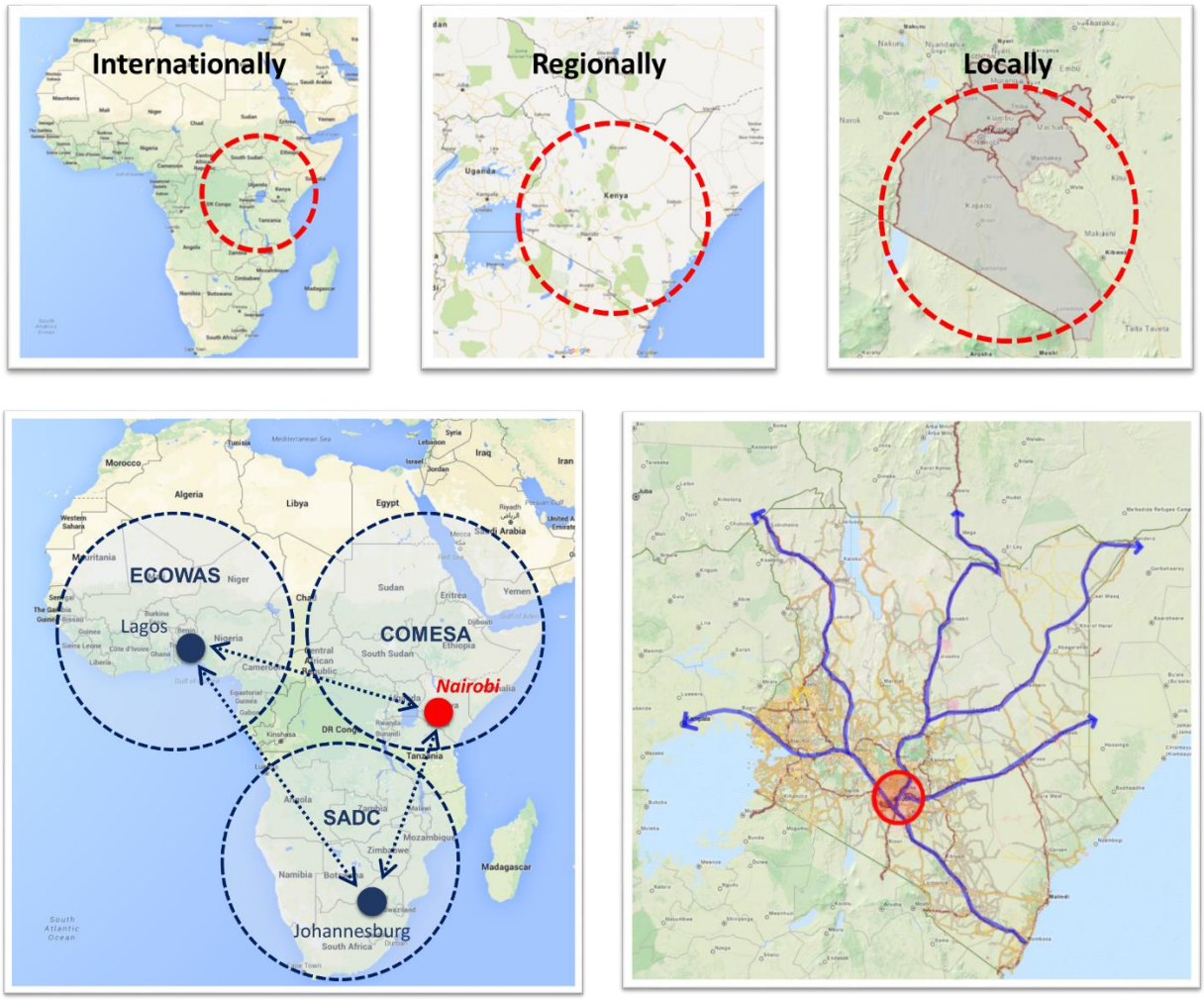
Nairobi's location benefits development but the lack of adequate and appropriate transport and other infrastructure constrains development in Nairobi and its immediate environment, hence NaMSIP as both facilitator and driver for addressing these constraints and improved service delivery in the metropolitan region.

Nairobi's growth and development is under extreme pressure through urbanization and lack of services. Regarding urbanisation, Nairobi is affected to the extent that the rest of the country and more specifically the counties in the metropolitan region contribute to the continued pressures. How these counties respond to the development of the metropolitan core are crucial. The key questions to be answered in the Murang'a Integrated Strategic County Development Plan are:

- How are Murang'a and its communities affected by these pressures emanating from the metropolitan core?
- How does development in Murang'a impact on the metropolitan core?

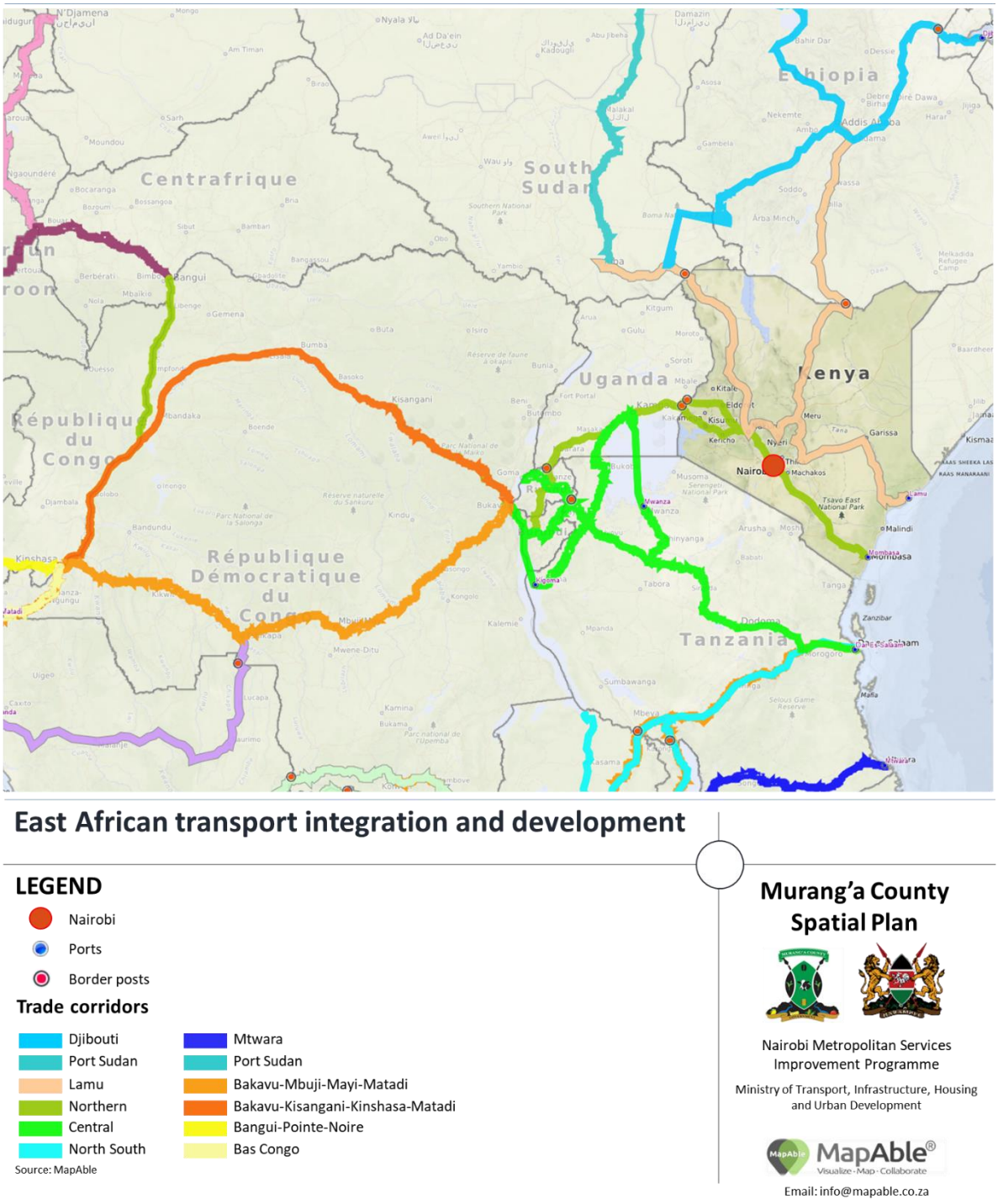
[7] http://www.brandsouthafrica.com/news/873-global-competitiveness-and-african-trade

Figure 13: Strategic context of Murang'a County



The map below shows how these objectives manifest across Central and East Africa. The emphasis on improved transport links the major drive in giving effect to regional integration. Regional integration clearly part of the macro-strategic environment that informs the Murang'a spatial plan and the implications these strategies have for the long term development of the County.

Map 3: Regional transport corridors



7 Strategic and institutional fit

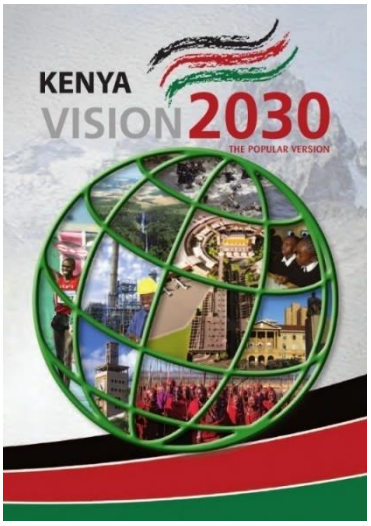
Since the adoption of the new Constitution in Kenya in 2010, a range of strategic plans were developed addressing various long-term development initiatives, goals, and objectives. The most important being Vision 2030 which formed the basis for the Nairobi Metropolitan 2030 Strategy, which in turn gave rise to Spatial planning concept for the Nairobi Metropolitan Region. One should note that Murang'a is not included as part of these metropolitan plans, but its incorporation into the region makes the objectives and strategic trusts applicable to the long terms development of the County itself. The strategic thrusts

reflected in NamSIP and then also in The First County Integrated Development Plan 2013-2017, emphasises this point. This section highlights the strategic objectives contained in these guiding documents.

7.1 The legislative framework

7.1.1 The Constitution of Kenya 2010

The Constitution of Kenya is the supreme law of the Republic that creates the basis for all other legislation and general conduct in the county. The Constitution of 2010 was created through an extensive process of reforming the 1969 Constitution. The Constitution received international acclaim for progressing human rights and for focusing on more transparent and corruption free governance. The Constitution has for the first time clearly identified and recognised the socio-economic rights of Kenyan Citizens (Chapter 4). These rights include:



- A clean and healthy environment (42);
- Health care services (43(a));
- Accessible and adequate housing (43(b));
- Reasonable standards of sanitation (43(b));
- Be free from hunger (43(c));
- Clean and Safe water in adequate quantities (43(d));
- Social Security (43(e));
- Education (43(f))

Additionally, Kenyan's are guaranteed fair and just treatment under the law, Freedom of movement and the press. The Constitution highlights the rights of children, persons with disabilities, the youth, minorities and marginalised and older members of society.

7.1.2 The County Government Act (Chapter 265)

This project was executed within the framework of this act. For the purposes of this project the following is relevant:

1. Part III that deals with citizen participation in the activities of the county government. (See Section 87 in particular).
2. Part XI enables and set the framework for county planning. The following sections are particularly important and should be noted:
    a. Section 102 spelling out the principles for planning.
    b. Section 103 the objectives with planning.
    c. Section 104 the obligation of the county government to plan.
    d. Section 105 deals with the arrangements to do planning and requires that the county establishes County Planning Unit.
    e. Section 106 highlights the integrated nature of planning and the requirement to respond in a multi-sectoral and multi-dimensional manner to planning and dealing with planning issues.
    f. Section 107 list the types of plans a county is responsible for. The key is the County Integrated Development Plan (CIDP) (Section 107(a). The next section allow for sector plans and Section 107(c) specifically makes provision for a County Spatial Plan.

g. Section 110 deals with the content and requirements of County Spatial Plans. The act states that:

"(1) There shall be a ten year county GIS based database system spatial plan for each county, which shall be a component part of the county integrated development plan providing—

- *(a) a spatial depiction of the social and economic development programme of the county as articulated in the integrated county development plan;*
- *(b) clear statements of how the spatial plan is linked to the regional, national and other county plans; and*
- *(c) clear clarifications on the anticipated sustainable development outcomes of the spatial plan.*

(2) The spatial plan, which shall be spatial development framework for the county, shall—

- *(a) give effect to the principles and objects contained in sections 102 and 103;*
- *(b) set out objectives that reflect the desired spatial form of the county taking into account the development programme of the county as articulated in its county integrated development plan;*
- *(c) contain strategies and policies regarding the manner in which the objectives referred to in paragraph (b), which strategies and policies shall—*
  - *(i) indicate desired patterns of land use within the county;*
  - *(ii) address the spatial construction or reconstruction of the county;*
  - *(iii) provide strategic guidance in respect of the location and nature of development within the county;*
  - *(iv) set out basic guidelines for a land use management system in the county taking into account any guidelines, regulations or laws as provided for under Article 67(2)(h) of the Constitution;*
  - *(v) set out a capital investment framework for the county's development programs;*
  - *(vi) contain a strategic assessment of the environmental impact of the spatial development framework;*
  - *(vii) identify programs and projects for the development of land within the county; and*
  - *(viii) be aligned with the spatial frameworks reflected in development the integrated development plans of neighbouring counties;*
- *(d) shall indicate where public and private land development and infrastructure investment should take place;*
- *(e) shall indicate desired or undesired utilization of space in a particular area;*
- *(f) may delineate the urban edges of the municipalities within its jurisdiction and mechanisms of dealing with the rural urban interfaces;*
- *(g) shall identify areas where strategic intervention is required;*
- *(h) shall indicate areas where priority spending is required;*
- *(i) clear clarifications on the anticipated sustainable development outcomes of the spatial plan; and*
- *(j) shall indicate the areas designated to conservation and recreation.*

(3) Each county spatial plan shall be developed by the county executive committee and approved by the respective county assemblies in accordance with procedures approved by the respective county assembly.

(4) Each county spatial plan shall be reviewed every five years and the revisions approved by the respective county assemblies."

Section 111 of the act describes city or municipal plans[8]. One should note that act allows for a range of plans at this level and not only a single plan. The act states that:

> *"(1) For each city and municipality there shall be the following plans—*
> *(a) city or municipal land use plans;*
> *(b) city or municipal building and zoning plans;*
> *(c) city or urban area building and zoning plans;*
> *(d) location of recreational areas and public facilities.*
> *(2) A city or municipal plans shall be the instrument for development facilitation and development control within the respective city or municipality.*
> *(3) A city or municipal plan shall, within a particular city or municipality, provide for—*
> *(a) functions and principles of land use and building plans;*
> *(b) location of various types of infrastructure within the city or municipality;*
> *(c) development control in the city or municipality within the national housing and building code framework.*
> *(4) City or municipal land use and building plans shall be binding on all public entities and private citizens operating within the particular city or municipality.*
> *(5) City or municipal land use and building plans shall be the regulatory instruments for guiding and facilitating development within the particular city or municipality.*
> *(6) Each city or municipal land use and building plan shall be reviewed every five years and the revisions approved by the respective county assemblies."*

The last matter that covered in Part XI is public participation in Section 115. The act required that

> *"(2) Each county assembly shall develop laws and regulations giving effect to the requirement for effective citizen participation in development planning and performance management within the county and such laws and guidelines shall adhere to minimum national requirements.*

This requirement stands under the principles spelled out Part VIII (Section 87) of this act.

7.1.3 The Urban Areas and Cities Act (Act 13 of 2013)

This act deal with a range of issues. Part II provides the criteria for cities and towns status while Part V deals with integrated development planning. The act is silent on spatial and urban plans per se although one should recognise the fact that spatial and urban plans are, in terms of the County Government Act (Chapter 265), an integral part of the IDP. The third schedule to this act deals with the drafting of county IDPs.

The Act specifies that the integrated development planning shall be the basis for:

- The preparation of environmental management plans
- The preparation of valuation rolls for property taxation
- Provision of physical and social infrastructure and transportation
- Preparation of annual strategic plans for a city or municipality
- Disaster preparedness and response
- Overall delivery of service including provision of water, electricity, health, telecommunications and solid waste management, and
- Preparation of a geographic information system for a city and municipality

[8] The Urban and Cities Act (Act 13 of 2013) equates urban areas to municipalities or towns.

7.1.4 The Physical Planning Act of 1966

The Physical Planning Act (PPA) Cap 286, 1996 provides for preparation and implementation of physical development plans (spatial plans) and for connected purposes. This Act is the basis for physical planning and development control (building construction permit and applications for development permission).

The Act provides that Local Physical Development Plans may be prepared for any land in Kenya, whether trust land or private land within the area of authority of a city, municipal, town or urban council or with reference to any trading or marketing centre. A local physical development plan may be a long-term or short-term physical development or for a renewal or redevelopment.

"Part V on Control of Development" shows powers of local authorities (county government) in development permission including application and approval of development. Permission will be required for four cases of land development, including development permission applications for land:

- Change of use
- Extension of use
- Amalgamation
- Subdivision

7.1.5 County Governments Act of 2013

According to the County Government Act, each county shall prepare a county plan which shall be the basis for all budgeting and spending of public funds. The act clearly states that "A county government shall plan for the county and no public funds shall be appropriated outside a planning framework developed by the county executive committee and approved by the county assembly". This is further qualified in Section 107(1) which provides that to guide, harmonize and facilitate development within each county there shall be the following plans;

- County integrated development plan;
- County sectorial plans;
- County spatial plan; and
- Cities and urban area plans as provided for under the Urban Areas and Cities Act.

7.1.6 Land Act No 6 of 2012

This is an Act of Parliament to give effect to Article 68 of the Constitution, to revise, consolidate and rationalize land laws; to provide for the sustainable administration and management of land and land-based resources, and for connected purposes.

According to this Act, "public land" has the meaning assigned by Article 62 of the Constitution and includes the coast foreshore, river, dam's lakes and other reserves under the Survey Act (Cap. 299) or under any other law. "Public purposes" means the purposes of:

- Transportation including roads, canals, highways, railways, bridges, wharves and airports;
- Public buildings including schools, libraries, hospitals, factories, religious institutions and public housing;
- Public utilities for water, sewage, electricity, gas, communication, irrigation and drainage, dams and reservoirs;
- Public parks, playgrounds, gardens, sports facilities and cemeteries;
- Security and defence installations; settlement of squatters, the poor and landless, and the internally displaced persons; and any other analogous public purpose.

7.1.7 Environment Management and Coordination Act 10 of 1999

Environment Management Coordination Act (EMCA) Number 10 of 1999 provides for the establishment of an appropriate legal and institutional framework for the management of the environment. General principles of the Act are that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. The entitlement to a clean and healthy environment includes the access by any person in Kenya to the various public elements or segments of the environment for recreational, educational, health, spiritual and cultural purposes.

7.1.8 The National Land Commission Act of 2012

This Act makes provision as to the functions and power of the National Land Commission, qualification and procedures for appointments to the Commission, and gives effect to the objects and principles of devolved government in land management and administration. The object and purpose of this Act is to provide:

- For the management and administration of land in accordance with the principles of land policy set out in Article 60 of the Constitution and the national land policy;
- For the operations, powers, responsibilities and additional functions of the Commission pursuant to Article 67 (3) of the Constitution;
- A legal framework for the identification and appointment of the chairperson, members and the secretary of the Commission pursuant to Article 250 (2) and (12) (a) of the Constitution; and
- For a linkage between the Commissions, county governments and other institutions dealing with land and land related resources.

7.2 The policy framework

7.2.1 Vision 2030

Kenya Vision 2030 is the national "blueprint" to guide development between 2008 and 2030. The primary objective of the vision document is to transform Kenya into a competitive, middle-income country that provides citizens a high quality of life. The vision is built upon three key pillars: the economic, social and the political. 124 flagships projects have been identified to be implemented in all sectors and are spread all over the country.

Table 4: Pillars of Vision 2030

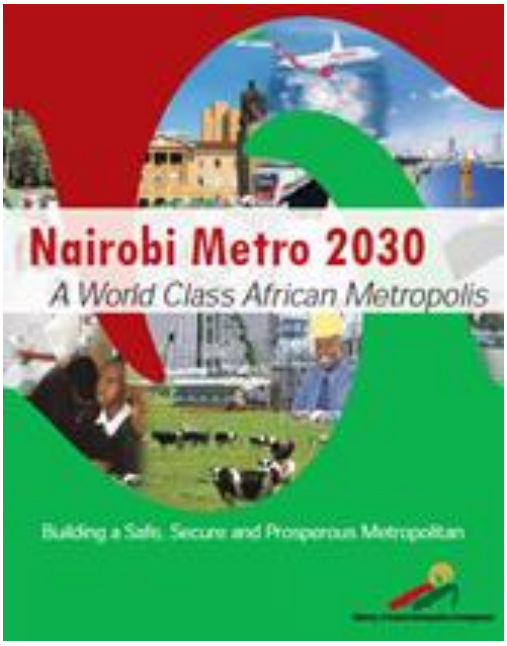
	Economic Pillar	Social Pillar	Political Pillar
Pillars	• To maintain a sustained economic growth of 10% p.a. over the next 25 years.	• A just and cohesive society enjoying equitable social development in a clean and secure environment.	• An issue-based, people-centred, result-orientated and accountable democratic political system.
Key areas for development	• Improving tourism infrastructure and destinations. • Increase value in agriculture through increases in productivity and access to markets. • More inclusive wholesale and retail trade sector through the inclusion of the informal sector with investment in infrastructure, training and linking local markets with global markets. • Manufacturing for the regional market with both basic and niche products manufacturing (including adding value to products). • Business Process Offshoring	• Improving education and training for development and individual well-being. • Provision of an efficient and high-quality health care system. • Provision of high-quality water supplies, expanded irrigation and improved sanitation system. • Ensuring a clean, safe and sustainable environment. • Improvinnng planning systems that provide adequate housing and a need to create high-quality urban livelihoods (including. rural settlements).	• Adherence to the rule of law applicable to a modern, market-based economy in a human rights-respecting state. • Institutionalising genuinely competitive and issue-based politics. • Aim to create a people-centred and politically engaged open society including enhanced public service delivery. • Ensuring a transparent and accountable results orientated government institutions. • Ensuring security for all persons and property in the country including

- Creation of a globally competitive financial services sector.
- More equity for both sexes and vulnerable groups including a globally and prosperous youth.
- Ensuring equity and poverty elimination.

peace-building and conflict management.

The foundation of the three pillars are as follows:

- Macroeconomic stability for long-term development;
- Continuity in government reforms;
- Enhanced equity and wealth creation opportunities for the poor;
- Infrastructure development;
- Energy sector investment;
- Science, Technology and Innovation (STI) investment;
- Land Reform;
- Human resource development;
- Increase in safety and security and ensuring an efficient, motivated and well-trained public service.



7.2.2 Nairobi Metro 2030 Strategy

The Nairobi Metro 2030 Strategy document strives to create a world class African Metropolis which is safe secure and prosperous. The Strategy forms part of the larger national plans such as the Vision 2030 document, that state that the main development issues include rapid, economic growth, employment, balanced wealth creation, poverty alleviation, meaningful youth engagement and regional equity. Due to the dominance of the Nairobi Metro, the overall Strategy has national and regional development implications specifically for surrounding counties such as Kiambu, Thika, Kajiado, Machakos and Murang'a. Sustainable development underpins this Strategy and focusses on social (liveability), economic (competitiveness) and environmental sustainability.

The following key results areas have been identified by the Strategy to the vision:

Table 5: Key Results Areas of the Nairobi Metro 2030

Key Results Areas	Objectives
Building an internationally competitive and inclusive economy.	• Creating a supportive environment for sustainable and quality jobs. • Connect the Metro to the global economy. • Linking households to markets, job opportunities and creating opportunities for businesses to growth.
Deploying world class infrastructure and utilities for the region.	• Ensuring economic and physical accessibility • Support world-class living, working and business environment.
Enhance mobility and connectivity through effective transportation.	• Optimising mobility and accessibility to create a competitive business environment. • Support public transport with Jomo Kenyatta International Airport as a central transport and logistics hub.
Enhance the quality of life in the region.	• Ensure quality of life for all residents through quality life interventions such as good housing choices, social facilities, and a safe, healthy environment. • Eradication of poverty and raising the overall income levels.
Delivering a unique image and identity through effective place branding.	• Unitise unique features in the region to "sell" the region and to create a recognisable identity.
Ensuring a safe and secure region.	• Ensure a safe environment, where free movement and social interaction of all people is promoted.

Key Results Areas	Objectives
	• Reduction of crime and ensuring disaster preparedness.
Building world class governance systems.	• Promote active partnerships with surrounding counties, the private sector and investors. • Strengthening citizen participation and creating certainty for private investment in the region.

7.2.3 Spatial Planning Concept for the Nairobi Metropolitan Region 2013

The Spatial Planning Concept for the Nairobi Metropolitan Region is an integrated spatial growth and development strategy that strives to establish integrated and strategic programmes that provide social, economic and infrastructural services.

The Spatial Planning Concept addresses the following issues:

Table 6: Key issues dealt with by the Spatial Planning Concept

Issues and key areas of interest	Objectives
Urbanisation and settlements	• There is a major urban concentration along the Mombasa-Kampala transport corridor. • 74% of the urban population of the country is concentrated in the Metro region. • The National Urbanisation Policy should promote national welfare and image of the country by channelling the urbanisation process and pattern in an effective and sustainable manner.
Settlement Pattern of the region and country	• The overall settlement pattern should be integrated, balanced and sustainable. • The growth of Metro should be used to integrated both urban and rural functions of the larger region. • The proposed settlement hierarchy includes Regional Centre, Sub-Regional Centre, Priority Town (New Town), Growth Centre, Market Centre, Central Village Centres and Basic Village.
Inclusive planning	• Facilitate economic planning that creates enough job opportunities, affordable housing, effective government and security and to eradicate poverty through inclusive planning.
Growth Scenarios for Nairobi Metro	• Business as usual – stable growth rate continues based on 1999-2009 growth rates resulting in a total Metro population of 13.2 million by 2030. • Vision Based Growth – rapid development with 10% p.a. Economic growth resulting in a total population of 15.1 million by 2030. • Unabated growth – in the absence of effective development policies the Metro population may grow to 20.1 million by 2030.
Economic growth strategy	• To achieve the 10% p.a. Economic growth as envisioned by the Vision 2030 document the Metro has to grow at between 12%-15%. • High unemployment, low per capita income, and high-income inequality are major challenges in the Metro. • A focus on more formal employment is envisioned through the promotion of MSEs and other industries in all sectors including agriculture, textile, IT, financial services and the tourism sector.
Transportation Infrastructure	• Ensure the development of an efficient multi-modal transportation system including internal, regional and international linkages in the Metro.
Bulk Service Infrastructure	• Provision of safe, efficient and sustainable water, sanitation, waste, and electricity for the Metro and region.
Social Facilities and Housing	• Currently, social facilities are not sufficient and not distributed evenly which is required for balanced development in the region. • The supply of quality affordable shelter should increase to promote the social-economic wellbeing of the populous. • Housing should be provided through the development of new housing areas, upgrading and densification of existing housing areas, Housing in new towns and housing in villages.
Development of New Towns	• To decongest Nairobi, six New Towns are proposed including transport and other economic/social centred New Towns.

Issues and key areas of interest	Objectives
	• A New Town is a self-contained city in the region to create new growth centres in the national economy as well as accommodating new activities to increase investment.
Land use classification	• A new land use management system is proposed to achieve an optimal balance between various land uses including: • Settlement Zone – built up areas including residential, commercial, industries etc. • Transport Zone – that including all road, rail, and airports. • Forest and Green Buffer Zone – that including ecological sensitive areas. • Water bodies – that include rivers, lakes, etc. • Agriculture – that include cultivated land, fallow land, etc.
Urban Design	• The Urban quality of urban centres in the Metro can be controlled and enhanced. • This is accomplished through various pre-defined guidelines that ensure an inspirational urban form of different functions that improve the lives of people. • Principles of 'smart growth' are embraced with a focused on form-based codes that are tailored for local conditions.
Tourism	• Nairobi is one of the major entrance points for international tourist, through Jomo Kenyatta International Airport. • The sector can be developed through the development of a New Town in Southern Metro (Kajiado County) based on tourism activity including the development of a second international airport. • Regional tourist activities and amenities should be developed.

7.3 First County Integrated Development Plan 2013-2017

The Constitution of Kenya 2010 provides for two distinct and interdependent levels of government – the national and the county governments. The Constitution Article 220(2) makes it mandatory for every County to prepare Development Plans. The County Governments Act, 2012 states that each county shall prepare a County Integrated Development Plan (CIDP) which shall be the basis for all budgeting and spending of public funds. Also, every county government is expected to plan for the county, and no public funds shall be appropriated outside a planning framework developed by the county executive committee and approved by the county assembly. The county integrated plan focuses on economic, physical, social, environmental and spatial planning.

The CIDP states the vision of Murang'a is *to be the leading county in socio-economic transformation*. The mission of the County is *to transform the county through participative, equitable and sustainable development initiatives for the benefit of all*.

The following section is extracted from the CIDP as it reflects on spatial planning and development.

7.3.1 The spatial framework

Chapter 3 of the CIDP addresses key issues regarding the spatial development of the County which should be dealt with through this project as the basis for articulating the spatial context of the County's vision and mission.

The CIDP states that Kenya's national goal is to attain rapid and sustained economic growth and development in all regions of the country. To put into effect this desired goal the government has put in place some programmes including the direction of financial resources to the counties through the Constituency Development Fund, the Roads Development Fund, the Local Authorities Transfer Fund (LATF), and Education Bursary Fund and now the Commission for Revenue Allocation, etc.

According to the CIDP, on should recognise the role and impact of numerous development agencies ranging from government line ministries, quasi-government development agencies, NGOs, CBOs, FBOs and private investors. An appropriate spatial framework is seen as crucial for coordinating the activities of these agencies. Furthermore, county spatial planning can help step down global and national development policies to become relevant at the local level. It can also assist in linking economic planning

(budgets) to spatial planning which has been identified as a major cause of underdevelopment in the country despite massive investments over the years.

The CIDP requires that the Muranga County Spatial Plan shows the overall integrated spatial framework for coordinating the various development efforts by different agencies so as to have sustainable development within the county.

The objectives of county spatial planning include:

- To identify the spatial distribution of the resources within the county, their level of utilization and potential;
- To assess the existing infrastructure their current conditions, capacity and projected demand;
- To identify fragile ecosystems and suggest intervention measures for their protection and conservation;
- To investigate human settlement trends and propose an appropriate hierarchy or urban centres that will spur rural development;
- To assess capacity of the existing institutions and organizations and suggest strategies to enhance their performance;
- To suggest an integrated spatial framework that will guide the sustainable utilization of the regional resources and to bring services closer to the people;
- Spur rural-urban inter-linkages and hasten economic growth and development; and
- Suggest priority areas for intervention.

7.3.2 Human Settlement Policy

According to the CIDP, in Kenya, the Human Settlement Policy emanated from the detailed Human Settlement Strategy of 1978. This strategy is an overall framework for the management of urban growth and location of Physical Development in the urban and rural areas of Kenya so as to develop "a coherent system of human settlement." Five strategies were outlined to achieve the above:

- The development of service centres;
- The development of growth centres;
- The development of an integrated transportation and communication system;
- Rural development; and
- The development of appropriate standards for urban infrastructure

The main objectives of the above strategies are:

- To continue to promote the maximum development of the rural areas to improve living standards for the majority of the people;
- To establish a more even geographical spread of urban physical infrastructure to promote more balanced economic growth throughout the nation as well as a more equitable standard of social services between different areas;
- To encourage the expansion of several large towns in addition to Nairobi and Mombasa in order to promote regional growth, thereby providing more alternatives for the absorption of the migrant population and the problems arising from excessive concentration in these towns;
- To continue to develop a complementary network of communication so as to improve accessibility between centres of economic and social development;
- To adopt standards for urban infrastructure which more closely relate to what can be afforded by the country as a whole; and
- To continue improving the planning machinery and co-ordination between developmental agencies, which are responsible for planning, decision making, financing, implementing and administering a wide variety of services.

Ideally, human settlements perform the following functions:

- Service Function: Settlements facilitate the provision of schools, health services, public utilities, commercial banks, co-operatives, administration among other vital services. These services not only serve the people in the towns but also those in the surrounding areas.
- Economic Function: They also provide employment opportunities e.g. within industries, commercial and the above service functions. They provide a market for the local produce, which stimulates the conversion from subsistence to a cash economy. It also creates real advancement in both rural and urban centres through the production of manufactured goods.
- Residential Function: Human settlements also provide a residential function for people working in non-agricultural employment.

7.3.3 Emerging Issues: Urban Settlements

The following issues are listed in the CIDP regarding settlement development.

- Indiscriminate solid waste disposal
- Urban sprawl/ Unplanned settlements
- Inadequate recreational facilities
- Poor road conditions
- Mixed Developments
- Inadequate water supply
- Pollution (land, air, and water)
- Inadequate housing units
- Poor waste water disposal
- Over-reliance on agro-based industries
- Inadequate sanitation facilities e.g. public toilets, waste receptors, waste disposal sites
- Stagnation of urban centres
- There is no strong industrial base
- Inadequate/Lack of public facilities such as cemeteries, health facilities

7.3.4 Lands Physical Planning (Spatial Planning) Department

In terms of implementation, the CIDP addresses land physical planning in the context as set out below. For this plan, this section of the CIDP was interpreted as an extension of the issues raised about spatial planning as described above.

The department outlined the achievement of its goals and objectives within the following framework as reported in the CIDP.

- Vision

To be an efficient and effective department for delivery of well-planned land use systems for vibrant, functional and sustainable towns, cities and regions

- Mission

Provide an integrated spatial framework for sustainable socio-economic development through research, policy, and land use planning

The Department recognises its enabling role in development and to create a sound basis for the long-term economic development of the county. According to the CIDP, this should happen through more focus on the integration of rural and urban development in the County against the background of growth pressures in the urban areas as well as the pressured created through the continuous subdivision of land. Also, some areas that are either of ecological and cultural importance warrants conservation. It is against this

background that spatial planning becomes a major undertaking for Murang'a County. The following goals were set to achieve this:

- Implementation of Vision 2030 flagship projects relevant to the department
- Preparation of County integrated development plans
- Preparation local physical development plans (Urban area plans)
- Facilitation of provision of secure land tenure
- Preparation of county spatial plans.

The department set the following objectives for it goals which working towards the achievement of its planning vision for the county.

Objective 1: Capacity building/empowerment of land sector

The objective will be achieved by creating an enabling environment for land, housing and urban development sector through:

- Staffing and rationalization of staff
- Setting up offices in major urban areas
- Training and development
- Equipping through Setting up a GIS lab
- Vehicles
- Development of contract documents for procurement of planning services
- Ensure customer satisfaction through service charters.

Objective 2: Administer land in a transparent manner through use of ICT

This objective will be achieved through the development of a land information system/database for all land transactions and plans

Objective 3: and 4 Ensure equitable access to land to promote livelihoods; Work with National government institution to secure land rights to promote investment

These objectives will be achieved through doing the following:

- Prepare local physical development plans
- Set aside land for public purposes i.e. markets, health, schools, jua kali, etc
- Prepare part development plans for alienation.
- Acquisition of land that was illegally acquired in conjunction with NLC
- Prepare zoning regulations /plans
- Set aside zone for low-income earners
- Form public-private partnerships

Objective 5 Oversight on land and physical development disputes

The achievement of this objective entails the following:

- Operationalise the County Physical Planning Liaison Committee
- Enforcement of decisions made by the land court

Objective 6: Control of development and housing typologies

This objective will be achieved through doing the following:

- Setting up of development control and enforcement unit
- Harmonize development control standards, regulations, guidelines
- Implementation of all prepared plans
- Re-planning of all town plots set aside during colonial era (popularly known as TPlots)

- Secure land tenure to promote viable investments

Objective 7: Conservation and protection of ecologically and culturally sensitive areas.

The achievement of this objective entails the following:

- Map all ecologically sensitive areas including dams
- Map all culturally important areas
- Secure all the areas and channel to appropriate sector
- Control/ prevent encroachment of these areas

7.3.5 Land projects

The CIDP identifies a range of projects. A distinction is made between new and ongoing projects. These projects are important for this plan, not only because it outlines the Counties intentions, but also because it provides context for developing the County

The ongoing projects are on the County's strategic programme:

Table 7: Ongoing projects

Projects	Specific Objective	Indicators	Description of Activities
Preparation of regional and local physical development plans	To provide a basis for investment and use of land in the urban and rural area.	• Develop and implement communication strategy.	• Issue notice of intention to plan • Reconnaissance survey • Stakeholders connotative meetings • Prepare base maps • Collect date and analyse • Prepare draft to stakeholders • Incorporate comments • Publish and gazetted • Approval by the Minister.
Registration of Land transactions.	To ensure the security of land tenure and facilitate investment.	• Security of tenure, Title deeds issued AIA and Revenue collected.	• Ascertain land rights • Register titles • Register Land transactions • Replace damaged/worn out land documents • Compile an inventory of all leased County land for rent revision • Asset valuation • Valuation for stamp duty
Resolution of land disputes	To minimize conflicts and improve land markets	• Secure tenure	• Resolve land boundaries disputes • Clear pending land disputes • Reconstitute and train members of • Land control boards.
Improve work environment	To meet increased demand for land services and enhance service delivery.	• New land registries established • Land registries refurbished	• Refurbish existing registries • Construct new land offices to • accommodate land registries.
	To improve performance of officers and enhance service delivery	• Improved work environment	• Organize workshops and seminars for continuous professional development • Enhance IT and other skills among eh staff Encourage multitasking among cadres that cut across the departments e.g. Clerks • Recognitions/appreciation of the staff through rewards and make commendation • letters, promotions, special duty allowances, acting allowances

Projects	Specific Objective	Indicators	Description of Activities
Mapping and updating of topography maps	To generate, maintain, update and disseminate geographical data for land use planning.	• Update and maintained maps and plans to support land registration • Updated topographical and urban maps	• Establish GIS database compatible with RIMS • Revise and update existing • topographical maps • Carry out mapping of the uncovered areas • Geo – reference • Preliminary Index • Maps diagrams • (PIDs) and Registry Index Maps • Publish and disseminate survey data • Harmonize land reference numbering systems

The following new projects are listed in the CIDP.

Table 8: New projects identified in the CIDP[9]

New project	Priority ranking	Objective	Targets	Description of activities
• Revision of Murang'a town zoning plan		• To coordinate the process of spatial development in the town	• 20-year plan	
• Revision of Kangema development plan		• To guide and link development within the region	• 20-year plan	
• Staffing and rationalization of staff • Training • Purchase at least two vehicles for planning functions • Equipping through Setting up a GIS lab • Set up offices in major urban areas		• Capacity building/ empowerment of land sector • Setting up of development control and enforcement unit • Harmonize development control standards, regulations, guidelines and fees and charges	• Organogram Increased efficiency • transparent land • Digitized data • Service charter	
• Develop land information system/database for all land transactions and plans • Development of contract documents for procurement of planning services • Ensure customer satisfaction through service charters. • Control of development and housing typologies • Operationalise the County Physical Planning Liaison Committee and other conflict resolution mechanisms e.g. land court				

[9] This table is quoted directly from the CIDP.

New project	Priority ranking	Objective	Targets	Description of activities
• Preparation of county spatial plans		• Promote appropriate and efficient land use • Provide a spatial depiction of social and economic development programmes • To contain urban sprawl • To contain unfettered spread of rural settlements • To safeguard agricultural land • To safeguard water towers and catchments • To protect wetlands, riparian reserves, etc. • To manage human-wildlife conflicts, etc. • To identify the spatial distribution of the resources within the county, their level of utilization and potential; • To assess the existing infrastructure their current conditions, capacity and projected demand; To identify fragile ecosystems and suggest intervention measures for their protection and conservation; • To investigate human settlement trends and propose an appropriate hierarchy or urban centres that will spur rural development; • To assess capacity of the existing institutions and organizations and suggest strategies to enhance their performance; • To design an integrated spatial framework • Spur rural-urban interlinkages	• sustainable and harmonious development outcomes enhanced • efficiency in services delivery and access	
• Operationalisation of Kenol Zoning Plan		• To improve the image of the town as a vibrant service town for recreation with hotel and light industries • Make town liveable	• Well planned functional town Acquired public places and open air markets and bus parks Improved connectivity and accessibility of residences, places of work, recreational/ social places • Adequate open spaces and recreational sites • Development control and Housing typologies. • Secure land rights to promote investments in urban centres	

New project	Priority ranking	Objective	Targets	Description of activities
• Re-planning of Kangari Town • Kangari Local Physical Development Plan		• Reduce congestion and disorder in Kangari • Regularization of developments • Security of tenure		
• Re-planning of Kandara Town • Kandara Local Physical Development Plan				
• Re-planning town plots (T plots)		• Improve accessibility • (connectivity) • Use of land more efficiently	• Functional plots	
• Preparation of Kiruara/ Gatura/ Gatanga local physical development plan				
• Ndakaine town to be planned as a tourist resort centre				
• Prepare part development plans for public land		• Secure public land	• Development of • public facilities	
• Mapping all ecologically sensitive areas including dams • Mapp all culturally important areas • Secure all the areas and channel to appropriate sector • Control/ prevent encroachment of these areas • Develop land information system/database for all land transactions and plans • Development of contract documents for procurement of planning services • Ensure customer satisfaction through service charters. • Control of development and housing typologies • Operationalise the County Physical Planning Liaison Committee and other conflict resolution mechanisms, e.g., land court		• Conservation and protection of ecologically and culturally sensitive areas	• Establishment of cultural centres Secured dams and water catchment areas	

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• Preparation of Kiruara/ Gatura/ Gatanga local physical development plan				
• Ndakaine town to be planned as a tourist resort centre				
• Prepare part development plans for public land		• Secure public land	• Development of public facilities	
• Mapping all ecologically sensitive areas including dams • Mapp all culturally important areas • Secure all the areas and channel to appropriate sector • Control/ prevent encroachment of these areas		• Conservation and protection of ecologically and culturally sensitive areas	• Establishment of cultural centres Secured dams and water catchment areas	

8 The ability to deal with the planning consequences

The challenges highlighted in the CIDP are real and constitute the issues confronting planners on a daily basis. However, plans most often fail for four reasons. The first is a lack of funding or access to funding to address all the issues identified. The second reason is planning for interventions where the planning authority have no executive authority, in other words, plan to intervene where planning authorites do not have the legal or constitutional mandate and thirdly, a lack of institutional capacity (including skills and experience) to plan and conceptualise realistic implementation plans. The last reason is a lack of an understating of the development dynamics in the planning environment due to a lack of suitable data and inappropriate analysis of the situation. The approach to the Murang'a County Spatial plans will, therefore, be to mitigate these challenges to ensure successful implementation.

Section 3. Macro development analysis

Land is commonly defined as a physical entity in terms of its topography and spatial nature; a broader integrative view also includes natural resources: the soils, minerals, water and biota that the land comprises. These components are organized in ecosystems which provide a variety of services essential to the maintenance of the integrity of life-support systems and the productive capacity of the environment. Expanding human requirements and economic activities are placing ever increasing pressures on land resources, creating competition and conflicts and resulting in suboptimal use of both land and land resources. It is essential to resolve these conflicts and move towards more effective and efficient use of land and its natural resources. Integrated physical and land-use planning and management is an eminently practical way to achieve this. By examining all uses of land in an integrated manner, it makes it possible to minimize conflicts, to make the most efficient trade-offs and to link social and economic development with environmental protection and enhancement, thus helping to achieve the objectives of sustainable development. The essence of the integrated approach finds expression in the coordination of the sectoral planning and management activities concerned with the various aspects of land use and land resources.[10]

The macro development assessment describes and analyses three distinct environments, being:

- The natural environment as the base upon which human activities developed,
- The built environment as the physical manifestation of human activities.
- The socio-economic environment that describes the content of human activities.

This section is concluded with integrating the impact of these three environments as they manifest as focal points for development (nodes), describing the movement and interaction between these nodes (networks) and the surfaces that fill the areas traversed by networks and activities interacting and gravitating towards nodal points. All this will be done against the backdrop of the urban-rural continuum that exists and described in an earlier section of this report. (See Paragraph 4: Methodology and approach)

9 Natural environment

Kenya is a country with varying climate, vegetation, topography, and underlying parent rock. The climate is the most important factor influencing soil formation. Climate affects the soil types directly through its weathering effects and indirectly as a result of its influence upon vegetation. In most parts of Kenya, soils are deficient in nitrogen (N), phosphorous (P) and occasionally potassium (K). The larger part of Murang'a falls within a humid region. These are areas with an altitude of over 1500 m which receive an annual rainfall of over 1000 mm. They have volcanic rocks, and the soils are mainly loamy. The eastern parts of Murang'a are regarded as part of the humid lowlands and have sandy soils which are well drained and are of loamy, sandy clay texture.

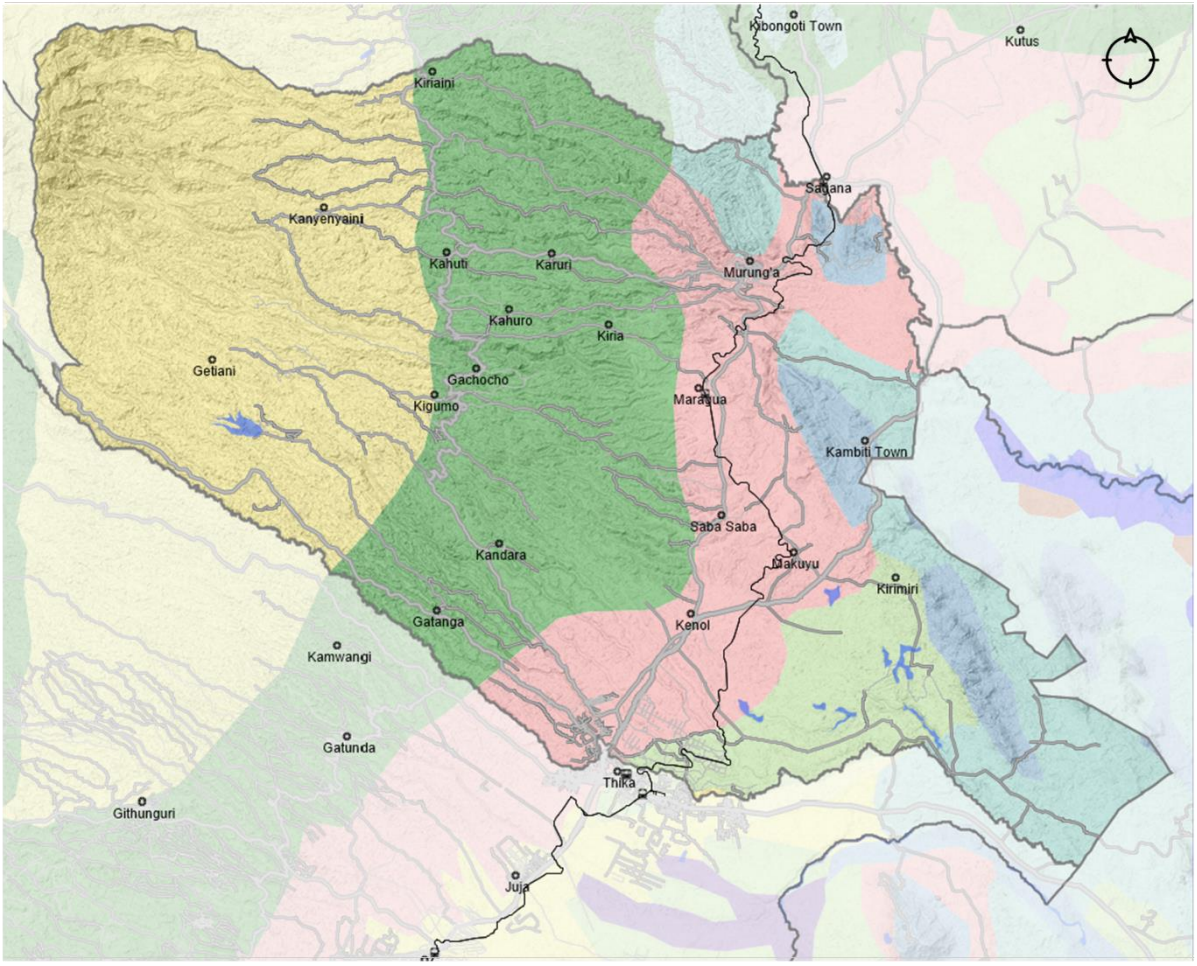
9.1 Geology

The underlying geology of the of the County was exclusively formed by volcanic activity. The western part of the county is dominated by the remnants of pyroclastic rocks which constitute a mix of volcanic ash, rocks, and materials emanated from volcanic eruptions. The rest of the County was covered by a family of igneous rock including basalt, gneiss, and andesite all resulting from lava flows. The pyroclastic rock is not well consolidated and often soft and subject to easy weathering. All volcanic soils generally have a

[10] UNEP Agenda 21, Integrated Approach to the Planning and Management of Land Resource. http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=52&ArticleID=58

high mineral content leading to deep, fertile soils. The engineering qualities of the rocks differ substantially.

Map 4: Geology



Lithology

LEGEND

- Acid igneous rock
- Acid metamorphic rock
- Andesite, trachyte, phonolite
- Basalt
- Basic igneous rock
- Clastic sediments
- Conglomerate, breccia
- Diorite-syenite
- Dolerite
- Eolian unconsolidated rock
- Fluvial
- Gneiss rich in ferro-magnesian mineral
- Gneiss, migmatite
- Granite
- Igneous rock
- Ilmenite, magnetite, ironstone, serpenti
- Intermediate igneous rock
- Lacustrine unconsolidated rock
- Limestone, other carbonate rocks
- Marine unconsolidated rock
- Marl and other mixtures
- Metamorphic rock
- Organic unconsolidated rock
- Pyroclastic unconsolidated rock
- Quartzite
- Rhyiolite
- Sandstone, greywacke, arkose
- Shale
- Siltstone, mudstone, claystone
- Ultrabasic igneous rock
- Unconsolidated
- Water

Source: MapAble

Murang'a County Spatial Plan

Nairobi Metropolitan Services Improvement Programme

Ministry of Transport, Infrastructure, Housing and Urban Development

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The next table gives a short summary of the soil profiles associated with the different rock formations as well as the engineering qualities thereof.

Table 9: Geology, soil and engineering properties of rock types

	Soil Profile	Engineering Qualities
Andesite	The rock is exposed to mechanical as well as chemical weathering. The typical chemical weathering product is a clayey soil.	The residual soils are expansive. Soils are only non-expansive in the early and late stages of weathering. Depth and stage of weathering vary significantly over short distances and may cause foundation problems. Large, unweathered core stones in the soil profile cause problems with the installation of piles as well as differential settlement. Damage to houses may be limited by using reinforced masonry work, flexible couplings in pipes and good site drainage with piled foundations or raft foundations in larger structures.
Basalt	Weathered basalt forms a clayey silt or silty clay soil depending on the rainfall and topography. In the mountains, the erosion rates are very high with virtually no soil cover except in the river valleys.	The soils have a moderate to high potential expansiveness and are relatively resistant to erosion. Buildings founded on these soils are prone to extensive damage due to the volume changes in the clay. The unweathered rock forms a good foundation and construction material when crushed. It may sometimes weather rapidly in roads, rockfill dams or embankments. The weathered product may be used for road building and is also a suitable impervious fill material for embankment dams.
Pyroclastic rocks	The rocks are composed solely or primarily of volcanic materials. Pyroclastic deposits are commonly formed from airborne ash, lapilli, and bombs or blocks ejected from the volcano itself, mixed in with shattered country rock. A deeply weathered soil profile usually forms. This is caused by the highly jointed rock mass.	A moderate collapsible soil may be expected, and moderate expansion is found in hillwash originating from these materials. In foundations, piles must be used in weathered zones due to core stone development and low strength. These rocks are extensively used as aggregates in construction as well as building (Block) materials.
Gneiss	In humid areas silty sand or clayey silt forms, which is mica-rich with quartz grains. These soils are dispersive (highly erodible) and have a high permeability. Core stone development and an uneven bedrock topography may occur. In some areas, e.g. Halfway House, a collapsible grain structure may develop.	Slope instability is frequent when it is saturated– which means that the ground can flow easily downhill. It is a high erodable soil. The core stones can cause problems in the placing of foundations such as piles. A collapsible grain structure may cause damage to structures if proper foundation measures are not implemented. Both the soils and the rock is widely used as aggregates for roads and concrete.
Basic igneous rocks	Basic igneous rocks include basalt, dolerite, and gabbro. The mineralogy of basic rocks is typically dominated by pyroxene and calcic plagioclase (>50% anorthite). They commonly include olivine as a non-essential mineral, and can include quartz, alkali feldspar, amphiboles and micas	Regarded as a solid rock and is therefore widely used as construction material.
Intermediate igneous rocks	Intermediate rocks are roughly even mixtures of felsic minerals (mainly plagioclase) and mafic minerals (mainly hornblende, pyroxene, and/or biotite). There is little or no quartz. Felsic rocks are mostly feldspar (especially K-feldspar), at least 10% quartz, and less than 15% mafic minerals (biotite, hornblende). Different soil profiles occur, but clay is the predominant soil forming in the wetter parts of the country. These clayey soils are the most expansive known in South Africa. The black colour is due to a complex forming between clay and organic material.	Unweathered rocks are hard and massive and are widely used in the building industry as dimension stone and concrete aggregate. Damage to structures is caused by the volume changes in the clay soil.

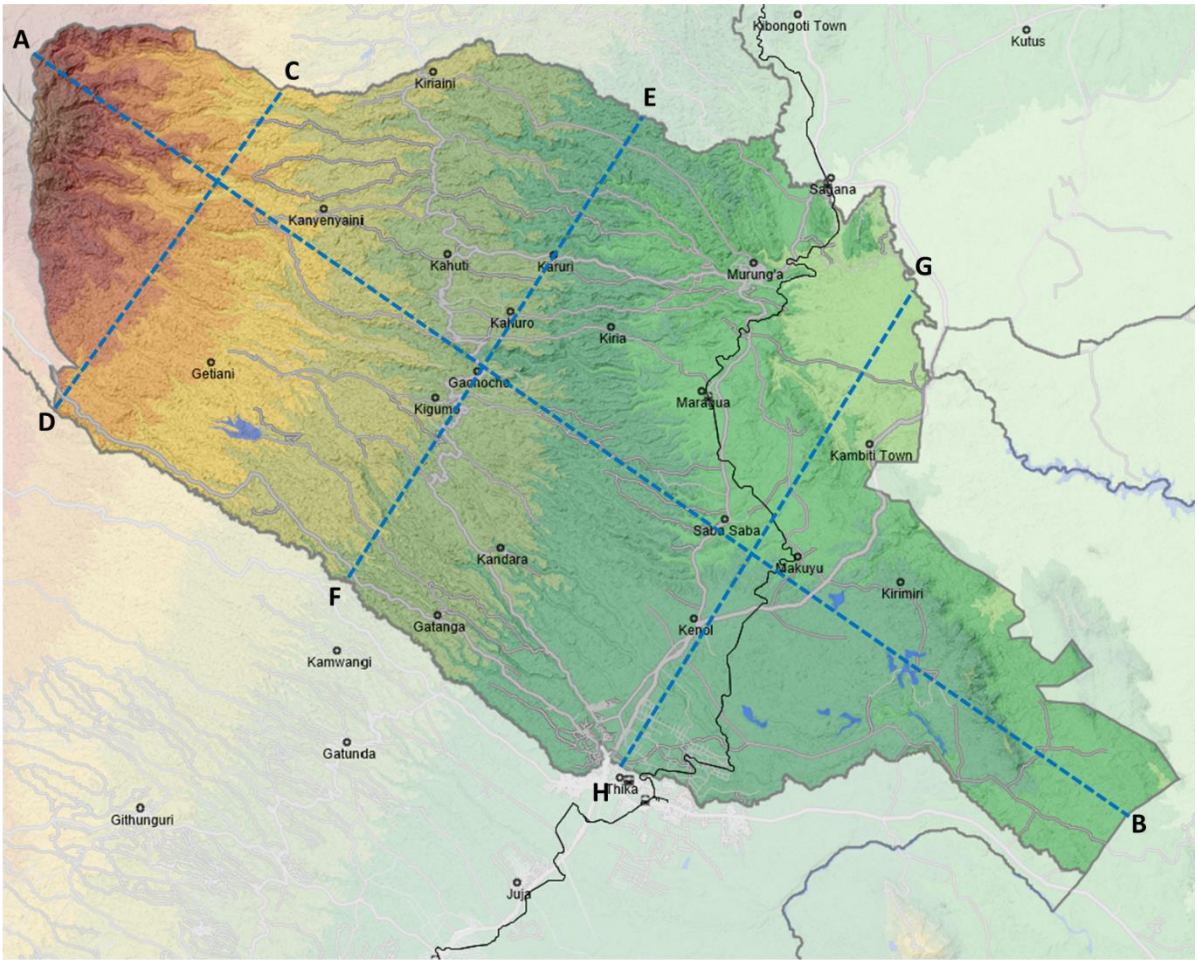
9.2 Topography

According to the County's website, Murang'a lies between 914m above sea level (ASL) in the East and 3,353m above sea level (ASL) along the slopes of the Aberdare Mountains in the West. The highest areas in the west have deeply dissected topography and are drained by several rivers. All the rivers flow from the Aberdare ranges to the West, South Eastward to join Tana River.

The topography and geology of the county is both an asset and liability to the county's development. The highest areas form the rain catchment areas from where most of the rivers draining the county originate.

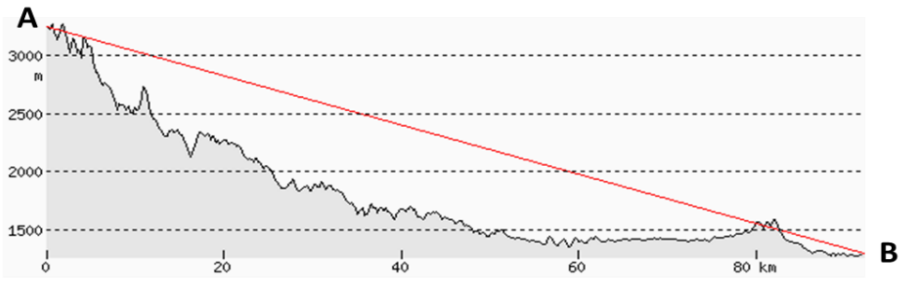
The terrain is dissected creating the menace of landslides and gulley erosion. The numerous streams and valleys necessitate the construction of numerous bridges to connect one ridge to the other; construction and maintenance of roads are therefore made difficult and expensive. Soils emanating from the volcanic activity are fertile and valuable for agriculture. The slopes in the rich volcanic soils on the higher altitudes are particularly suitable for tea growing.

Map 5: Elevation

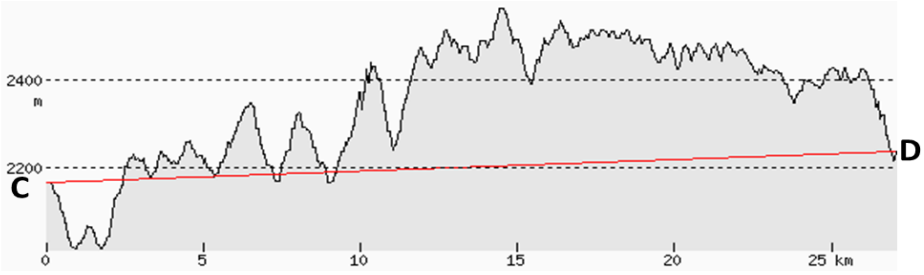


The variation in slope is illustrated in the vertical profiles.

Figure 14: Vertical profiles of Murang'a County



This profile shows the length of the County. The slopes are steep but flatten out from Sab Saba to the eastern boundary of the County. The flatter areas in the east are also the area dominated by commercial farming



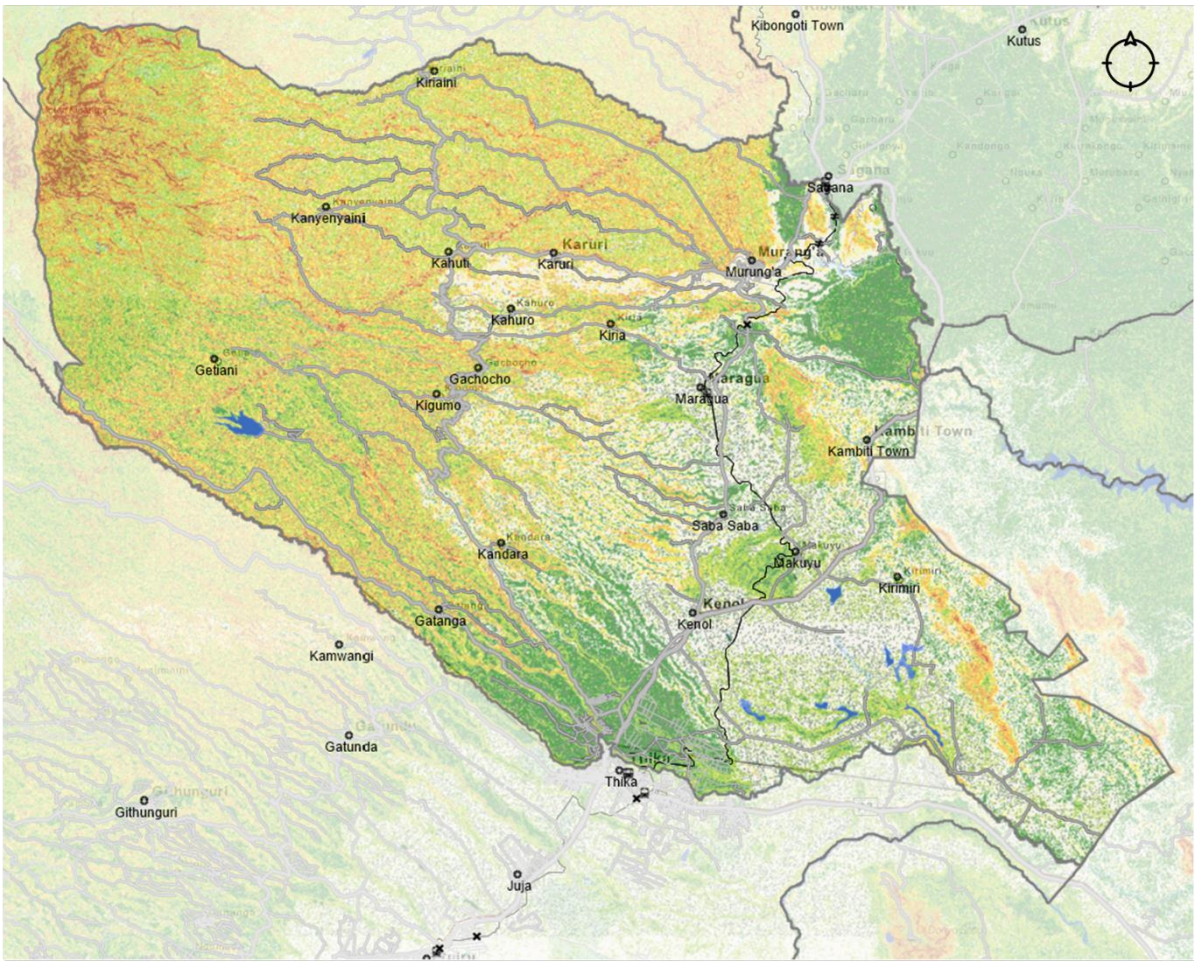
This slope is a cross section high up in the mountains. It is noticeable how the valleys are becoming more pronounced lower down the slopes.

Further down the northeast- southwest slope, the ruggedness of the terrain is even more pronounced. The deep valleys make south to north movement very challenging if not impossible in most cases

The variations in the vertical profile becomes less pronounced towards the southeast. There is a steep incline in the vicinity of Kambiti Town before the land levels out towards Thika in the west.

The next map indicates the slopes in the County. Slope might be one of the most notable features of the County determining settlement patterns and farming practices.

Map 6: Slope



Slope

LEGEND

- 0 - 2%
- 2 - 9%
- 9 - 21%
- 21 - 27%
- 27 - 45%
- 45% or more

Source: Kenya Planning Handbook

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The county slopes from the Aberdare Mountains in the northwest down to the southeast. These slopes were eroded by water courses and rivers and streams draining towards the low-lying areas. Given the underlying pyroclastic rocks and the weather basalts, resulting in soft deep loamy soils, erosion and weathering has led to very deep ravines and well-defined ridges that are not easily traversed. Slope profiles make movement from the southwest to northeast across the County very difficult if not often impossible. The largest parts of the County have slopes exceeding 9% which are areas not accessible to vehicles. The flattest parts of the County are in the southeast and are utilized by large farming estates. The area with steeper and most rugged slopes are also the areas the most densely occupied and settled areas. The high occupation densities and intensive small-scale farmer activities linked to small land division have created environmental imbalances that not only led to environmental degradation but also directly contributed to slope instability

Slope, in combination with underlying geology and high rainfall, make the most mountainous parts of the County susceptible to landslides. Several cases of landslides, mainly triggered by rainfall and human activities have been reported in the past and recently many landslides have occurred along Murang'a, Kisii and Mt Elgon region. Landslides are common in highly mountainous landscapes with ragged terrain. Sediment supplies from storm floods and by over steepening of dispositional slope and water movement trigger the slides. Due to the steep physiography and high sedimentation rates within Murang'a county, slumps, debris flows and turbidity currents are common. The county is the most prone part in Kenya, with the greatest number of recorded events.

Tea cultivation on very steep slopes

Unconsolidated soil leading to unstable slopes when disturbed (Outside Murang'a town)

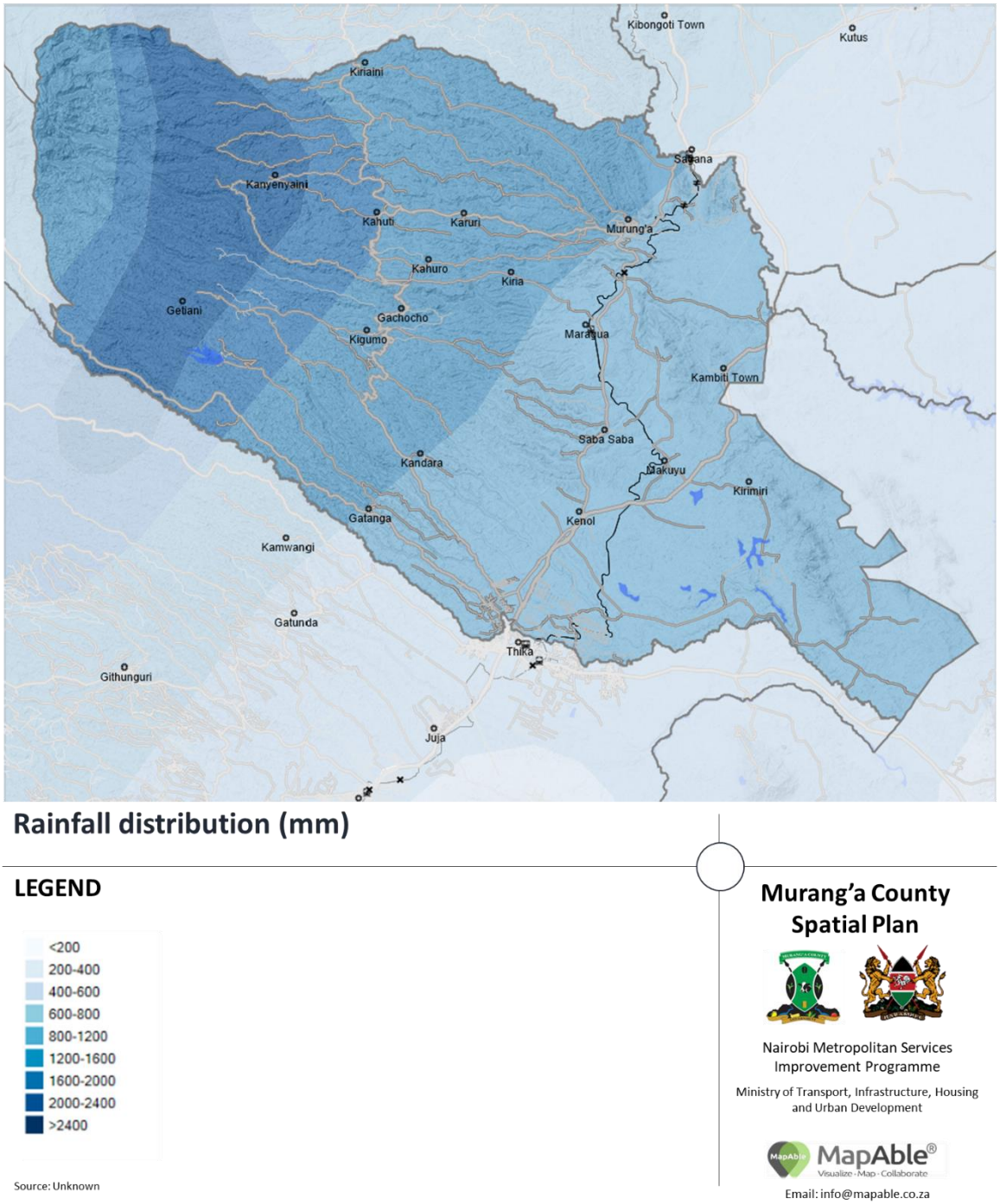
Uncontrolled quarrying on steep slopes

Landslide in Murang'a in April 2016 [11]

9.3 Climate

The climate of Murang'a is a derivative of its topography. The map below shows the usual rainfall patterns in the County which broadly divides the County into a western region with an equatorial type of climate, the central region with a sub-tropical climate and the eastern part of semi-arid conditions.

Map 7: Rainfall in Murang'a County



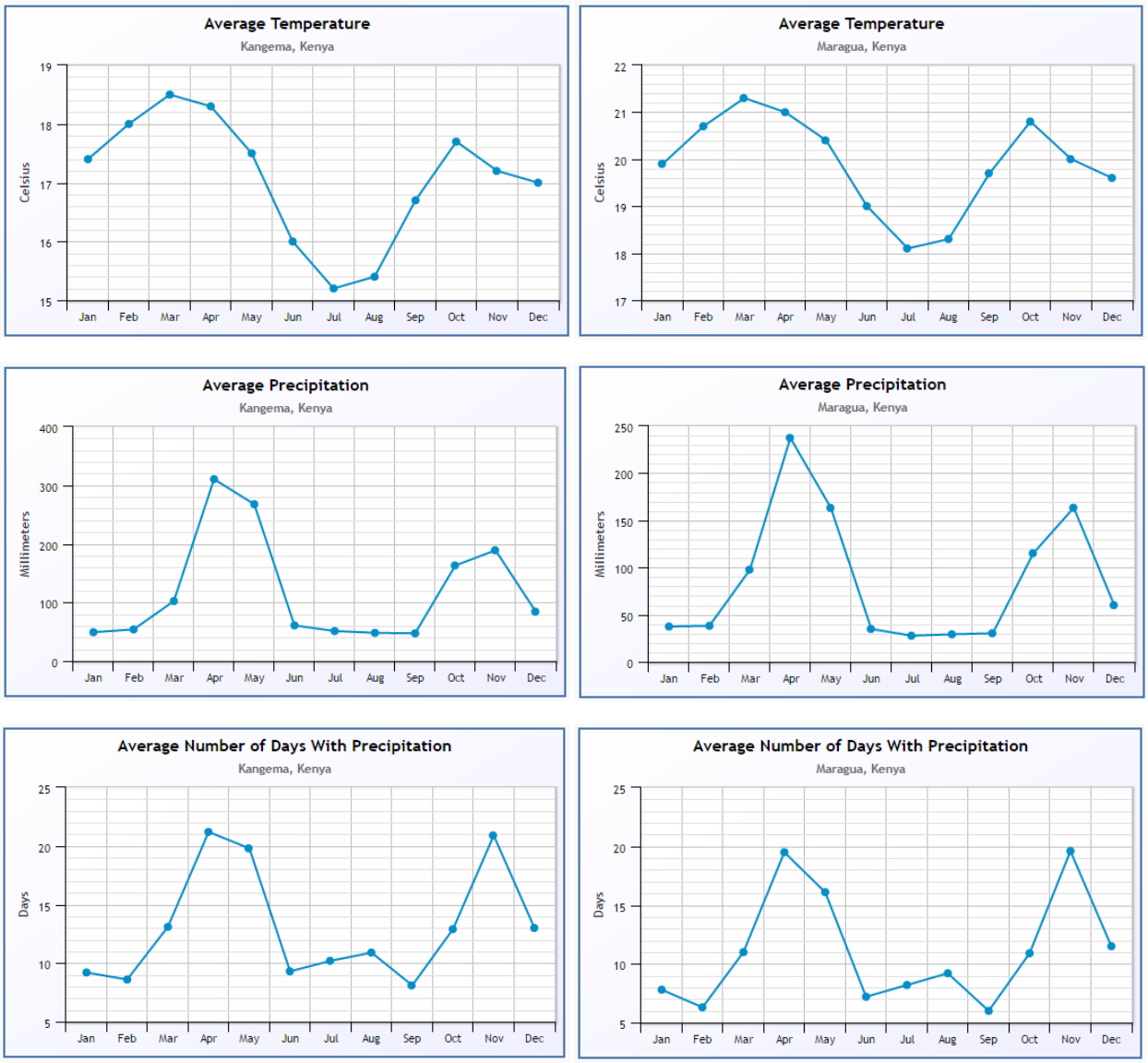
[11] http://www.the-star.co.ke/news/2016/04/27/video-landslides-alert-as-rains-pound-kigumo-constituency_c1339953

The majority of the rain falls in the months of March, April and May. The highest amount of rainfall is recorded in the month of April, and reliability of rainfall during this month is very high. The low rain fall season occures during the months of October and November. The western region, Kangema, Gatanga, and higher parts of Kigumo and Kandara is generally wet and humid due to the influence of the Aberdares and Mt. Kenya. The eastern region, lower parts of Kigumo, Kandara, Kiharu and Maragua constituencies, receive less rain, and crop production requires irrigation

The following figures show the average temperatures and rainfall for Maragua and Kangema. Although these two towns are only 21km apart the impact of Maragua being further east than Kangema clearly shows in the rainfall and temperature statistics

The difference is best illustrated by the fact that the rainfall in Kangema 1427.5mm per annum while Maragua receives 1034.6mm per annum. There is nearly a 400mm difference with a 600mm difference over the 90km length of the County.

Figure 15: Climate comparisons between Kangema and Maragua



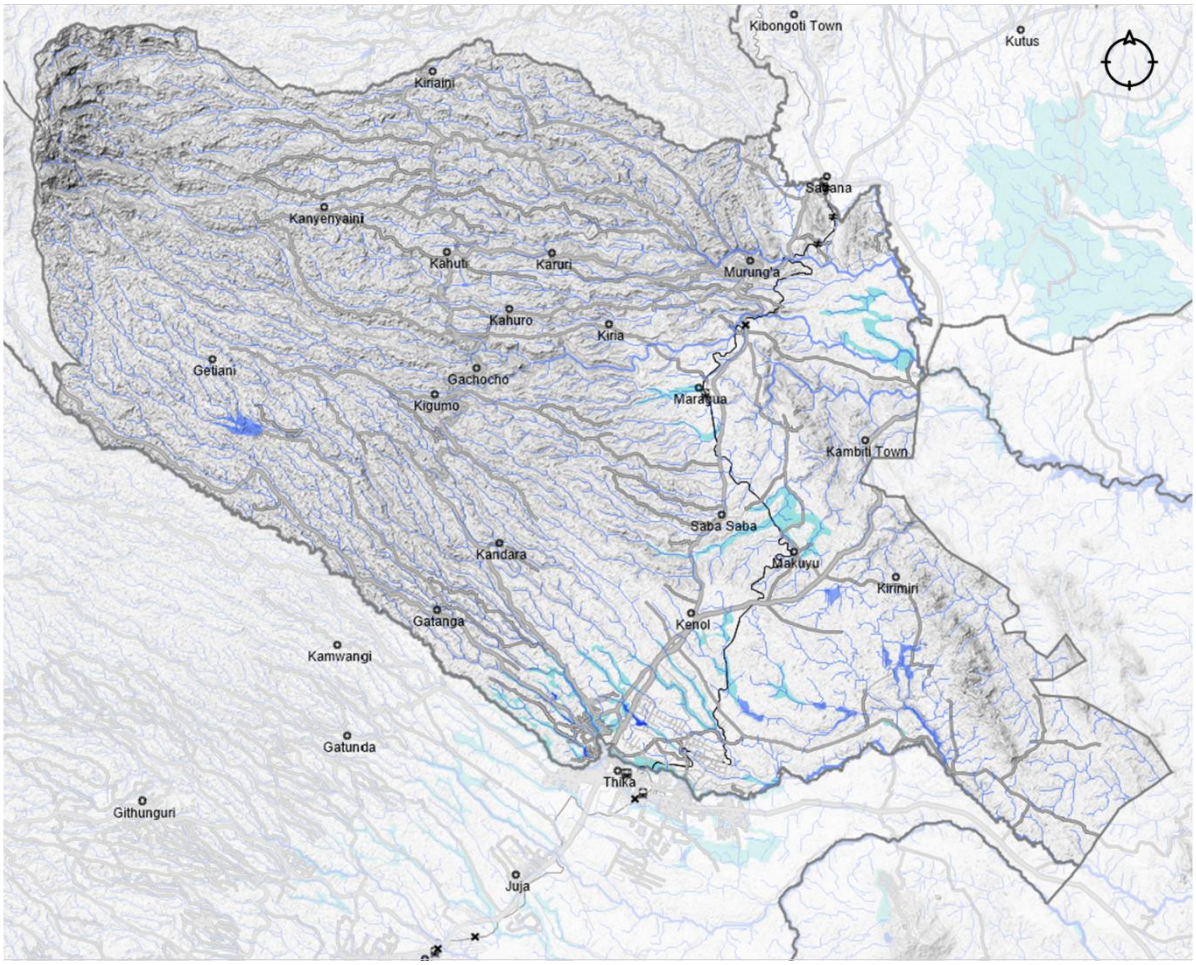
9.4 Hydrology

Again the hydrology of hydrological features reflects the topography and the County as well as the marked contrast between the large agricultural estates and the small scale farmers higher up in the mountainous areas. The forests of the Aberdare Mountains are also the major source of various rivers namely Maragwa, Mathioya North, Mathioya South, Kiama and Thika rivers. All these rivers eventually flow into the Tana River, but the county is topographically split by a watershed with the Thika and Kiama rivers to the south and the rest draining the northern part before joining the Tana River.

The terrain is dissected creating very pronounce topographical features consisting of a set of parallel running deep gorges separated by ridges along which most of the settlement takes place. The numerous streams and valleys necessitate the construction of numerous bridges to connect one ridge to the other; construction and maintenance of roads are therefore made difficult and expensive.

According to the County Development Planning Office, water resources are rivers, shallow wells, springs, dams, boreholes and roof catchment. There are ten permanent rivers, 400 shallow wells, 75 springs, 30 dams and 100 boreholes that supply water for domestic and agricultural use in the county. All these sources supply 60 percent of the county's population with clean and safe drinking water. However, some rivers in the county especially those near urban centres and markets are polluted due to poorly managed sewerage and drainage systems. Polluted rivers lead to diseases and environmental degradation contributing to the drying up of rivers and waterbeds.

Map 8: Hydrology



The most significant dam in the County is the Ndakaini Dam while there are numerous smaller dams associated with the agricultural estates in lower lying areas of the County. These dams are mainly for irrigation purposes where the rainfall is substantially lower than in the areas closer to the Aberdare Mountains in the west. According to a report in The Star[12] the Murang'a government has announced plans to build 25 dams in lower parts of the county to boost food security. The county government will also roll out mega irrigation programmes in the areas. 15 dams dug by colonial administrators in 1950s remain

[12] http://www.the-star.co.ke/news/2014/05/23/25-dams-set-to-boost-crops-in-muranga-county_c944053

abandoned despite their potential in supporting irrigation for food crops and ten more will be built by the Murang'a County government.

The Thika dam is owned by Athi Water and operated by the Nairobi City Water & Sewerage Company. The dam's construction started in the year 1988. when The Kenya Government acquired approximately 1,200 acres of land to create space for the construction of the dam to supply portable water to the residents of Nairobi City and its environs. Water from the dam is conveyed through a system of tunnels running from the dam, tapping Kiama River and Kimakia River and diverting the flows to Chania River at the Mwagu Outfall. Water is tapped from Chania River at Mwagu and conveyed via a tunnel to the Mataara chamber from where it's conveyed by pipelines to Ngethu water production plant.[13]

Figure 16: Ndakaini Dam

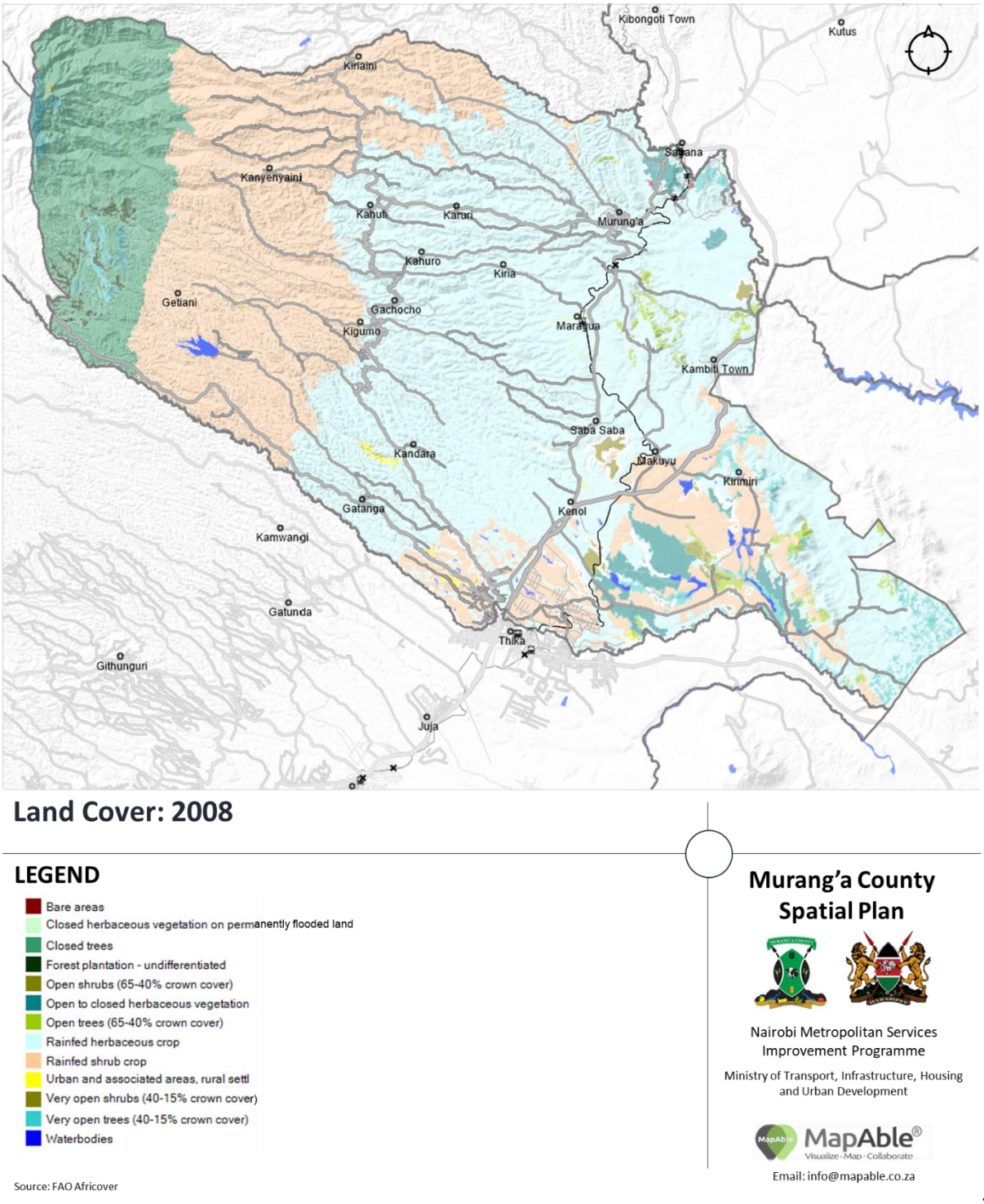
Source: *http://awsboard.go.ke/media/photo-gallery/ndakaini-dam/*

9.5 Vegetation and land cover

The land cover map below clearly shows how land cover and hence, vegetation, align with the topography and rainfall patterns in the County.

[13] http://awsboard.go.ke/our-projects/thika-dam-ndakaini/

Map 9: Land cover 2008



The land cover describes four major areas all associated with particular vegetation types. The forest areas are well defined and represent an area of highly dense and undifferentiated tree growth. There is a high premium on the protection of these areas to sustain water resources and ensure sufficient rainfall and runoff to meet the water requirements of the lower lying agricultural zones.

The rain fed scrub crop area represents the tea growing area in the county and is associated with high rainfall and occurs general above 1 700m above sea level. This area is very intensively cultivated and

largely devoid of any natural indigenous vegetation with exotic trees such as blue gums, black wattle and various other species invading river banks and roadsides.

Figure 17: The characteristics of the rain fed scrub crop zone

The majority of the lower lying area is covered by rain fed herbaceous crops and a subtropical zone. In this area a range of crops are cultivated which includes coffee, bananas, various other fruits and also grain. This area, especially in lower eastern parts, is also used for more extensive stock farming. This area is also the most densely populated area, outside the main urban cores, in the county. It is largely devoid of any natural or indigenousness vegetation.

Figure 18: Land cultivation and mixed crops in the rain fed herbaceous crop zone

The southeaster part of the County represents a mixed land cover with ranging from rain fed scrub crops, herbaceous vegetation, tree covered areas and open grasslands. This part of the County is also intensely

cultivated and large tracks of land utilised by agricultural estates. These areas are generally dryer than the rest of the county and irrigation of crops takes place.

Figure 19: Coffee estate and drying facilities off the Thika-Gatura Road

Figure 20: Low scrubland in the eastern dryer parts of the County

9.6 Sensitive areas and conservation

In Kenya, the adverse impacts of climate change are compounded by local environmental degradation (illegal encroachments and settlements, logging and livestock grazing), which have, among others, further aggravated deforestation and land degradation. Forest cover in Kenya for instance has fallen from 12% in the 1960s to less than 2%. This has considerably affected the ability of Kenya's five main Water Towers to act as water catchments for major rivers and lakes, which are the main sources of water for daily consumption in rural and urban areas.[14]

[14] Government of Kenya, *National Climate Change Response Strategy*. April 2010. p10

Within the context of the broader views expressed in the National Climate Change Response Strategy of 2010, the Country Integrated Development plan is more focused. The CIDP (p.57) states that environmental conservation and management is important to county development. The CIDP highlights the following areas to be addressed:

- To ensure that the populace lives in a clean, secure and sustainable environment,
- Increased forest cover;
- Reduction of environment-related diseases;
- Promoting environmental conservation;
- Improving pollution and waste management;
- Promoting public-private partnership improves water and sanitation delivery.

Figure 21: Entrance to the Aberdare forest area

The CIDP recognises that saving the environment, environmental protection and long term economic growth are both complementary and mutually dependent. A number issues that contributes to a poor environmental quality. These issues are listed as:

- Poor farming methods leading to soil erosion and leaching;
- Deforestation;
- Quarrying and sand harvesting;
- Poor drainage;
- Overgrazing;
- Poor soil conservation methods;
- River pollution.

9.6.1 Water source conservation: Water towers

Most documents and articles dealing with environmental issues in Kenya emphasises the importance of water conservation and specifically conserving and protecting water sources. The basis of these conservation drives centres on the so-called “water towers” in Kenya. Kenya’s five key “water towers”

(Mount Kenya, the Aberdare Range, the Mau Forest Complex, Mount Elgon and the Cherangani Hills) are the main water catchments for nearly all the main Kenyan rivers. Deforestation of these water towers deprives the economy of 6 billion shillings annually and threatens more than 70% of the country's water supply and 50% of its electricity, according to UNEP[15].

The Aberdare Range, which is located in central Kenya, on the eastern edge of the Rift Valley and forms the western boundary of Murang'a County. The forest belt of the Aberdare Range comprises some forest reserves, as well as some forest areas in the Aberdare National Park. The forests cover over 250,000 ha. These forests form part of the upper catchments of Tana River, Kenya's largest river starting in the forests of the Aberdare Mountains and give rise to numerous streams and rivers shaping the landscape of Murang'a before joining the main flow of the Tana River. They are also the main catchments for the Sasumua and Ndakaini dams, which provide most of the drinking water to Nairobi.

Water and other forms of pollution remains a serious issue at local as well as county scale. At a local level the inability to delivery sanitation services leads to sewage drain into storm water system and then into the natural water runoff drainage systems.

9.6.2 Deforestation and environmental degradation

According to the CIDP the effects of environmental degradation are being experienced at county level as a result of over exploitation of forests and unsustainable extraction of non-renewable resources. Indiscriminate felling of trees in protected and unprotected forests has led to destruction of water catchment areas and consequently reducing river recharge base.

Figure 22: Charcoal burning in Murang'a contributing to deforestation

The extent of the populations living of the land in Murang'a simply makes deforestation inevitable. Limited land, as reflected in a number of indicators, forces people to deforest areas to find land to live and cultivate crops to survive. Deforestation for crop production, leads to inappropriate agricultural practices contributing to erosion and in some cases landslides. However, one should recognise that all

[15] http://www.naturekenya.org/content/water-towers-forests-and-green-economy-outcome-first-high-level-national-dialogue

these practices are part of a day to day survival strategy of very poor people living on uneconomical plots of land.

Figure 23: Deforestation as part of a survival strategy

9.6.3 Quarrying

Murang'a quarries is the main source of building materials especially bricks and building stones. There are also sand quarries on the border of Murang'a and Machakos that are a source of income for local residents. According to the Daily Nation[16], quarrying is the backbone of the local building construction industry. According to the paper, the sector, perceived as a source of livelihood for many communities, has turned into a death trap. In February 2016, five people were buried alive after a quarry caved in at the Mukangu village of Murang'a East district. Quarries operates without any clear regulatory framework, leading to dangerous operations. Most workers have no protective gear, water or toilets. Work takes place in high vertical cliffs, and risky transport and tunnelling make the sites unsafe. Several quarries are close to homesteads, schools, roads, rivers, railway lines and shopping centres, and there are complaints of a nuisance and danger posed by uncontrolled and illegal blasting, dust and water ponding in the pits. Quarries encroach onto ecologically sensitive areas and the deposition of waste in some waterways. There is notable land degradation due to inadequate rehabilitation and quarries' after-use plans. However, quarries are important sources of employment and economic activities, and one should expect them to remain so into the future.

16 http://www.nation.co.ke/News/regional/New%20move%20to%20make%20quarries%20a%20safe%20place%20to%20work%20in%20/-/1070/903220/-/nbj5e7z/-/index.html

Figure 24: Informal brick making contributing to environmental degradation

Figure 25: Uncontrolled quarrying outside Murang'a Town

10 Socio-economic environment

Building on the resource base and attributes of the natural environment as described above, the socio-economic environment reflects the outcomes of the interactions between people amongst themselves and the broader environment in which they function.

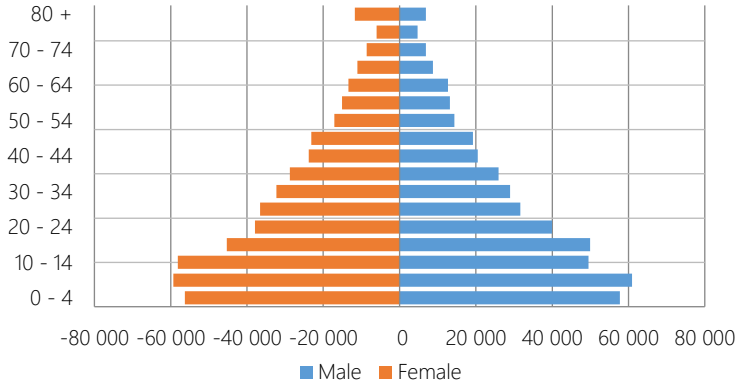
10.1 Demographics[17]

The 2009 Population and Housing Census recorded a population of 936,228 persons for Murang'a County, consisting of 451,751 males and 484,477 females and a growth rate of 0.4 per cent per annum.

10.1.1 Population size and gender characteristics

The figures bellows shows the age structure of the County's population based on the 2009 census. The structure of the population shows a wide base which is expected and indicative of a very young population normally associated with rural population in areas with Murang'a characteristics.

Figure 26: Murang'a population structure 2009



A number of indicators can be derived from this data as indicated in the table below.

Table 10: Gender ratios - Muranga and Kenya

	Murang'a		Kenya	
	Population	%	Population	%
Female	484 477	51.7%	19 417 639	50.3%
Male	451 751	48.3%	19 19 2458	49.7%
Total	936 228	100.0%	38 610 097	100.0%
Female/Male ratio	1.07	7.2%	1.01	1.2%

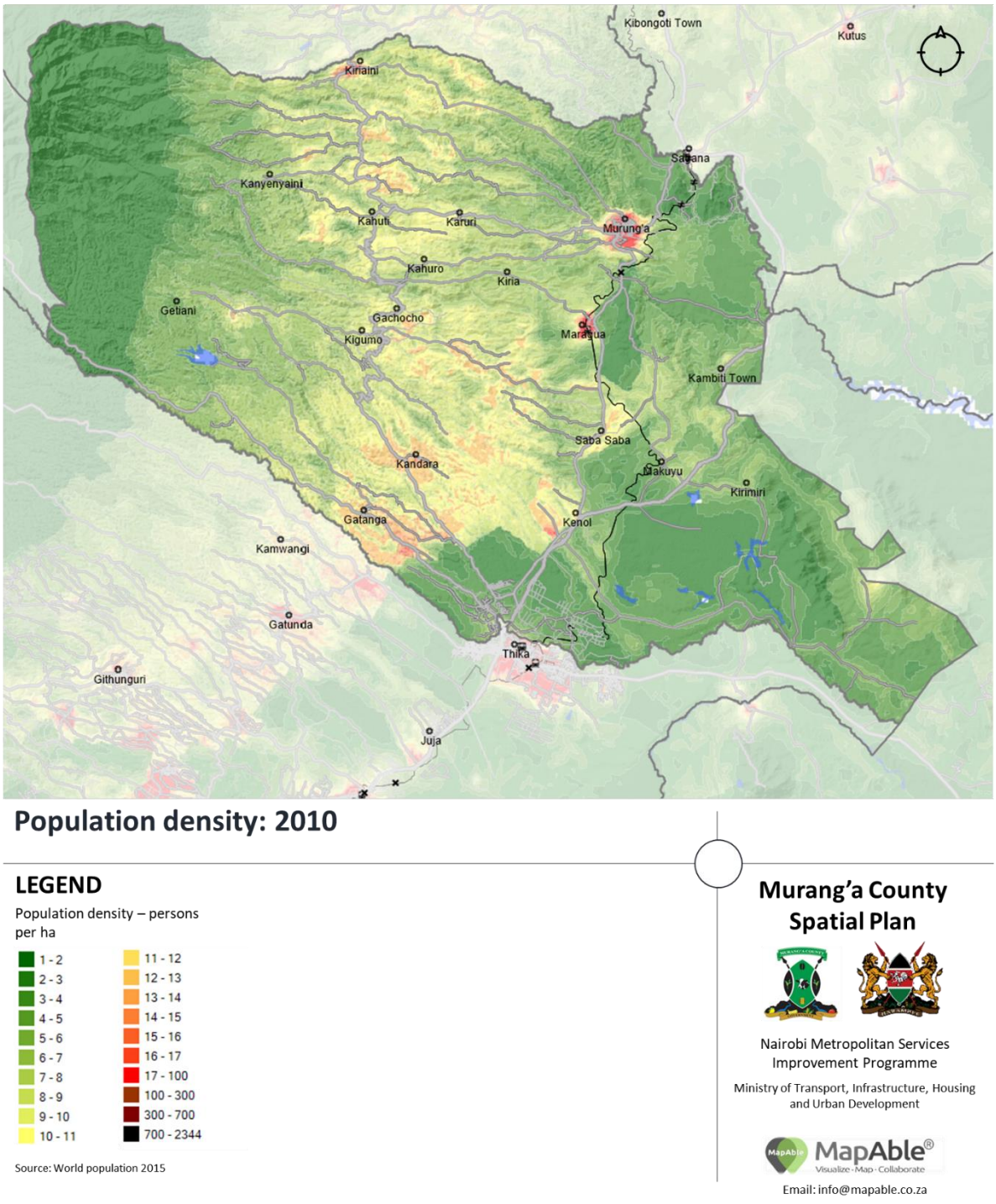
The male: female sex ratio for the county is 48:52 compared to the national 50:50. The higher female population in relation to male is attributed to male emigration to other counties and towns in search of employment and business opportunities. One should, however, expect this to be more pronounced in the economic active group of the population. However, this is not the case, and the ratios remain fairly consistent through all the age cohorts.

10.1.2 Population distribution

The next two maps show the distribution of populations in Murang'a in 2010 and 2015 respectively.

[17] This section of the report is based on the data and details provided in County Integrated Development Plan 2013 – 2017. The data is accepted as presented in the CIDP and reworked for the purposes of this plan where necessary. This approach was adopted since the team wants to avoid a position where data is provided for decision making that might differ from other official plans in the County. Where different sources were used the source is referenced in the text.

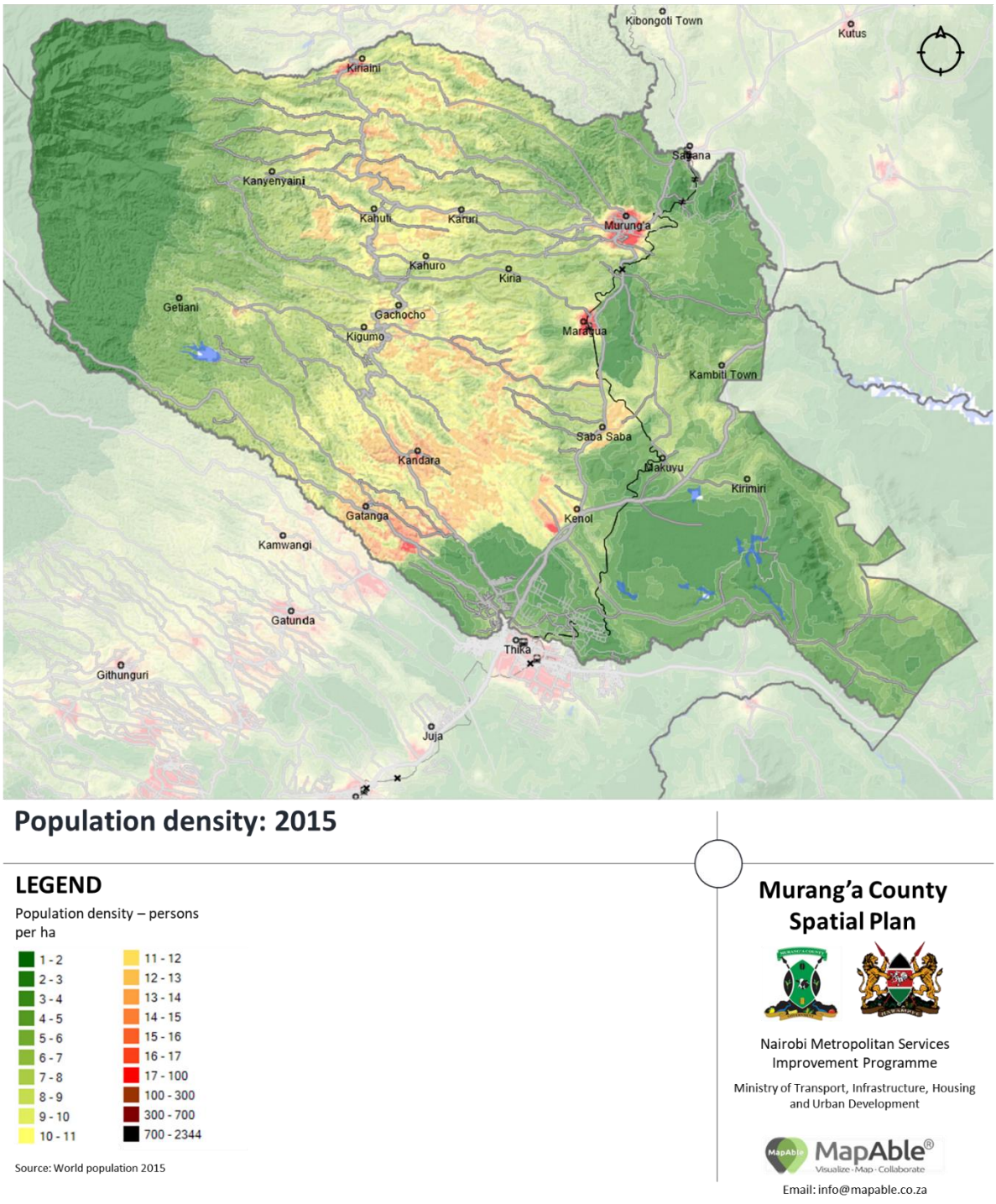
Map 10: Population density and distribution 2010



Source: *http://www.worldpop.org.uk/ as prepared by MapAble*

When comparing the 2010 and 2015 positions as shown on the two maps, it is clear that there are little changes in the broad patterns that exist. Population distribution still reflects broad settlement patterns that developed during Kenya's colonial area persist. Settlement densities are relatively high for rural areas and reflect the impact of topography, agricultural production, and accessibility. There are only three significant population concentrations, namely Murang'a, Muragua, a small area next to the A2 south of Kenol and Kiriaini in the north.

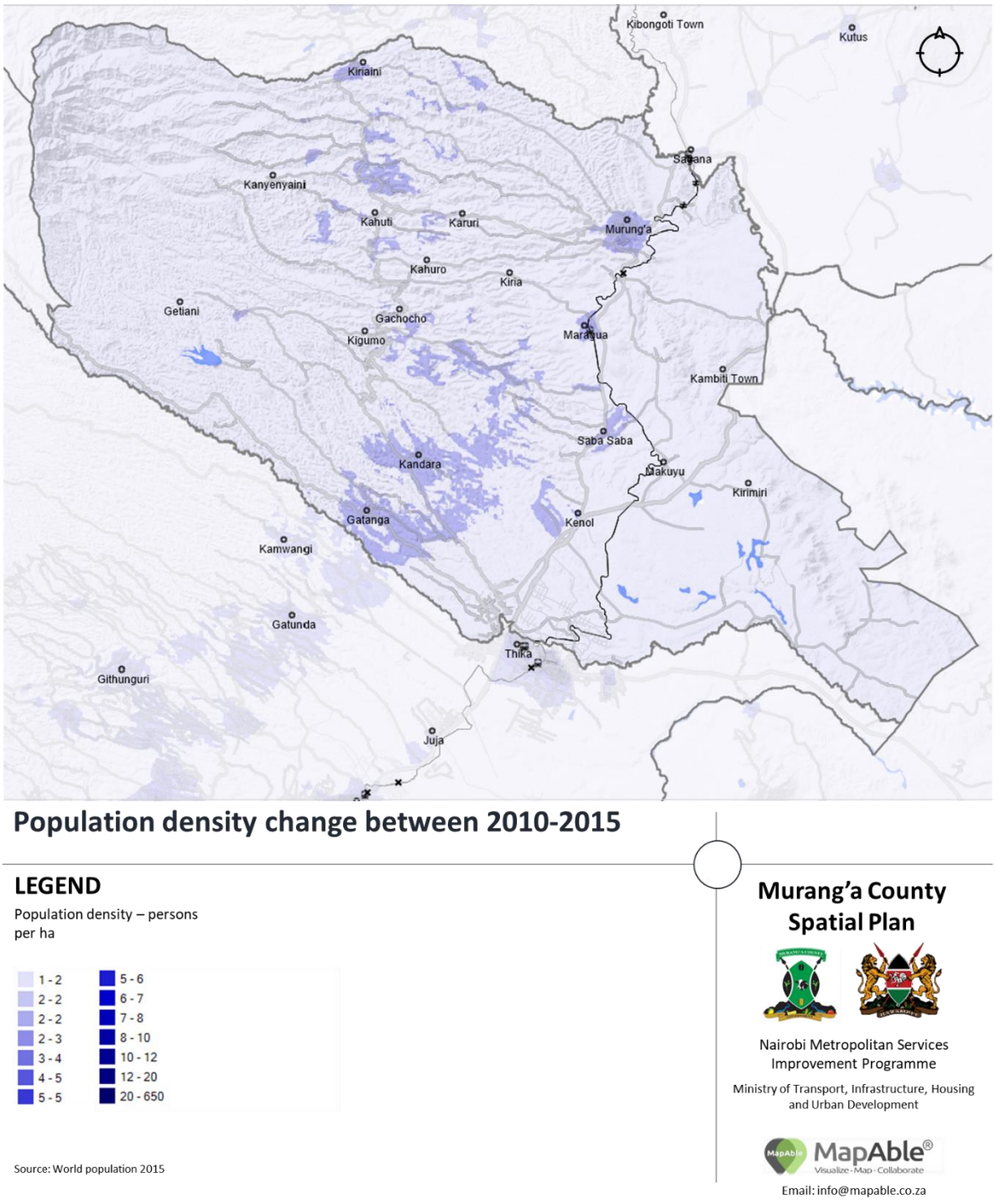
Map 11: Population density and distribution 2015



Source: *http://www.worldpop.org.uk/ as prepared by MapAble*

The map below shows the spatial extent of population changes between 2010 and 2015. It confirms the growth areas as highlighted above but it also focusses attention on population growth in the subtropical agricultural area. It is clear that there is practically no population increase in the tree growing area on the mountain slopes while the commercial areas. With the exception of the towns has little or no population growth.

Map 12: Population density change between 2010 and 2015



Source: *http://www.worldpop.org.uk/ as calculated by MapAble*

10.1.3 Population growth expectations

As indicated above, the CIDP indicates an expected population growth rate in in the County of 0.4% per annum with a total population of 936 228 in 2009. All population changes presented the CIDP is based on a uniform and consistent growth rate of 0.4% per annum. This applies to gender and age cohort splits as well as urban and rural population. The data does not take into account possible structural changes as well as differential growth between urban and rural areas. The projections below are based on trend

projection which confirms a declining growth rate since 1979 and well as a decreasing household size. The net result is not much different from the CIDP projection but may present a more realistic trend.

This projection represents an increase of only 4 056 or, at an average household size of 3.66, and increase over less than 1 000 households. This is very low growth and one should therefore not expect changes in demand and spatial structure based on local growth expectation.

Figure 27: Census based population projections

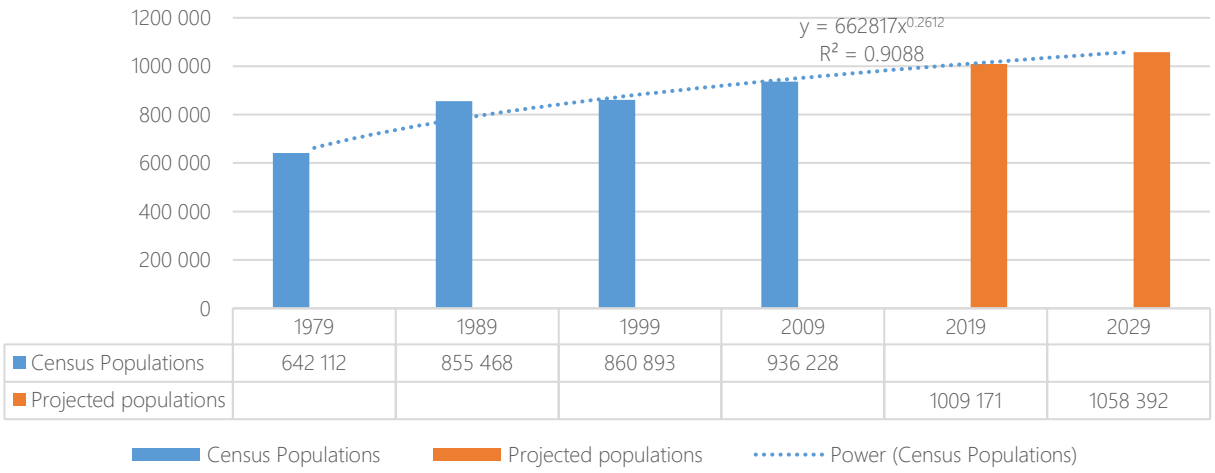
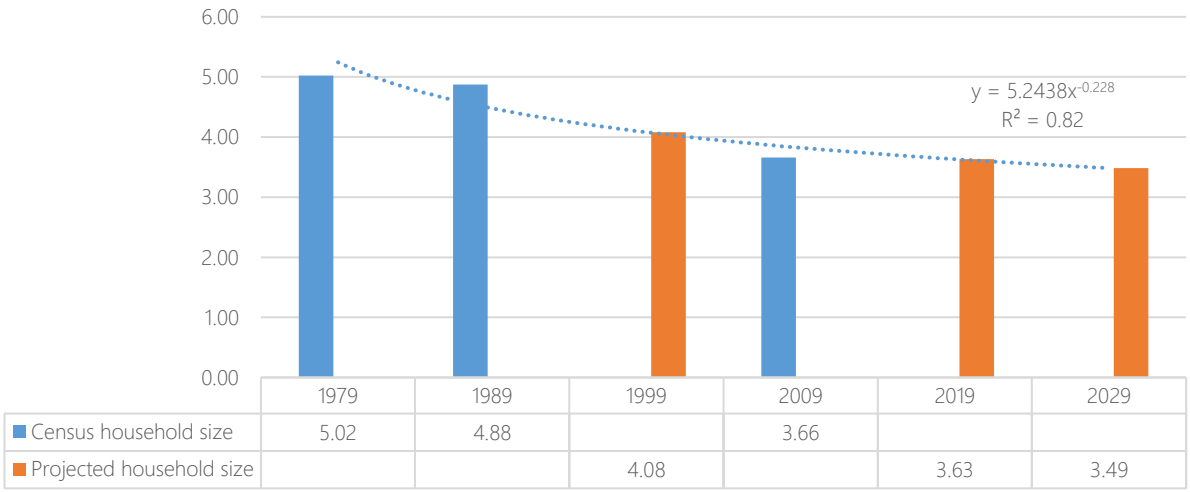


Figure 28: Census based household size estimates



The results of the projections are summarised in the table below.

Table 11: Population and household estimates for Murang'a 1979 to 2029

Year	Population			Households			
	Census	Projected	Growth	Census	Projected	Household size	Projected size
1979	642 112			127 804		5.02	
1989	855 468		3.3%	175 425		4.88	
1999	860 893		0.1%	210 905			4.08

Year	Population			Households			
	Census	Projected	Growth	Census	Projected	Household size	Projected size
2009	936 228		0.9%	255 696		3.66	
2019		1 009 171	0.8%		277 769		3.63
2029		1 058 392	0.5%		303 682		3.49
Average			1.3%			3.3%	

10.1.4 Urban-rural distribution of populations

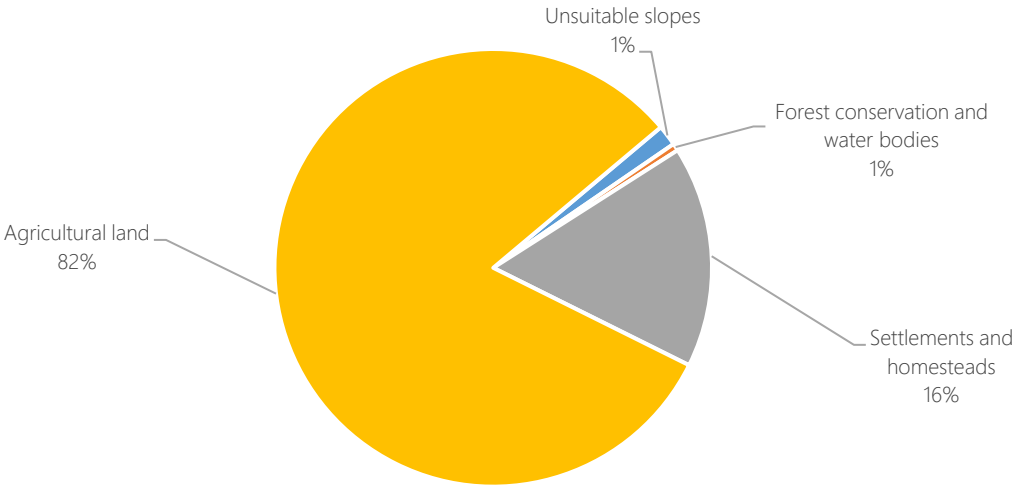
Murang'a is 16.3% urbanised against the 32.3% of Kenya and a whole.[18]. This is extremely low but important to the extent that it describes and dictates the nature of spatial development and interaction in the county. The CIDP (pages 31 to 40) gives a comprehensive overview the range of economic activities in the County. This section of this report will interpret these activities in terms of its spatial impact and linkages across the broader region.

10.2 Local economic structure

The space economy of the County is dominated by agriculture with smaller settlements dispersed through the County mainly supporting agricultural activities through the provision of basic retail, financial and marketing systems for agricultural produce.

In 1979 the proportions of land use in the County was as follows.

Figure 29: Proportions of land use[19]

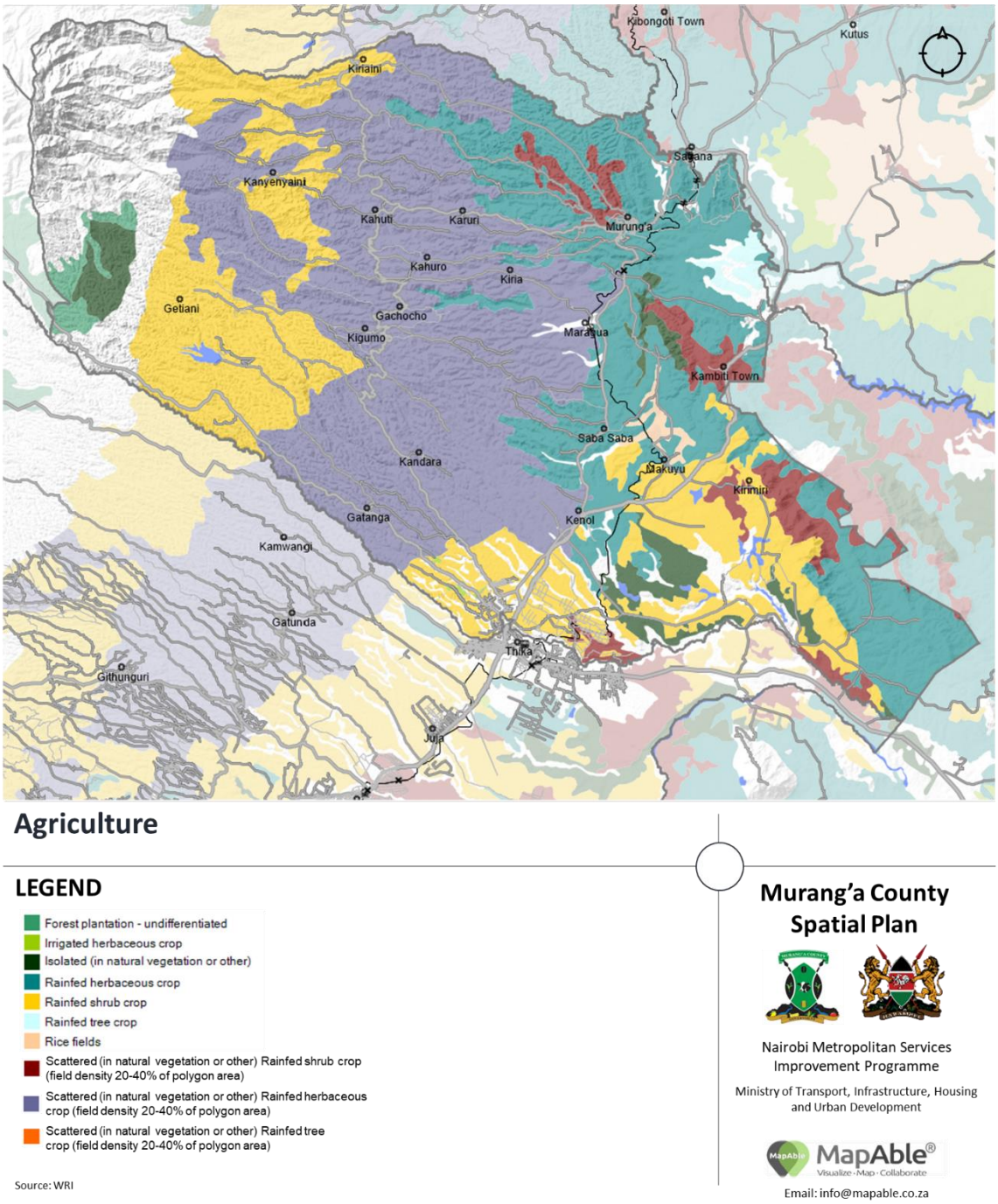


10.2.1 Agriculture

The backbone of Murang'a County's economy is deeply rooted in the agricultural sector. The residents also engage in small scale farming and livestock keeping. Agriculture is practiced on small family land holdings. Over 60 percent of small scale, farmers grow cash crops tea and coffee.

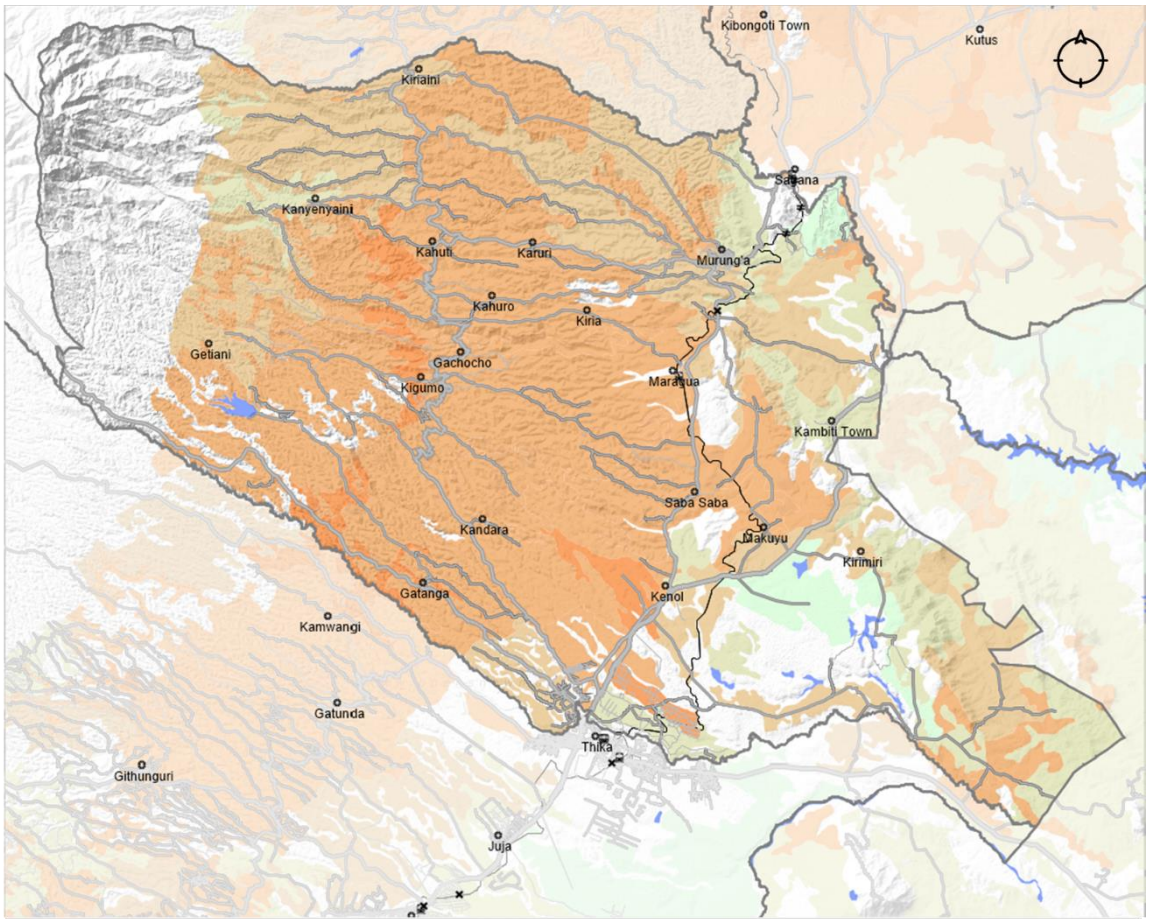
[18] https://www.opendata.go.ke/Urbanization-/County-Urbanization-Murang-a/9qgm-exbm/data
[19] Department of Agriculture, *Farm Management Handbook Vol II Part B*, 1983. p.583

Map 13: Agricultural production areas



The map above shows the extent to which the variety of crops cultivated in Murang'a is a function of the underlying climatic and geographical features of the County. According to the the CIDP, six tea factories serve most farmers in Githambo, Gatunguru, Kanyenya-ini and Kiru. Coffee factories in the area include Kanyenyaini, Mihuti and Gathima, Kiharu coffee factories among others. Other agricultural activities that support the county's economy include macadamia farming. Dairy farming is widespread in the county with milk processing plants spread across various towns. Kenya Cooperative Creameries and Mountain Fresh milk plants are in Kangema.

Map 14: Crop diversity



Crop diversity (total different types)

LEGEND

0 - 1
1 - 2
2 - 3
3 - 5
5 - 7,5

Source: WRI

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The map above shows the extent of crop diversity in the agricultural areas. Diversity is always a measure of risk mitigation and lessens the dependence on single commodities to sustain the local economy. Crop diversity is the highest in the sub-tropical zone with much lesser diversity in the eastern parts. However, the lower crop diversity might also be associated with the large farming estates focusing and specialising in single crops types.

Although there is high crop diversity, tea and coffee production still dominates agriculture. These are commodities produced by mostly small-scale farmers and marketed through cooperatives and factories for the export market. Being export orientated industries, they are subject to international economic fluctuations outside local control. This makes the whole County economically very vulnerable as was

illustrated by the collapse of international coffee market in the mid-1990's. According to the Composite Index of the London-based International Coffee Organization, the monthly coffee price averages in international trade, had been well above 100 US cent/lb during the 1970s and 1980s, but then declined during the late 1990s reaching a minimum in September 2001 of just 41.17 US cent per lb and stayed low until 2004. The reasons for this decline included a collapse of the International Coffee Agreement of 1962–1989[15] with Cold War pressures, which had held the minimum coffee price at US$1.20 per pound.[20]

Figure 30: Redundant infrastructure in after the collapse of the international coffee market

Figure 31: Abandoned coffee factory

Small-scale tea farmers are very dependent on the existing marketing system whereby the delivery tea through collection points to factories. The system is currently going through a period of uncertainty with the possible introduction of the draft Bill that seeks to expand the functions of the Agriculture, Fisheries and Food Authority (Affa) to include prescribing the guaranteed least earnings for the two cash crops. Proposed price control and regulating marketing might have a detrimental impact on the County economy[21]. Regarding the spatial impact, tea marketing, linked to the relative immobility of small-scale farmers are dependent on a system of tea collection points. These collection points naturally demand a minimum level of road access and are spread through the tea producing zone. There is no evidence that

[20] https://en.wikipedia.org/wiki/Economics_of_coffee
[21] http://www.the-star.co.ke/news/2016/07/15/muranga-tea-farmers-tussle-with-tea-agency_c1386053

the system, as it has developed, is contributing in any way to improve the spatial system or spatial differentiation in terms of the settlement and movement.

Figure 32: Farmer delivering tea to a collection point

Figure 33: Difficult road conditions hamper the collection of agricultural products and access to markets

Figure 34: Collecting tea at a rural collection point

Livestock farming is also important in Murang'a and it general regarded as an important milk production area. However, except the most eastern parts, livestock farming is part of broader mix agriculture production across the County. The table below shows how Murang'a contribute to livestock farming in Kenya

Figure 35: Distribution of livestock between the Counties in Kenya[22]

	Cattle	Sheep	Goats	Donkeys	Pigs	Indigenous Chicken	Chicken Commercial	Bee Hives	Camels
Baringo	1.4%	1.3%	1.5%	1.6%	0.1%	1.1%	0.5%	2.2%	1.9%
Bomet	6.2%	2.2%	1.6%	5.0%	0.6%	5.3%	0.9%	3.3%	5.7%
Embu	2.2%	0.9%	3.2%	1.5%	3.0%	3.3%	1.5%	9.7%	3.8%
Garissa	6.7%	15.4%	22.7%	11.4%	0.0%	0.4%	0.4%	0.3%	3.8%
Homa Bay	1.9%	1.0%	1.5%	1.1%	0.5%	3.3%	0.5%	0.1%	1.9%
Kajiado	2.2%	6.0%	3.4%	0.4%	2.5%	1.1%	5.7%	0.3%	1.9%
Kakamega	1.1%	0.2%	0.1%	0.1%	5.8%	2.1%	0.3%	0.3%	1.9%
Kericho	3.2%	1.0%	1.1%	3.8%	0.4%	3.1%	1.0%	1.2%	1.9%
Kiambu	4.1%	2.8%	1.7%	2.6%	20.6%	6.1%	37.1%	2.3%	5.7%
Kirinyaga	2.1%	0.5%	1.5%	0.8%	5.0%	3.6%	1.8%	1.0%	1.9%
Kisii	3.9%	0.4%	1.1%	1.1%	0.9%	6.7%	2.5%	0.9%	1.9%
Kisumu	3.2%	2.6%	2.3%	2.9%	1.8%	5.2%	2.5%	1.2%	3.8%
Kitui	4.0%	1.1%	12.1%	21.1%	0.4%	4.5%	0.9%	28.8%	5.7%
Laikipia	0.8%	2.0%	0.7%	0.5%	0.6%	1.0%	0.5%	0.4%	1.9%
Machakos	4.9%	2.4%	9.2%	4.1%	1.9%	6.6%	4.0%	4.4%	7.5%
Makueni	0.7%	0.2%	1.7%	1.3%	0.1%	1.2%	0.2%	1.1%	1.9%
Meru	5.3%	3.3%	4.4%	1.8%	11.8%	7.0%	3.5%	11.8%	11.3%
Murang'a	3.5%	1.0%	2.7%	0.6%	10.6%	5.2%	11.3%	3.2%	1.9%

[22] https://www.opendata.go.ke/

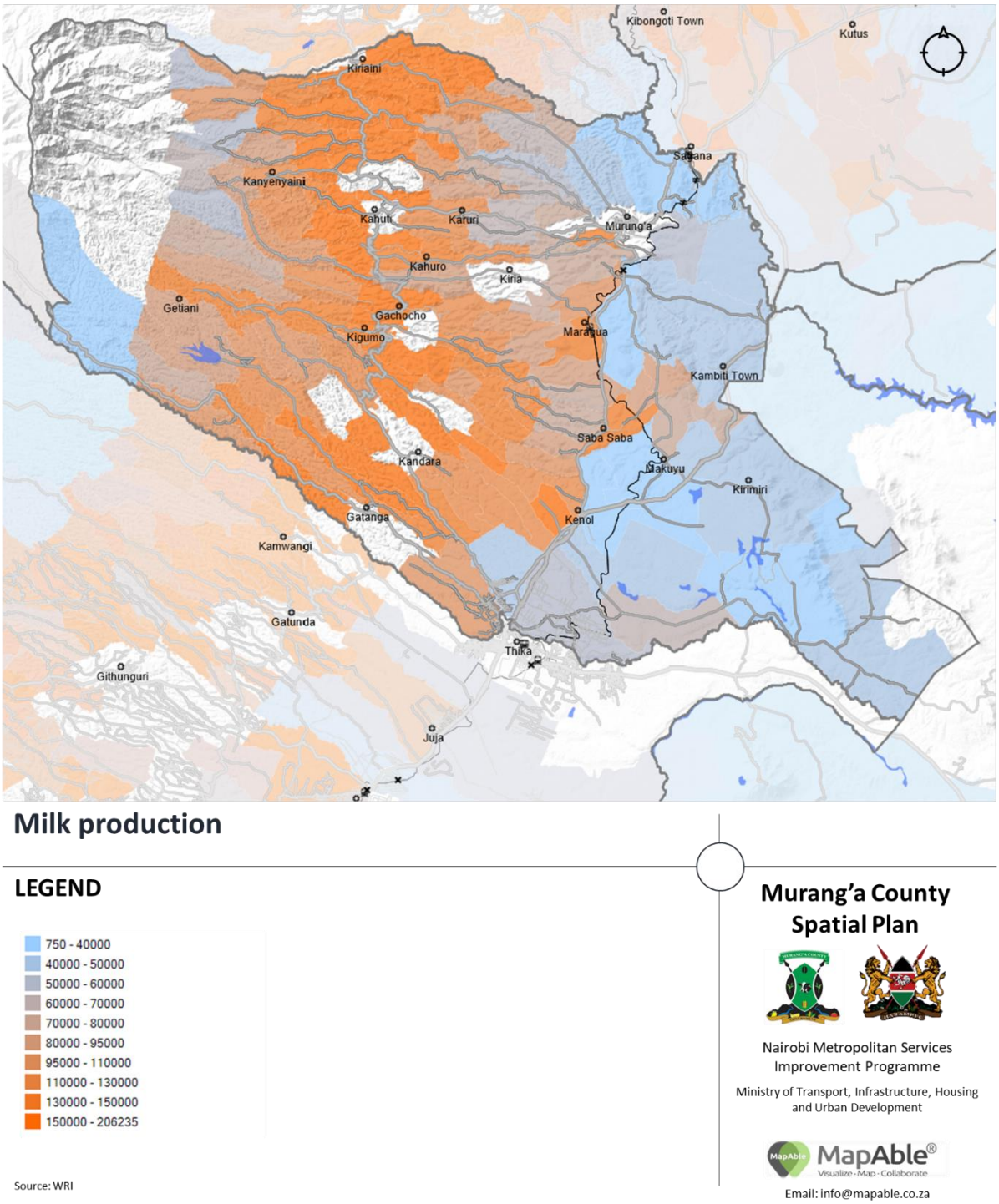
	Cattle	Sheep	Goats	Donkeys	Pigs	Indigenous Chicken	Chicken Commercial	Bee Hives	Camels
Nairobi	0.8%	0.7%	0.7%	2.5%	14.2%	2.1%	7.5%	0.7%	3.8%
Nakuru	6.4%	9.7%	3.3%	8.8%	6.6%	8.4%	9.4%	7.2%	5.7%
Nandi	3.2%	1.5%	0.6%	1.5%	0.5%	3.5%	0.7%	1.7%	5.7%
Narok	20.6%	31.6%	12.8%	18.8%	3.5%	4.3%	0.8%	6.2%	5.7%
Nyamira	1.8%	0.2%	0.6%	0.4%	0.4%	2.7%	1.2%	0.4%	0.0%
Nyandarua	3.4%	5.1%	0.3%	2.2%	1.0%	4.4%	1.2%	1.2%	3.8%
Nyeri	3.2%	3.2%	1.5%	0.6%	6.4%	3.9%	3.4%	1.5%	3.8%
Tana River	0.8%	2.7%	5.3%	2.4%	0.0%	0.3%	0.1%	1.1%	1.9%
Tharaka Nithi	0.9%	0.6%	2.1%	1.0%	0.5%	1.0%	0.1%	7.4%	1.9%
Vihiga	1.4%	0.1%	0.3%	0.1%	0.4%	2.5%	0.5%	0.1%	1.9%
Grand Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The extent of milk production is shown on the next map. Again it is the most densely populated central area of Murang'a that also makes the biggest contribution to milk production. Milk production is also managed by delivery to collection points by farmers from where it is transported to factories for further processing.

Figure 36: Milk collection point in a village

Figure 37: Milk collection point in a rural area

Map 15: Milk production (litres)



10.2.2 Effects of rising rural population density on smallholder agriculture[23]

Reducing poverty and hunger have been overriding policy concerns for the past half century in sub-Saharan Africa. More than 70% of the poor live in rural areas and derive more than half of their livelihood

[23] This section is based on work done by Milu Muyanga, and, T.S. Jayne in a work titled, *Effects of rising rural population density on smallholder agriculture in Kenya*, April 2014. http://dx.doi.org/10.1016/j.foodpol.2014.03.001 Research for this work was done from 1997 to 2010.

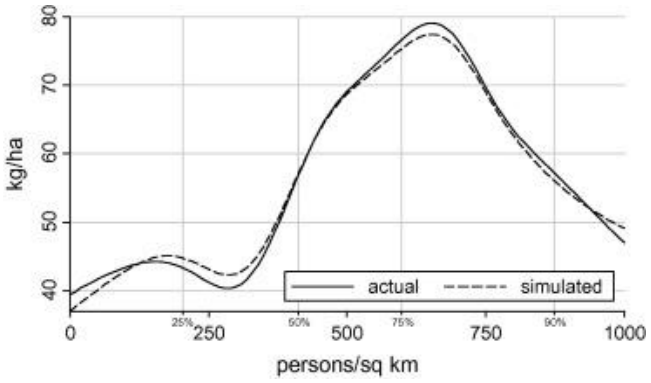
from farming. Broad-based agricultural growth has been widely understood to be the most powerful vehicle for reducing rural poverty and kick-starting broader structural transformation processes. A major feature of the structural transformation processes achieved in the Asia green revolution, was that it was mostly made up of small farm-led and broad-based farming. Smallholders tend to spend their incomes on locally produced goods and services, therefore stimulating the domestic non-farm economy and creating additional jobs that would support diversification out of agriculture and demographic transition. For these reasons, a smallholder-led growth strategy has been touted as having the brightest prospects for rapid and sustained reductions in poverty and hunger in sub-Saharan Africa

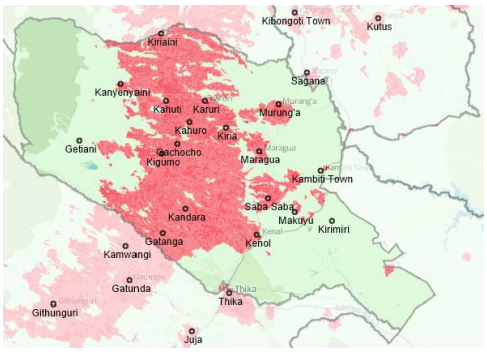
Evidence from most African countries shows limited land productivity growth in response to rising population density. Moreover, especially in densely populated areas, soils have been continuously cultivated and are facing fertility constraints that make them less responsive to inorganic fertilizer. Agricultural growth in sub-Saharan Africa (SSA) has historically been based on area expansion, not yield growth. However, continued area expansion is increasingly problematic. There is little or no unallocated land for further expansion, as is the case in Murang'a.

Unavailability of land for cropland expansion is particularly serious in countries with high rural population densities such as Kenya. Farm sizes are small and are gradually shrinking as households subdivide their land to the next generation (See a later section on land markets). Outmigration to towns and more sparsely populated rural areas with arable land might be a possibility, but there are well-known constraints to migration by members of one ethnic group to lands traditionally held by other ethnic groups. There is an increased concern that development policy in the region has not adequately addressed how a smallholder-led agricultural strategy must be adapted to address the limitations of small and declining farm sizes and the growing problems of land accessibility in the densely populated areas that remain dependent on rain-fed production systems.

The following were concluded from the research.

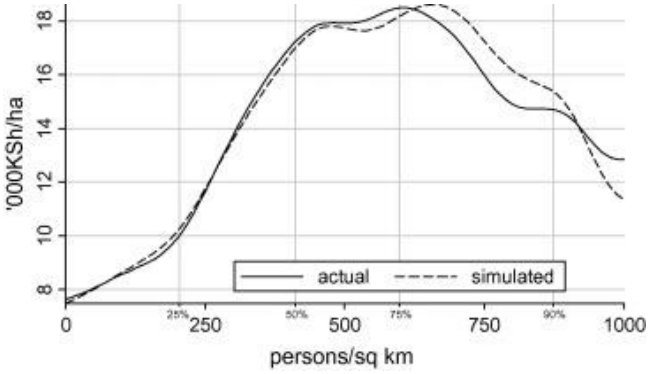
Figure 38: Fertilizer quantities applied per hectare cultivated

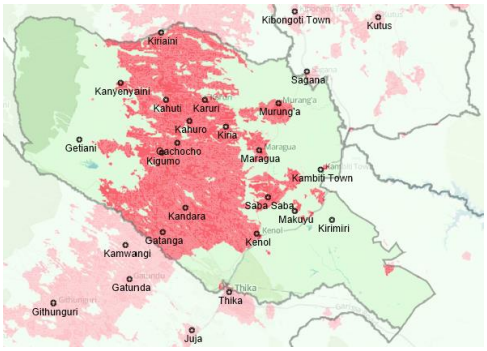




Population threshold breakpoint: 700 persons per km^2

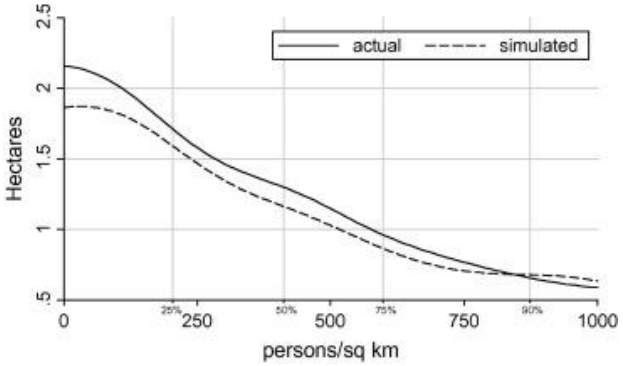
Figure 39: Total value of cash input expenditures per ha cultivated

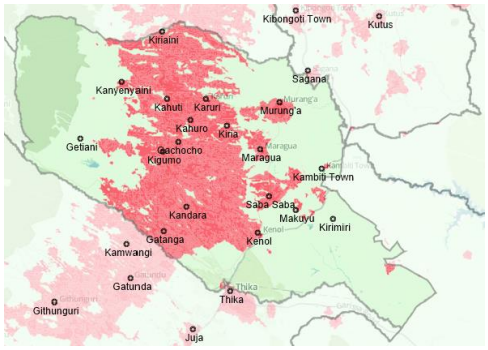




Population threshold breakpoint: 650 persons per km^2

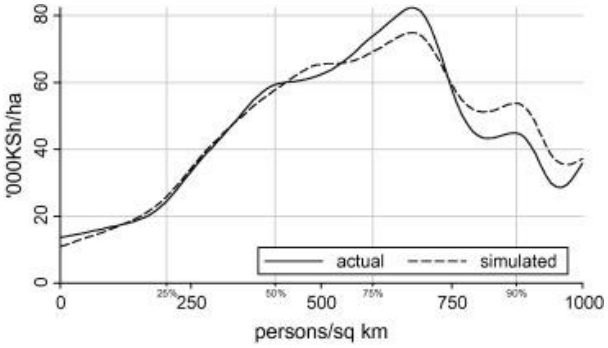
Figure 40: Area cultivated per household

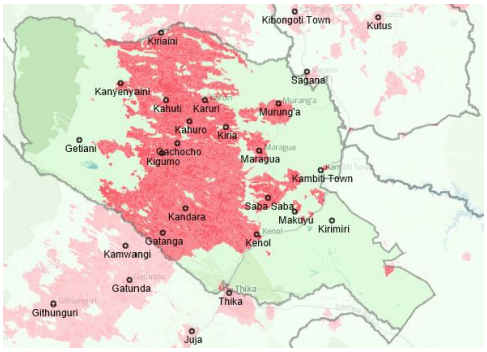




Population threshold breakpoint: 650 persons per km^2

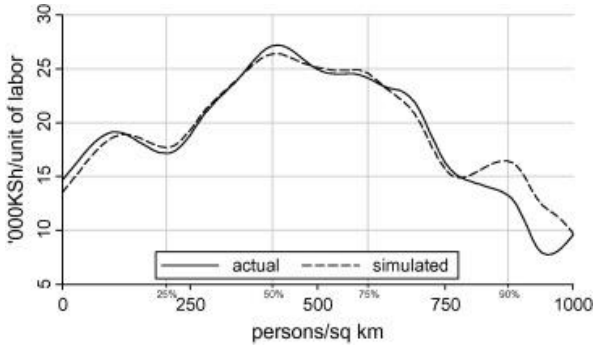
Figure 41: Net crop income per hectare owned

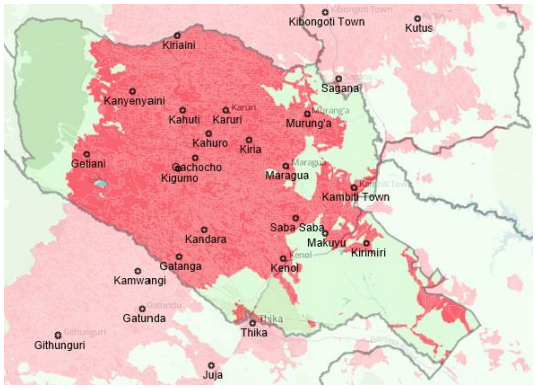




Population threshold breakpoint: 700 persons per km^2

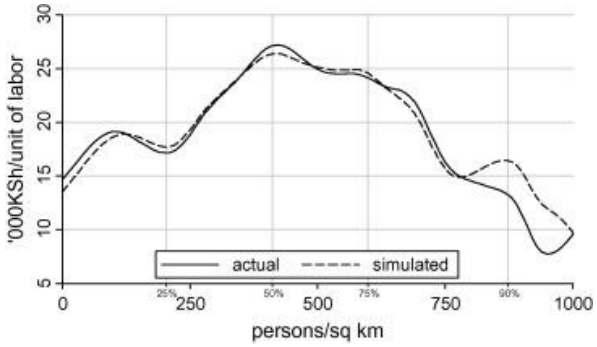
Figure 42: Net farm income per unit of family labour (resident adults)

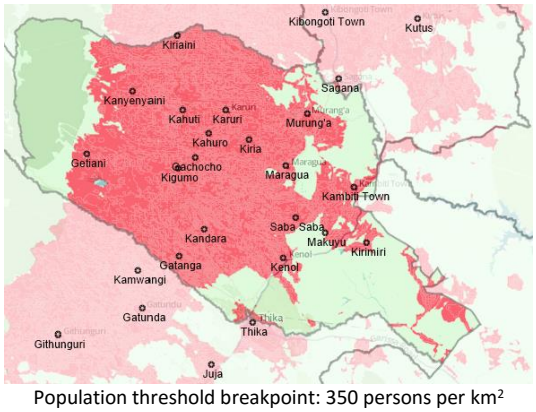




Population threshold breakpoint: 350 persons per km^2

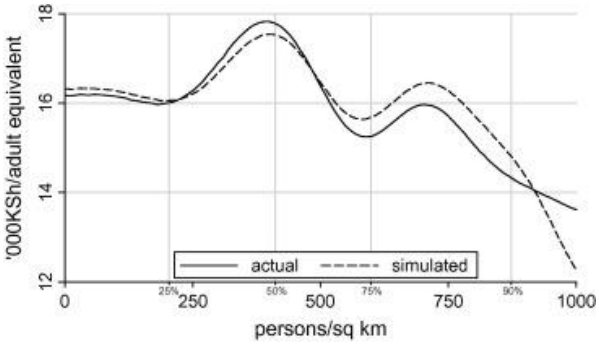
Figure 43: Net farm income per unit of family labour (resident adults)

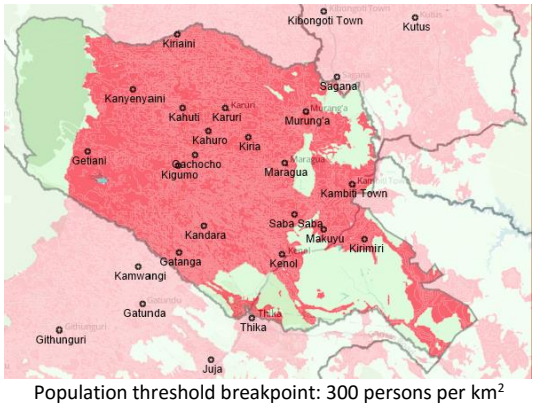




Population threshold breakpoint: 350 persons per km^2

Figure 44: Non-farm income per adult equivalent





Population threshold breakpoint: 300 persons per km^2

The overall picture emerging from these bivariate findings is smallholder agricultural practices are becoming more land-intensive as population density rises, and that indicators of agricultural productivity and rural livelihoods are declining as population density rises beyond a certain threshold. The research highlighted the following:

- Farm sizes are declining gradually and inversely related to population density.
- Shrinking farms are associated with increasing land intensification.
- However, intensification tends to plateau at about 500–600 persons/km2.
- Rural household income per adult declines as population density rises.
- Land scarcity may be constraining broader structural transformation processes

10.3 Land markets and land ownership

The World Bank notes in its *Kenya Urbanization Review*[24] that poorly functioning urban land markets and institutions are not a new phenomenon. Over decades' institutional structures have been over-centralized, and land management practices have tended to be technocratic, not always well-organized, and with too many opportunities for corruption in the system. The colonial period saw the introduction of private property, the establishment of strong central administration over land, and the preparation of urban plans intended for European, not African, cities. This period saw the consolidation of corruption and poor efficacy of land institutions, resulting in planning, land registration, and administration systems that are opaque, unreliable, costly, and in need of reform. Before the 2010 constitution and implementation of the National Land Policy of 2009, a complex set of land laws resulted in overly complex processes to administer land. Laws required different registries to be set up under each law. These were maintained at district and national levels, and it was not clear that the registries were connected. This system allowed graft. Parallel title and deeds systems further complicated the system. Likewise, planning systems were mostly ineffective, as reflected in unplanned growth and unauthorized development.

10.3.1 Effects of population density on farm sizes, cultivated area and land under fallow

Household landholding sizes and land under cultivation decrease with population pressure. If population density increases by 100 persons/km^2, household landholding and area under crop decline by about 16% and 17%, respectively. Land under fallow also declines with population density. An increase in population density by 100 persons reduces fallow land by about 19%. Household landholding sizes and cultivated areas decrease with land rental rates. Rising population density in rural Kenya, in general, has produced many multiple effects. On the one hand, rising population density is associated with smaller farms and more intensive use of available land. Rising population density also increases land rental rates, which exert further downward pressure on the cultivated area. Besides population density, other variables such as land rental rates, household demographic characteristics, intergenerational factors, and ethnicity as captured by the household head's tribe also influence household landholding sizes. The more land controlled by the father to the household head, the more land on average is controlled by the current household.[25]

[24] World Bank Republic of Kenya: *Kenya Urbanization Review* Report No: AUS8099 February 2016

[25] Milu Muyanga, and, T.S. Jayne in a work titled, *Effects of rising rural population density on smallholder agriculture in Kenya*, April 2014. http://dx.doi.org/10.1016/j.foodpol.2014.03.001 Research for this work was done from 1997 to 2010

Figure 45: Land subdivision near Kangari

10.3.2 Land sizes in selected areas

It is not possible to get general land size data for Murang'a, however, in Kenya, cultivated land per person in agriculture has declined from 0.462 ha in the 1960s to 0.219 ha in the 2000–08 period. A similar picture emerges from comparisons in mean farm size within the small-scale farming sector over time. A nationally representative survey of Kenya's small-scale farm sector in 1977 carried out by the Central Bureau of Statistics reports mean farm size ranging across provinces from 2.10 to 3.48 ha. By contrast, mean farm size in Egerton University's nationwide surveys from 1997 to 2010 show mean farm size to be 1.86 ha per farm; these longitudinal surveys show a decline in farm size even within that 13-year period.[26]

The next table shows land sizes in selected area in Murang'a. One should note the how the average land sizes along the A2 Corridor (Kenol to where the A2 crosses the boundary in Machakos) differ from the areas with a lower population density Muragua to that of Kangari and Kandara with substantial higher population densities.

Table 12: Land sizes in selected areas in Murang'a[27]

	A2 corridor	Muragua	Kangari	Kandara
Number of parcels assessed	6 121	4 333	1 914	715
Average size (ha)	3.11	0.81	0.88	0.65
Total size (ha)	19 022.01	3 508.51	1 679.04	465.54
Maximum size (ha)	4 238.43	390.02	83.95	50.01

[26] T. S. Jayne, Milu Muyanga, Land constraints in Kenya's densely populated rural areas: implications for food policy and institutional reform. Food Security, September 2012, Volume 4, Issue 3, pp 399–421
[27] Data captured by Ecoplan Kenya and MapAble

10.4 The spatial determinants of income and poverty.[28]

Evidence from poverty maps for Kenya and other developing countries suggests that poverty and income distribution are not homogenous. Slope, soil type, distance/travel time to public resources, elevation, type of land use, and demographic variables prove to be significant in explaining spatial patterns of poverty. However, the differential influence of these and other factors at the location level shows that counties in Kenya are highly heterogeneous; hence different spatial factors are important in explaining welfare levels in different areas within provinces, suggesting that targeted pro-poor policies are needed.

Poverty, income inequality, and natural resource degradation are severe problems in rural areas. Kenya poverty rates are among the highest in the developing world. National poverty prevalence is estimated at 45%, and natural resource degradation is reported to be increasing. The following spatial factors impact on income and poverty should be considered:

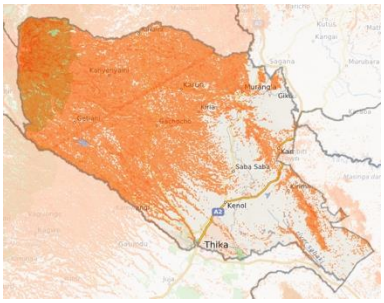
10.4.1 Soil conditions

Locations with good soils are likely to have high agricultural potential and thus have an absolute advantage in producing high-value perishable vegetables and other crops. Investigations have shown that locations with good soils are associated with less poverty. The magnitude of the effect is not large, improving soil fertility (from poor to good soil) would reduce poverty by up to one percentage point in rural areas. This strongly points to the policy of improving soil quality through the use of fertilizers and soil conservation techniques. (Note the issues population density thresholds and the application of fertiliser on crop cultivation – See Figure 38: Fertilizer quantities applied per hectare cultivated)

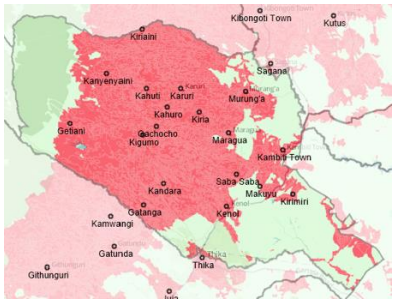
10.4.2 Slope and poverty

Slope is a very important factor, Relative to the very flat areas (0-4% slope), locations that have a high percentage of land made up of steep slopes have higher poverty levels. The coefficient is largest for locations with a >30% slope area, a result that is consistent with theoretical explanations that point toward serious erosion, cultivation, and irrigation-related problems associated with steep land.

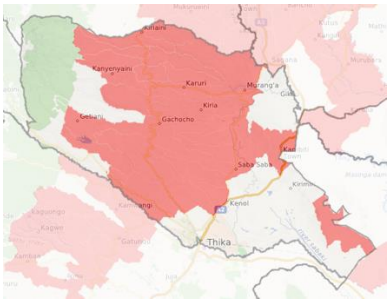
Figure 46: Slope, population density, and poverty



Slope exceeding 27%



Population threshold breakpoint: 350 persons per km2



Poverty density > 100 persons per ha

10.4.3 Land use variables

Land-use variables emerge as strong determinants of poverty among rural locations. Locations that have large areas that are built up (occupied by buildings) tend to have lower rates of poverty. This suggests that built-up areas represent tendencies toward urbanization, and more urbanization is expected to result in

[28] This section is based on research done by Paul O. Okwi, Godfrey Ndeng'e, Patti Kristjanson, Mike Arunga, An Notenbaert, Abisalom Omolo, Norbert Henninger, Todd Benson, Patrick Kariuki and John Owuor. *Spatial Determinants of Poverty in Rural Kenya.* Proceedings of the National Academy of Sciences of the United States of America, Vol. 104, No. 43 (Oct. 23, 2007), pp. 16769-16774

lower poverty. In general, poverty maps show that urban areas are richer than rural areas in Kenya. However, the research on which this section is based, suggests that locations with large areas under grassland are likely to have lower poverty rates, a somewhat unintuitive result. It may be that this result is reflecting the fact that there are very few people in grasslands areas, or it may indicate that this variable is capturing something else. With respect to the percentage of wooded area, another non-nutritive higher poverty rates in rural areas (given that woodlands often provide nuts, fruits, and firewood for low-income families).

10.4.4 Elevation

Measured in meters above sea level, elevation has a significant negative effect on Location-level welfare: Communities at higher elevation are likely to be less poor. This is expected because many communities living in the highlands are much better off than their counterparts in many parts of dry lowlands of Kenya.

10.4.5 Agro-climatic conditions

The variation in poverty among rural communities is strongly influenced by agro-climatic factors. Locations with longer growing periods are likely to have lower poverty rates relative to areas with shorter growing periods. The effect here is clear, because most crops such as (maize, beans, millet, sorghum, peas) require >60 days to mature.

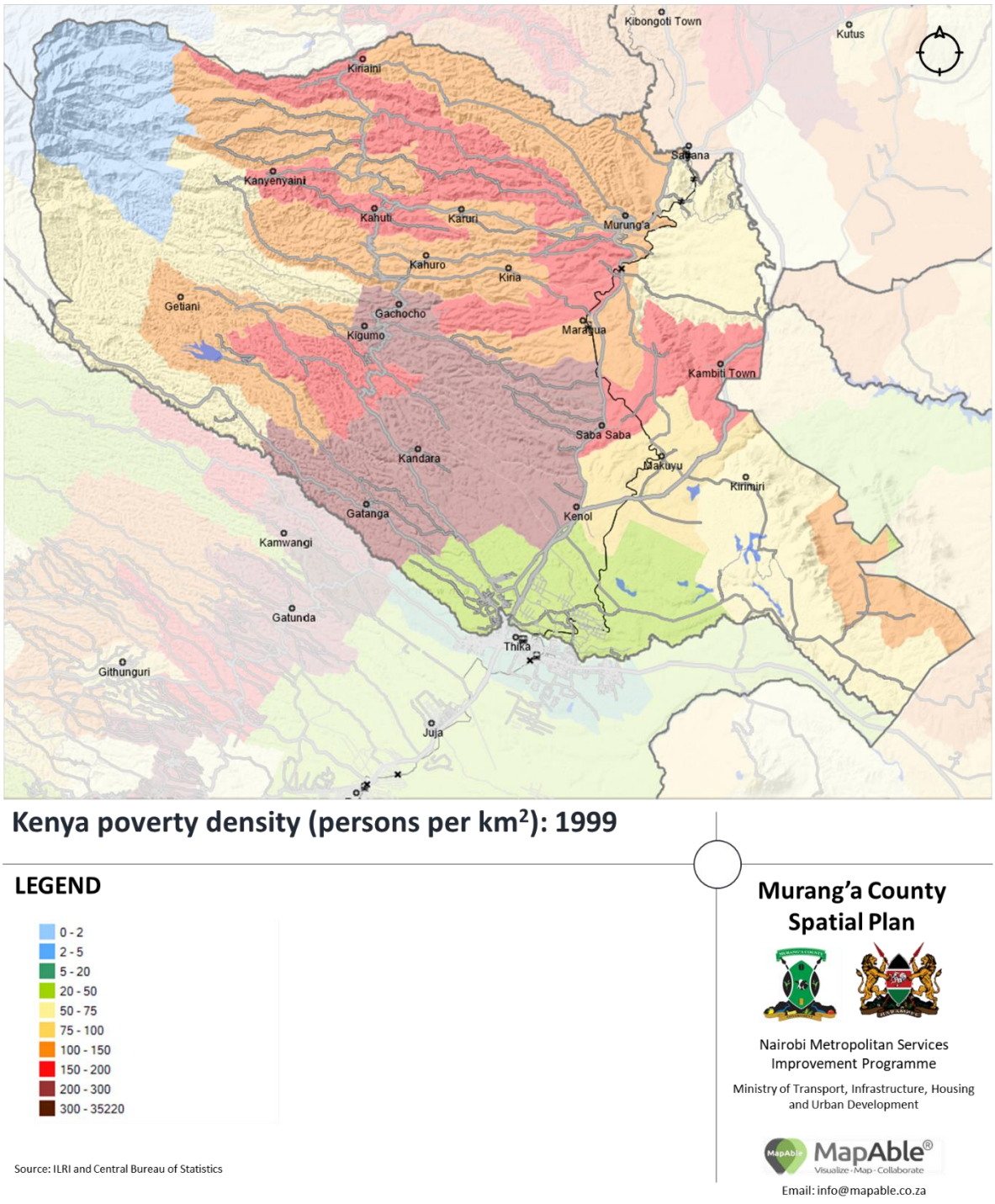
For the livestock-related variables, communities living in rangelands are likely to have higher poverty levels. The results suggest that there is a strong positive relationship between poverty and living in the rangelands. Recent studies have shown that the rangelands have some of the highest poverty rates. This is somewhat intuitive because they are also the areas with the poorest access to roads, services (education and health), and general infrastructure in the country.

10.4.6 Population density

The demographic variable (population density) has significant negative effects on poverty in rural areas. Areas with high population densities are associated with lower poverty rates. Population density influences labour intensity of agricultural production, including the choice of commodities as well as production technologies and land management practices, by affecting the land-labour ratio. This result implies that people tend to settle in areas where they can enhance their incomes, for example, through farming, and such areas end up having relatively low poverty levels. One should note that, as described in a previous section, that there are clear density thresholds beyond which high densities it become a contributing factor to increased poverty.)

The map below shows poverty density in Murang'a. There is a clear difference in poverty density between the subtropical belt of central Murang'a and the tea belt in the northwest, as well as substantial lower poverty densities in the areas of the southeast associated with large scale commercial farming.

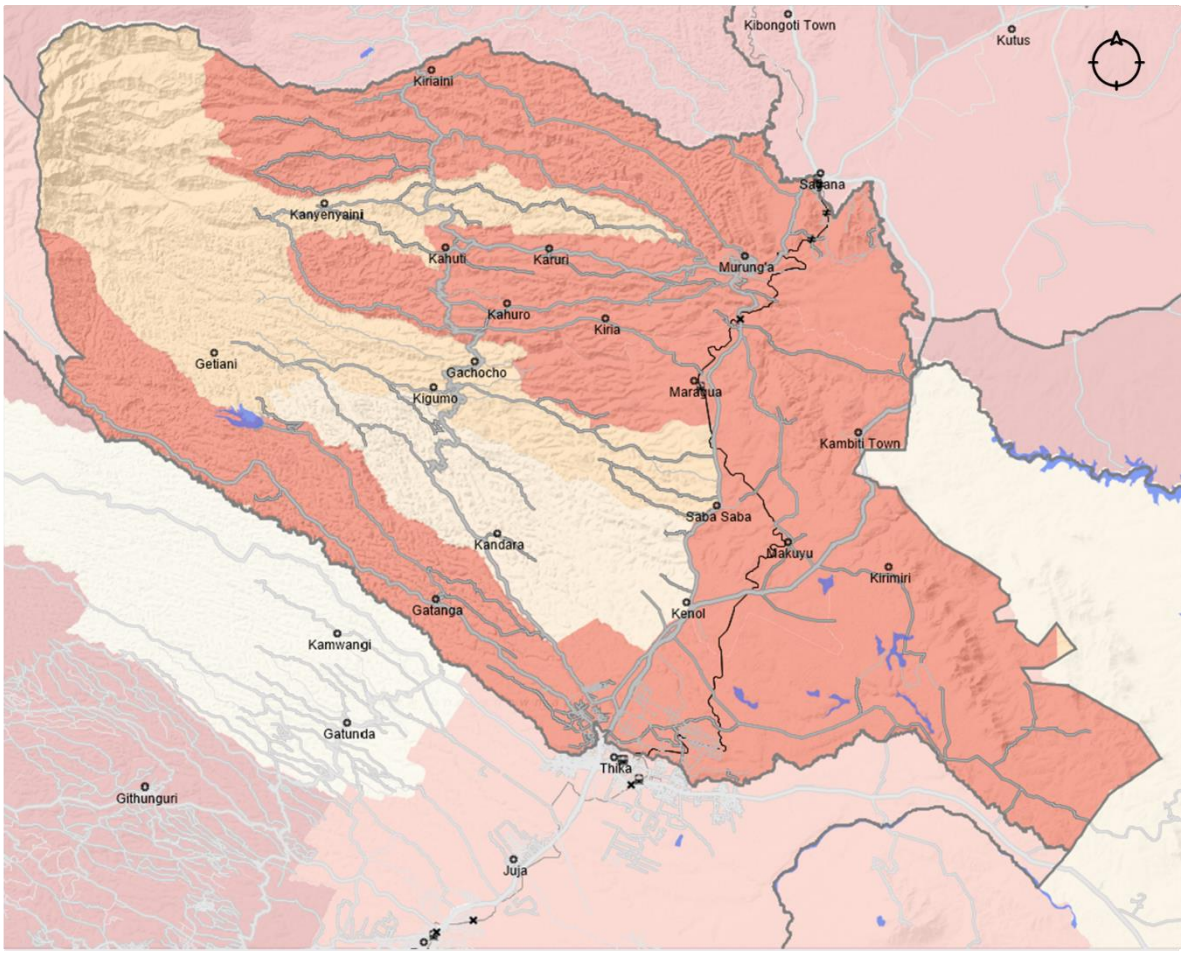
Map 16: Poverty density in Kenya



The map below shows income disparities as measured in terms of the Gini coefficient. The Gini coefficient measures inequality. A Gini coefficient of zero expresses perfect equality, where all values are the same (for example, where everyone has the same income). A Gini coefficient of 1 (or 100%) expresses maximal inequality among values (e.g., for a large number of people, where only one person has all the income or consumption, and all others have none, the Gini coefficient will be very closer to one)

Notwithstanding high concentrations of poverty as illustrated in the previous map, the next map shows that there are very little inequality amounts the people of Murang'a. The area with the highest concentration of poverty is also the area with the lowest Gini coefficient implying that everybody is effectively equally poor.

Map 17: Income disparities in Murang'a



Income disparities -Gini coefficient: 1999

LEGEND

- 0 - 0,31
- 0,31 - 0,33
- 0,33 - 0,34
- 0,34 - 0,35
- 0,35 - 0,35
- 0,35 - 0,36
- 0,36 - 0,38
- 0,38 - 0,43

Source: WRI

Murang'a County Spatial Plan

Nairobi Metropolitan Services Improvement Programme

Ministry of Transport, Infrastructure, Housing and Urban Development

MapAble® Visualize · Map · Collaborate

Email: info@mapable.co.za

10.4.7 Roads and access to markets

Better roads and access to markets are expected to favour production of high-value products and nonfarm activities that will contribute to higher incomes or lower poverty. The results of this study show that longer travel times to tarmac and murram roads significantly increase poverty levels. The standard explanation here is that the greater the travel time to a good road, the more difficult it is to access markets, limiting livelihood options. Conversely, communities that have greater access to markets, good infrastructure (health and education), and public administration face lower transaction costs and more livelihood options, leading to lower poverty levels. The above results point toward the need for investment in improved rural roads if poverty is to be reduced.

The results show that limited access to roads is associated with higher poverty levels. The longer the travel time from the location centre to the nearest road (track or tarmac), the poorer it is. Roads provide crucial access to markets.

11 Built environment systems

The process of urbanisation is one of the most important factors shaping the developing world's urban and rural spaces. The flow of goods, services, and people are often considered as a one-way flow where the urban dwellers contribute to rural livelihoods through remittances. This however, neglects the dynamic interactions between urban and rural places, particularly for the poor.

In Kenya and many developing countries, urban households (typically poor and lower middle income) have a foothold in both urban and rural places. Many urban households have deep connections to rural areas, which includes spatial, cultural and economic linkages. Culturally, urban dwellers consider the place they live in urban areas as their 'urban house' with their rural residence as their 'rural home.' Spatially and economically urban-rural interactions include various flows of goods, services, money, labour and other factors which often blur the lines between the two such as 'rural' non-farm employment as well as 'urban' agriculture[29].

These urban-rural linkages can be described as a 'multi-spatial livelihood' strategy by many urban and rural poor[30]. This strategy is crucial as urban employment, and income can fluctuate specifically for the vulnerable, poorly skilled and educated. Practically, it means that in the case of an economic crisis, urban households can return to their rural 'homes' where income is lower, but housing and food are effectively free. Additionally, a household can also be split where the husband of a household works and lives in the urban area while the wife and children live and farm in the rural areas. This can improve both income and food security for said household, becoming a safety or welfare net that is often lacking in a developing world context. Migration between urban and rural areas often occurs in cycles linked to the overall economic prospects, where economic downturns can force out-migration to rural areas[31]. Outside of poor and lower-middle-income households, commuting to and from the urban areas has also increased in the developing world. This is both in the form of suburban sprawl and gated communities with middle and higher income families able to afford to commute to urban cores.

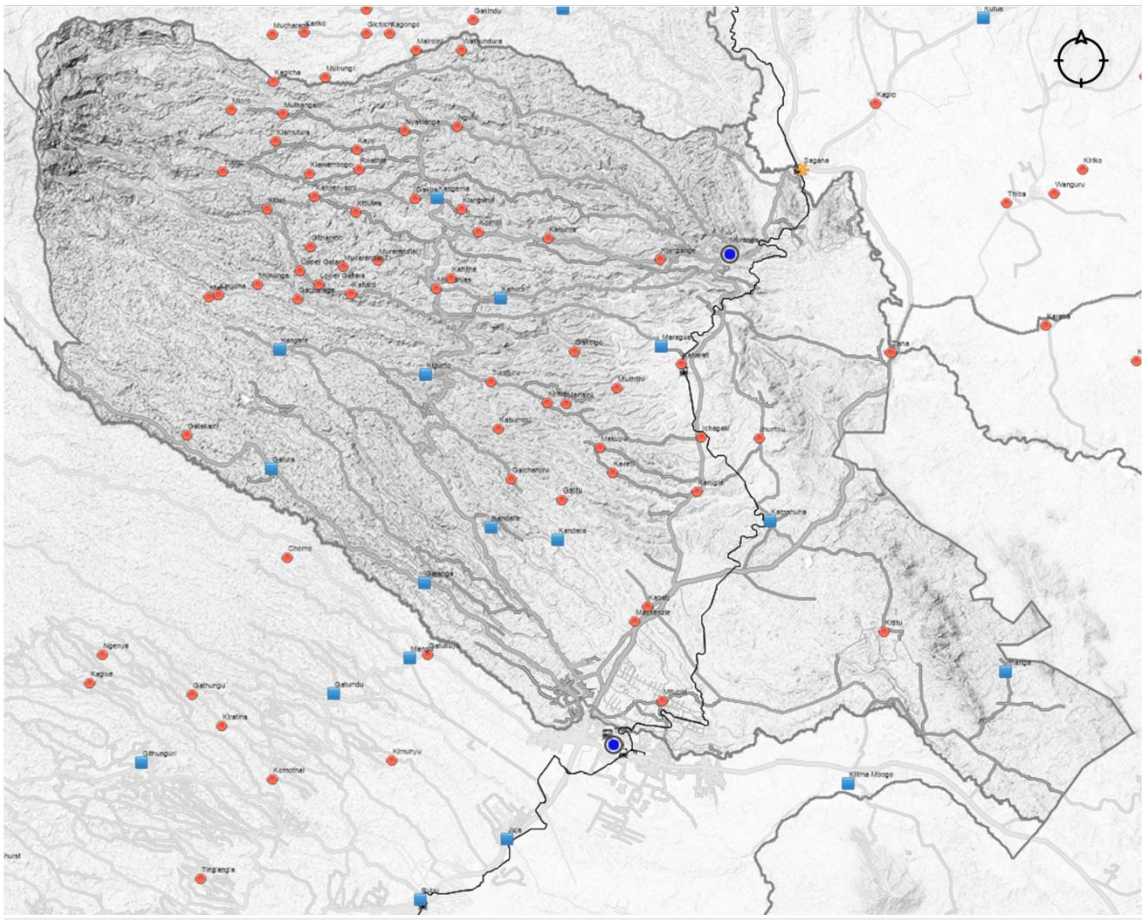
The interactions mentioned above demonstrate that urban and rural areas are not mutually exclusive and that answers to development challenges can be found in both the urban and rural areas.

[29] Owuor, 2007. *Migrants, urban poverty and the changing nature of urban-rural linkages in Kenya*, Development Southern Africa, 24:1, pp. 109-122.
[30] Foeken & Oquor, 2001. *Multi-spatial livelihoods in sub-Saharan Africa: Rural farming by urban households – the case of Nakuru Town, Kenya*. In de Bruijn, M, van Dijk, R & Foeken, D (Eds), Mobile Africa: changing patterns of movement in Africa and beyond. Leiden, the Netherlands: Brill, pp. 125–40.
[31] Beauchemin and Bocquier, 2003. Migration and urbanization in francophone West Africa: a review of the recent empirical evidence. Paris: DIAL, Document de Travail.

11.1 Settlement

According to the CIDP, Murang'a has 108 849 people living in the 513 urban centres in the county, while 89% are in the rural areas consist of 845,111 people. This implies an average settlement size of 212 people per settlement. This, linked to the expected growth over the next 20 years (Paragraph 10.1.3 Population growth expectations) of just more than 4 000 people, indicates that there is no inherent growth dynamic to effect structural or spatial change in the County. It implies that the status quo will remain for the foreseeable future. This creates challenges in light of general growth expectations, but it also creates the opportunity to improve local conditions, services, and amenities without the added pressure of growth. One should, however, expect that there will never be any zero growth scenario, but it simply implies that provisos from growth will be limited to a very small number strategic points or settlements. The following maps show the current settlement points in the County. These points describe a very rudimentary system of dispersed market points, trading centres, and Murang'a as a single major town in the County.

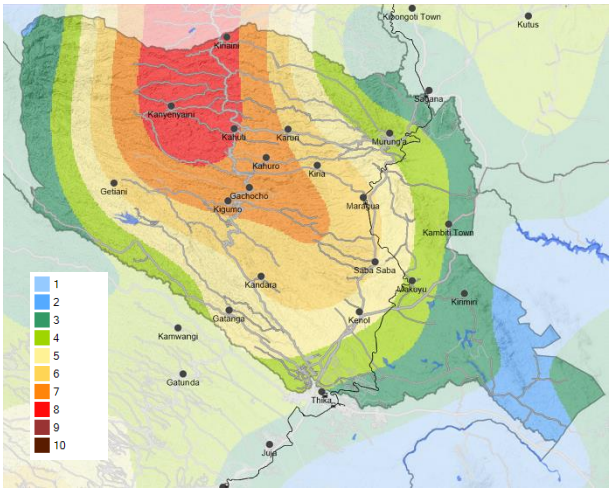
Map 18: Settlement hierarchy



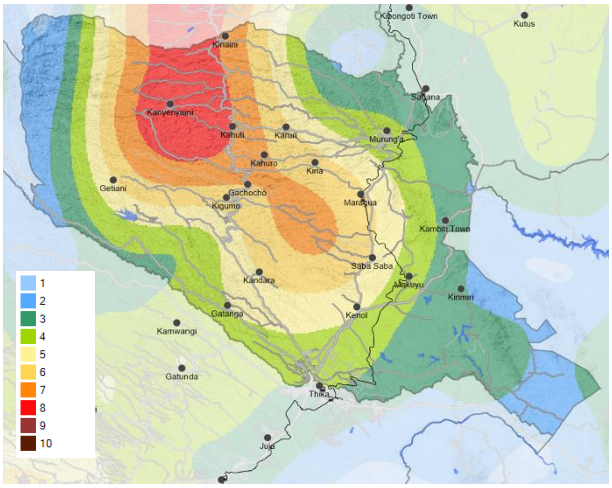
11.1.1 Location and intensity of settlement

Various factors impacting on the development of the spatial structure of the County have been described in the previous sections. Underlying the assessment is questions regarding spatial differentiation and the ability to detect patterns that point towards the development of settlement hierarchy. Spatial differentiation is important and should indicate points of higher access with higher population number that can access these points with a consequential benefit towards increased thresholds for higher order service functions.

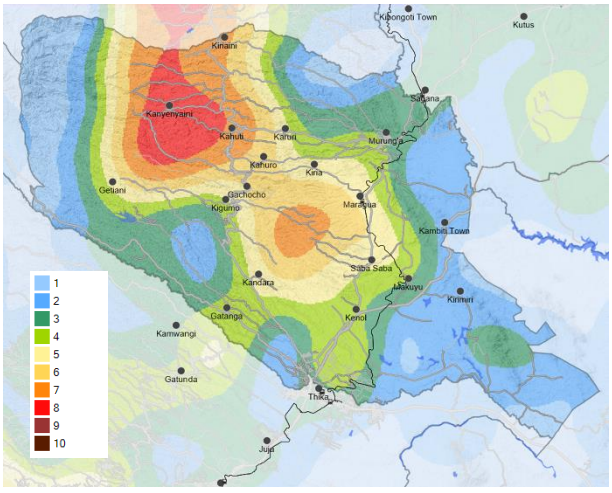
Figure 47: Settlement densities (kernel densities)



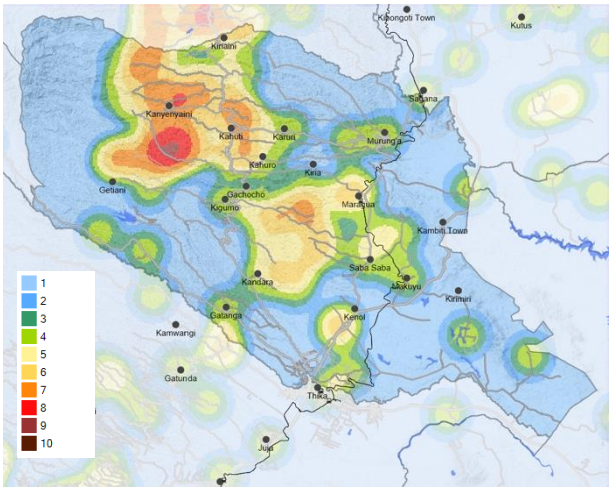
Settlement density: 20km kernel



Settlement density: 15km kernel



Settlement density: 10km kernel

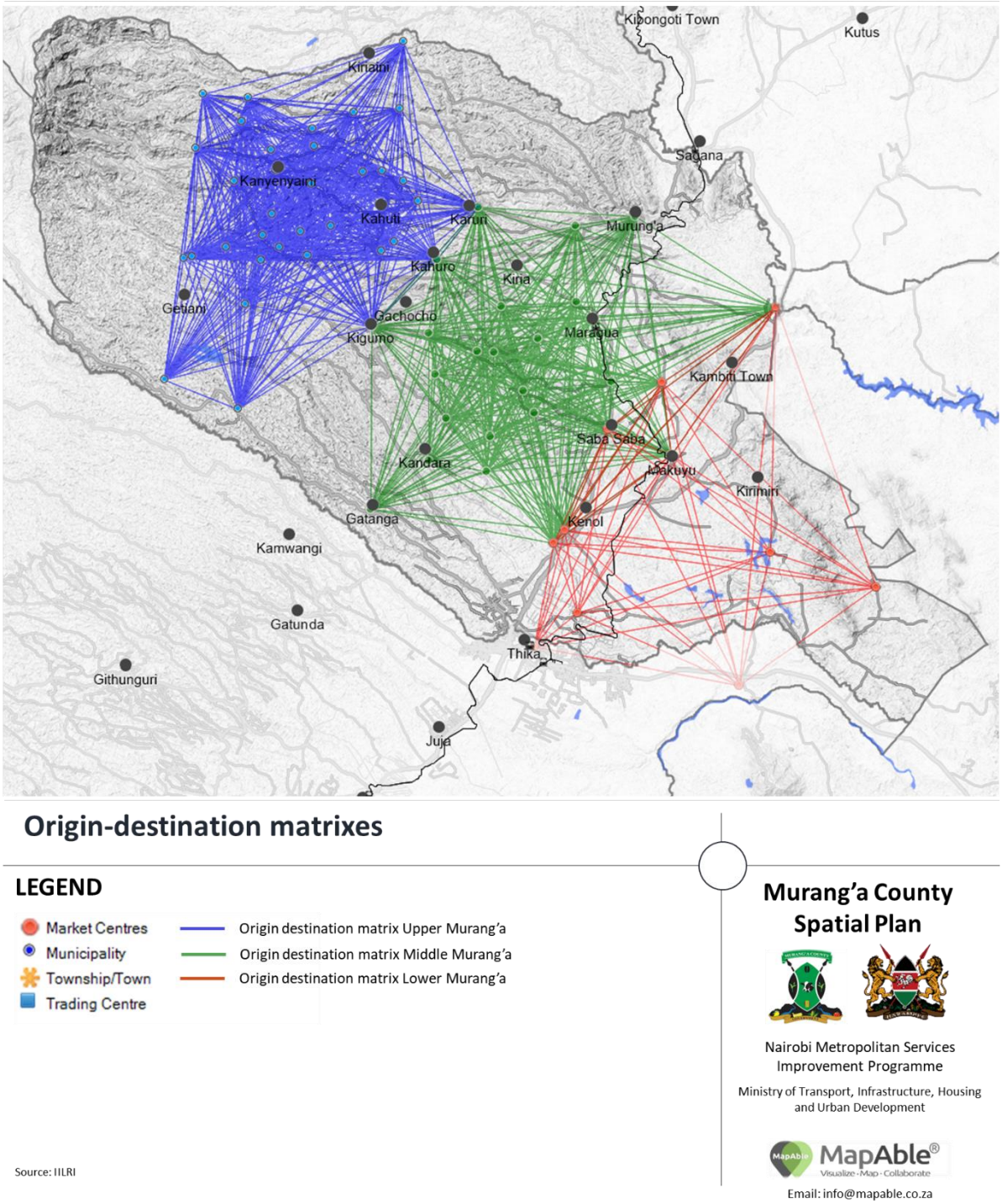


Settlement density: 5km kernel

The figure above shows how settlements are grouped based on four different kernel density assessments. There is a clear concentration of settlements in the north. With a smaller kernel radius a finer grain of settlement concentrations develop, which again define the upper, middle and lower zones of development in the County.

As highlighted earlier, the upper zone is adversely affected by topography. Strong topographical features, which makes movement difficult and hence limit the mobility of the people primarily depended on walking access to services and facilities. The middle zone also shows the impact of topography on mobility and hence a denser consecration of settlements albeit not to the extent of settlements in the upper zone. This is notwithstanding the fact that the middle zone is the most densely populated part of the county. The lower zone, being of low population density also shows fewer settlements and hence lower settlement densities.

Map 19: Origin-destination matrixes – average distances between urban centres



The most important aspect is that there seems no spatial correlation between major roads and settlement density. This also applies to the development along the A2 route. It might again reflect on a very immobile population where regional movement or mobility do not play any significant role in development and the day to day activities of the local people.

11.1.2 The average distance between settlement

The next question, in the light of the apparent immobility to of the local population is what the average distances between settlements area. The map above shows the origin-destination matrixes that was assessed to calculate the average distances in the upper, middle and lower zones respectively.

The following table shows the average distances between settlements. The average distances are very small and indicates on average less than an hour's walk to any settlement in Murang'a. The average for Kenya as a whole is equally low. The average between the upper, middle and lower zones in Murang'a is a clear indication of the impact of topography on accessibility and movement. The short distances between settlements is a clear indication of high levels of immobility of the local populations

Table 13: Average distances between settlements

Zone assessed	Average distance between settlements
Kenya total	6.93km
Murang'a	3.27km
Lower zone	6.41km
Middle zone	3.81km
Upper zone	2.82km

11.2 Functional typologies and settlement hierarchy

11.2.1 Central place theory as point of departure

Central place theory is always a good starting point for assessing settlement typologies and hierarchies. Central place theory is a geographical theory that seeks to explain the number, size and location of human settlements in an urban system. The theory then relied on two concepts: threshold and range.

- Threshold is the minimum market (population or income) needed to bring about the selling of a particular good or service.
- Range is the maximum distance consumers are prepared to travel to acquire goods - at some point the cost or inconvenience will outweigh the need for the good.

Figure 48: Market day in a small village

The result of these consumer preferences is that a system of centres of various sizes will emerge. Each centre will supply particular types of goods forming levels of hierarchy. In the functional hierarchies, generalizations can be made regarding the spacing, size, and function of settlements. The following normally apply:

- The larger the settlements are in size, the fewer in number they will be, i.e. there are many small villages, but few large cities.
- The larger the settlements grow in size, the greater the distance between them, i.e. villages are usually found close together, while cities are spaced much further apart.
- As a settlement increases in size, the range and number of its functions will increase.
- As a settlement increases in size, the number of higher-order services will also increase, i.e. a greater degree of specialization occurs in the services.
- The higher the order of the goods and services (more durable, valuable and variable), the larger the range of the goods and services, the longer the distance people are willing to travel to acquire them.

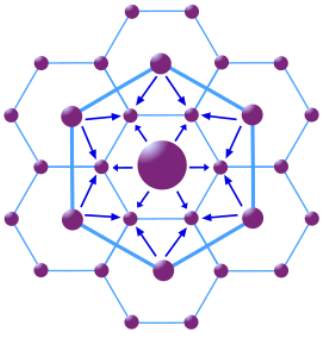
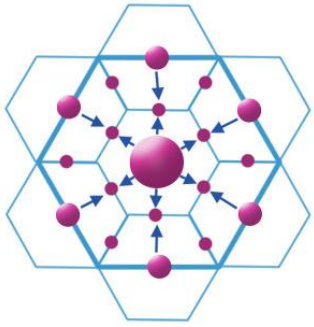
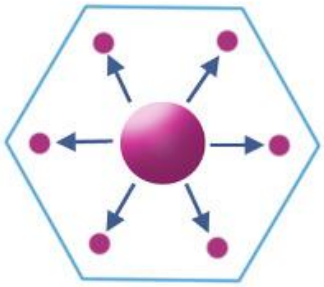
The validity of the central place theory may vary with local factors, such as climate, topography, history of development, technological improvement and personal preference of consumers and suppliers. The impact of topography in Murang'a is evident one would, therefore, expect deviations from the predicted hierarchy according to the theory. Also, the economic status of consumers in an area is also important. Consumers of higher economic status tend to be more mobile and therefore bypass centres providing only lower order goods. Purchasing power and density affect the spacing of centres and hierarchical arrangements. Factors shaping the extent of market areas:

- Land use: industrial areas can provide little in the way of a consuming population
- Poor accessibility: this can limit the extent of a centre's market area
- Competition: this limits the extent of market areas in all directions
- Technology: high mobility afforded by the automobile allows overlapping of market areas.

In the orderly arrangement of an urban hierarchy, seven different principal orders of settlement have been identified by Christaller, providing different groups of goods and services. If settlements are regularly spaced - equidistant spacing between same order centres, with larger centres farther apart than smaller centres. Settlements have hexagonal market areas and are most efficient in number and functions. The different layouts predicted by Christaller have K-values which show how much the sphere of Influence of the central places takes in — the central place itself counts as 1 and each portion of a satellite counts as its portion.

Figure 49: Higher order service function in larger settlements

Table 14: K-principles in central theory

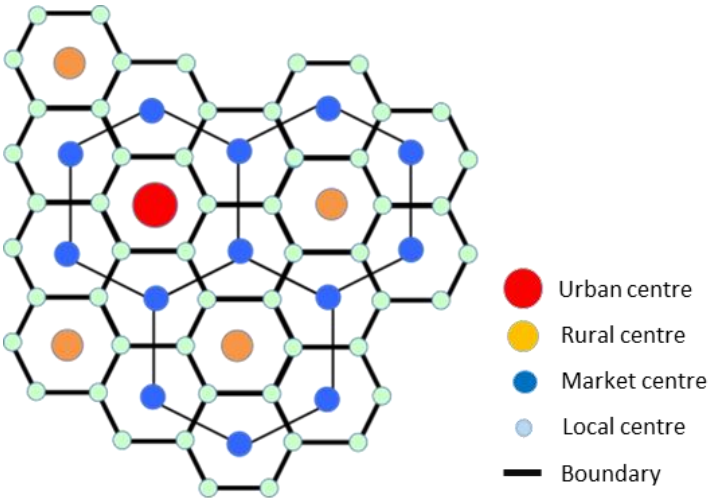
K = 3 Marketing principle	K = 4 Transport/Traffic principle	K = 7 Administrative principle
		

In assessing the Murang'a settlement hierarchy, the K3 marketing principle is most appropriate. The administrative principle does not apply and is a given in the light of existing institutional arrangements. Transportation and traffic principle are dealt with in a subsequent section when accessibility and movement in the County are assessed.

According to the marketing principle K = 3, the market area of a higher-order place(node) occupies 1/3rd of the market area of each of the consecutive lower size place(node) which lies on its neighbour; the lower size nodes (6 in numbers and 2nd larger circles) are located at the corner of the largest hexagon around

the high-order settlement. Each high-order settlement gets 1/3rd of each satellite settlement (which are 6 in total), thus K = 1 + 6×1/3 = 3. However, although in a K = 3 marketing network the distance travelled is minimized, the transport network is not the most efficient, because there are no intermediate transport links (network) between the larger places (nodes).

Figure 50: Central place theory based on the K3 market principle[32]



Excluding Nairobi as key metropolitan area, in Kenya settlements exist in the following ratios; for each town (urban centre) there are approximately five trading or rural centres; for each rural centre, there are nearly five market centres. The same applies in Murang'a. The extent of the hierarchy and the numbers that apply are shown in the next table.

Table 15: Kenya and Murang'a settlement hierarchy[33]

	Kenya Planning Handbook equivalent	Kenya settlements[34]		Murang'a settlements	
		Number	Ratio	Number	Ratio
City		1			
Towns	Urban centre	57	1.0	2[35]	1.0
Trading centre	Rural centre	279	4.9	11	5.5
Market centre	Market centre	1 278	22.4	49	24.5
Totals		1 615		62	

One can conclude that the settlement hierarchy in Murang'a is well developed. However, it will change over time as the mobility and income levels of local residents change. It might lead to some centres improving their position as population shifts. However, low population growth and low levels of mobility might indicate that the spatial system might remain unchanged and stable for the foreseeable future.

[32] https://www.e-education.psu.edu/geog597i_02/node/680 with settlement typology names adjusted to fit Kenya terminology
[33] Assessment done in MapAble® based on a data layer from the International livestock research institute (IILRI).
[34] Excludes Nairobi a metropolitan core area
[35] Thika was included in this count to its strong functional links and impact on the southern parts of Murang'a county

11.2.2 Requirements of the Kenya Physical Planning Handbook

According to the Physical Planning Handbook[36], human settlements are concentrations of activities and people. These range from smallest village in the rural area to the largest metropolis. Rural settlements are human habitats which spread across the countryside while urban settlements are agglomerations of 2000 people and over. Human settlements are considered focal points of commercial, industrial, administrative, health, educational and recreational activities required by the population. Human settlements can be classified into four categories:

Table 16: Classification of settlements

	KPHB Classification	Associated classification for the IILRI	Catchments	Resident population	Minimum facilities required
Rural settlements	Local centre		5000		• Full primary school, • Several shops, • A dispensary, • A public water supply system • An open air market.
	Market centre	Market centre	15,000	<2000	• Primary school • Secondary school • Health centre • A public water supply • Post office • Telephone facilities • A police post • A local bus service • Other social, commercial and local administrative services.
Urban settlements	Rural centre	Trading centre	40,000	2,000 to 10,000	• A secondary school of at least from four standard • A health centre with maternity facilities • Development of better shopping facilities • Markets and Banking facilities • A piped water supply and sewerage disposals systems • Electricity and telephone services postal
	Urban centre	Town	100,000-150,000	5000>	• A hospital • A secondary school • Commercial, industrial, administrative and recreational services

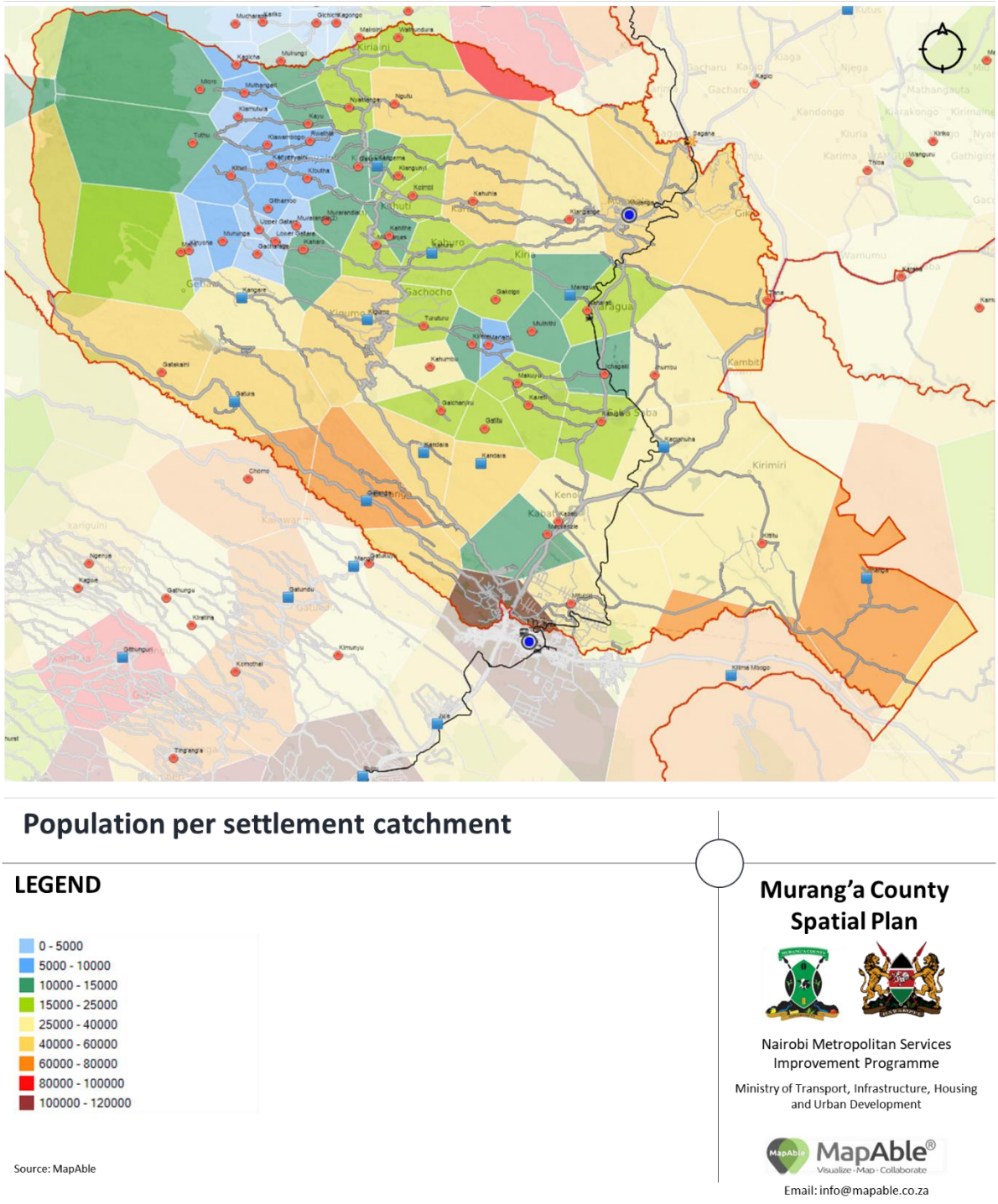
One should note that the distinction between where urban areas end and when non-urban activities start is not always clearly demarcated. It is therefore not easy to determine resident populations and also which facilities fall within the boundaries of the urban areas or not? The suggested catchment populations, however, give a good indication of the functional status of selected areas around settlement points.

[36] Ministry of Lands, Physical Planning Department, *Physical Planning Handbook.,* Undated. pp 14-16

Figure 51: Typical commercial activities in a rural settlement point

The map below shows the catchments of settlement points based on Thiessen polygons generated around each settlement point. It does not reflect a hierarchy in any way. However, it is clear that population density and typography and the general mobility of the local populations plays very important roles in the size and distribution of settlement.

Map 20: Population per settlement catchment area



The CIDP highlights the importance of markets states that the promotion of the development of markets supports informal sector development. However, markets need minimum facilities such as sheds, Jua Kali sites, and parking. The following is a list of existing markets in Murang'a. One should note that a market is only one of a range of facilities in settlements and the presence of a market does not necessarily denote the specific status of a settlement.

Table 17: List of markets in Murang'a

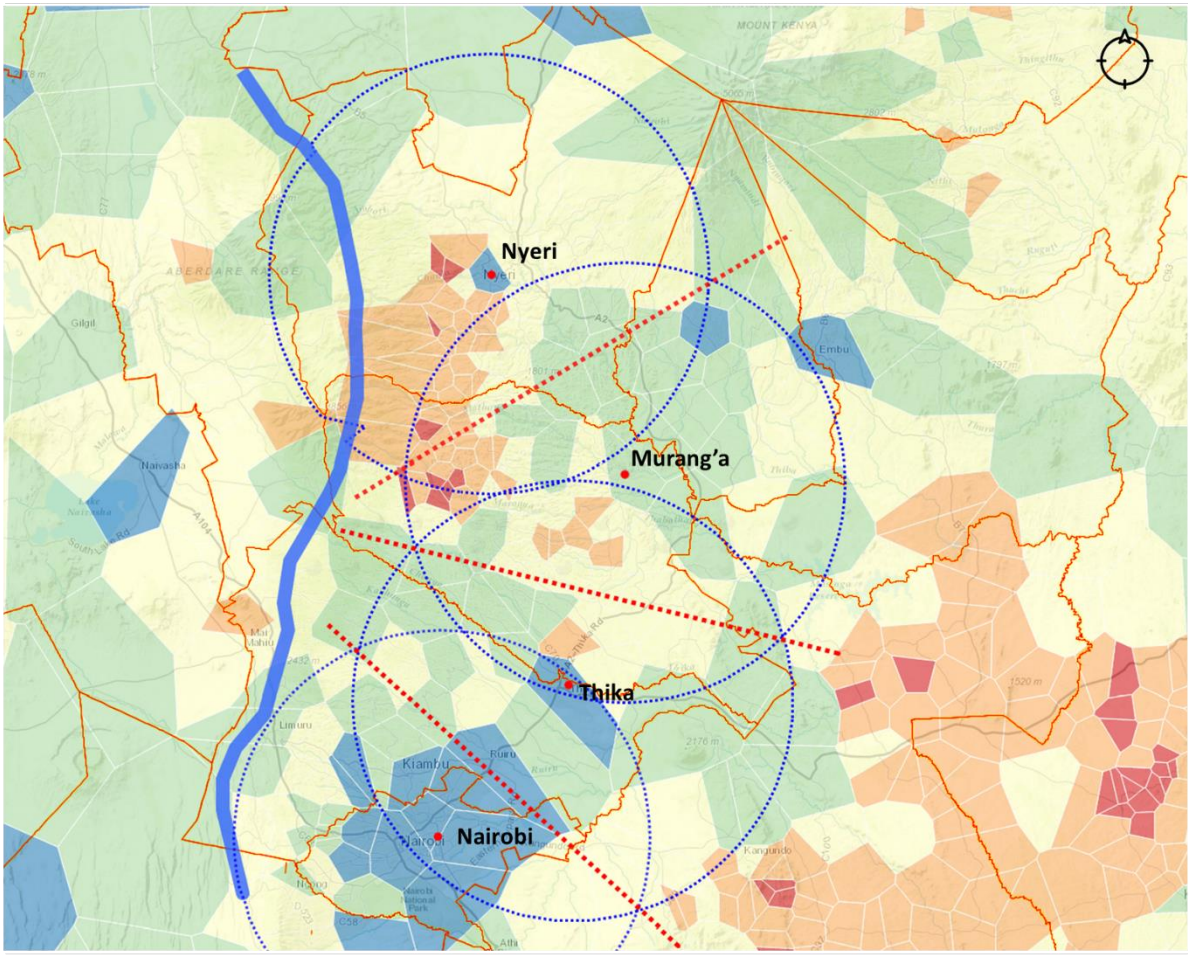
Name of market		Division	Operating Days
1	Makuyu	Makuyu	Sunday and Wednesday
2	Kamahuha	Makuyu	Tuesday and Saturday
3	Saba Saba	Makuyu	Monday and Friday.
4	Kambiti	Makuyu	All days
5	Kandara	Kandara	Monday and Thursday
6	Ng'araria	Kandara	Wednesday and Thursday
7	Kagundu-ini	Kandara	Friday and Tuesday
8	Githumu	Kandara	Wednesday and Saturday
9	Gacharage	Kandara	Sunday
10	Kabati	Kandara	Wednesday and Saturday
11	Kirere	Kigumo	Wednesday and Saturday
12	Mareira	Kigumo	Tuesday and Saturday
13	Kangari	Kigumo	Thursday
14	Kigumo	Kigumo	Sunday
15	Maragua	Maragua	Sunday
16	Muthithi	Maragua	Monday and Friday
17	Kihoya	Kangema	Sunday
18	Kanyenya-ini	Kangema	Sunday
19	Rwathia	Kangema	Sunday
20	Ichichi	Kangema	Wednesday and Sunday
21	Kiamara	Kangema	Sunday
22	Karugia	Kangema	Sunday
23	Kiria-ini	Mathioya	Monday and Thursday
24	Gakira	Kangema	Tuesday and Friday
25	Mukuyu	Kiharu	Wednesday and Saturday
26	Mithini		Sunday
27	Kirwara	Gatanga	Wednesday
28	Gatura	Gatanga	Friday
29	Ndunyu Chege	Gatanga	Sunday
30	Kaguku	Gatanga	Wednesday and Saturday
31	Ngelelya	Gatanga	Sunday
32	Como	Gatanga	Thursday

Most of the smaller and lower order centres affect very limited areas functions within the county boundaries. Regarding the demarcation criteria Murang'a town is the only first order centre in the county.

However, it relates directly to Thika in the south and Nyeri in the north. The map below shows these relations ships. The following should be noted:

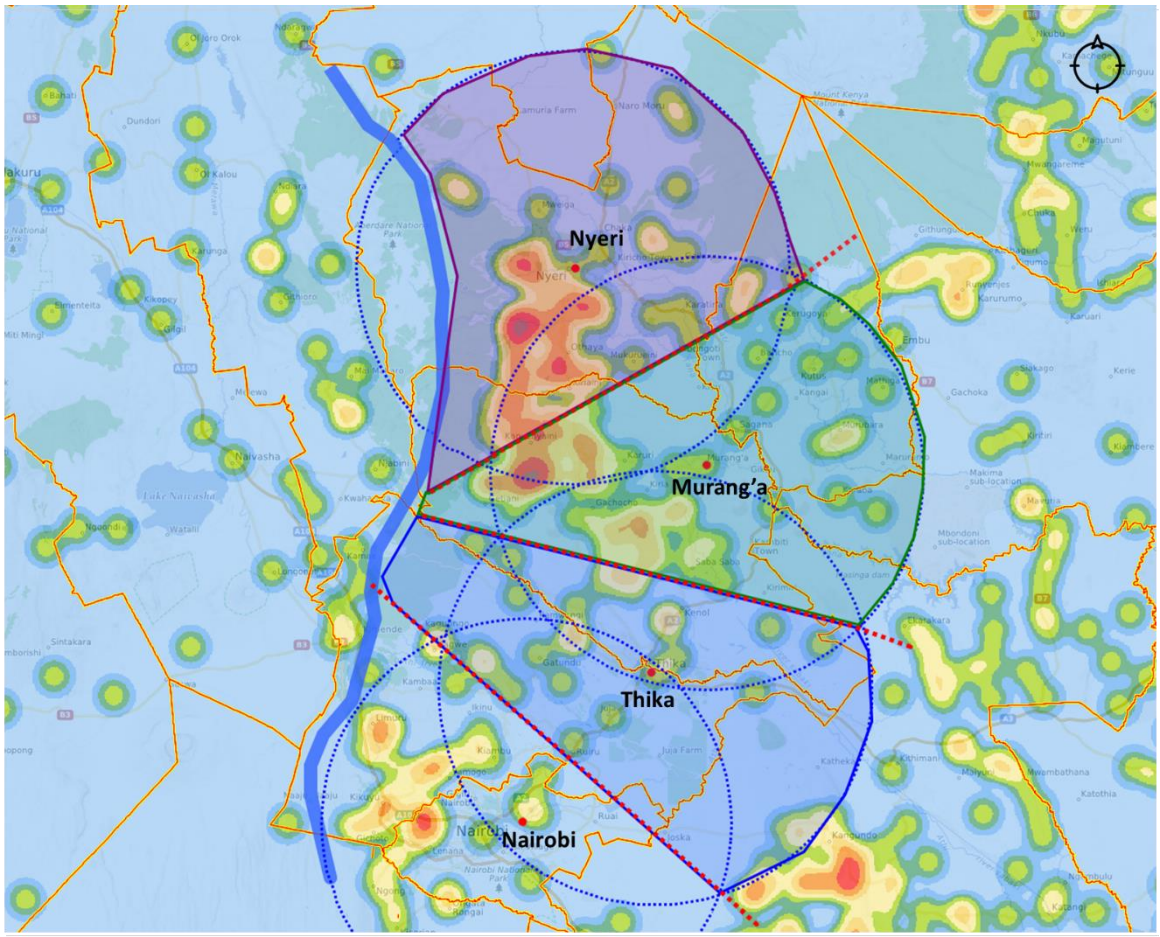
1. Regarding linear distance, the three centres are 35km apart.
2. Nyeri and Thika are on the A2 with Murang'a located close, but 10km off the A2, on the C71.
3. Very importunately the functional boundaries of the three towns cross the institutional boundaries of the three counties involved.
    a. Thika serves important areas in the southern parts of Murang'a and Machakos
    b. Murang'a sphere of influence extends. Into Nyeri, Kirinayaga, Embu and Machakos
    c. Nyeri extends into Krirnyaga, the southern tip of Laikipai and is the closest centre to the densely populated areas of north-west Murang'a
4. The Aberdare mountains in the west is a strong buffer with linkages extending through the mountains to the areas west of Murang'a

Map 21: Spatial relations in 1st order urban centres



Regarding 1st order catchment population densities area important. The next maps show how settlement cluster and when considered in the context of populations distributions and densities estimates can be made of the populations in the indicative service areas of the 1st order centres. The next maps the indicative service areas and their relationship to settlement clusters.

Map 22: Service areas for 1st order urban centres



Service areas for 1st order urban centres

LEGEND

No of towns in 5km kernel

1
2
3
4
5
6
7
8
9
10

1st order service areas

- Thika service area
- Nyeri service area
- Murang'a service area

- 35km catchment
- Topographical barrier
- Equidistance edge

Source: MapAble

Murang'a County Spatial Plan

Nairobi Metropolitan Services Improvement Programme

Ministry of Transport, Infrastructure, Housing and Urban Development

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When settlement and population densities are discounted in the context of the effective service areas the following population estimates apply which confirms their status as first order centres as per the planning norms and standards:

Table 18: Population within first order catchments

	Nyeri	Marunga	Thika
1979	460 194	706 104	616 706
1989	624 102	936 772	704 669
2010	1 078 413	1 415 487	1 351 771
2015	1 187 826	1 569 355	1 564 312

11.3 Transportation, movement systems, and accessibility

Transportation and movement are the lifeblood of development. The better a transportation network, the better the access to opportunities. In this, mobility of users and connectivity and network density plays and important role. According to the UNHABITAT[37] affordable transport is an important aspect of economic and social well-being. It means the low-income earner can afford access to healthcare, household goods, education, work and social activities. Unaffordable transport denies vulnerable groups these opportunities and exacerbates poverty. It further states that accessibility is an even greater concern in developing countries. Where governments are unable (or unwilling) to provide subsidized public transport systems, the poor are at the mercy of informal sector transport operators or are forced to cover long distances by foot. In poorer and smaller cities, this may reach 90 percent. Pedestrians must deal with the lack of pavements and safe crosswalks. They are prone to car accidents, and the personal security threat that comes with unlit streets. In many African countries school children and youth often walk long distances along congested corridors to reach schools, exposing them to accidents risks and other hardships.

Figure 52: People dependent on walking in a pedestrian unfriendly environment

[37] http://unhabitat.org/wp-content/uploads/2013/06/pr1.pdf

Figure 53: Mixed modes of transport

According to Opiyo, and Mitullah[38] the Kenya Government has put a lot of effort in streamlining transportation sector in the whole country. This has led to the formulation of the Sessional Paper number 2 of 2012 on Integrated National Transport Policy (INTP) and initiating other progressive programmes and projects such as Roads 2000 and the recently launched National Urban Transport Improvement Project (NUTRIP). The state that the achievement of good mobility and accessibility at County level will heavily rely on their ability to formulate multi and intermodal oriented transport policies and plans, which will also enhance the competitiveness of the Counties and attract investors.

11.3.1 Transport infrastructure

11.3.1.1 Air

Murang'a do not have any air transport facilities within its boundaries. There are two facilities juts outside its borders. The first is a landing strip east of Thika. This strip has a 1 200m unpaved runway. The second is the Wanguru (Thiba) airfield northeast of Murang'a. This airfield has two unpaved runways of 800m and 700m respectively.

11.3.1.2 Rail

There is one abandoned railway line running through Muranga from Nairobi to Nanyuki in the north. There were railway stations, namely, at Sesheni Railway station, Makuyu station, Muragua and one just outside Murang'a (Karii Railway station). Practically, the line does not exist anymore, and should it prove to be an option for long-term development, the whole line will have to be rebuilt.

[38] Romanus Opiyo, and Winnie Mitullah, *Enhancing Mobility in Kenya Counties through Strategic Policies Formulation*. International Conference on Transport and Road Research-15th-17th March 2016, Whitesands Hotel, Mombasa, Kenya

Figure 54: Abandoned railway line near Muragua

Figure 55: Abandoned railway line crossing the C71 south of Murang'a

11.3.1.3 Road network

Murang'a County has a total road network of 10 649km of which 9 524km is very low order dirt roads, tracks, and footpaths. The formal road network is 1 125km in extent. The backbone of the road network

in Muranga is the A2 between Thika in the south, passing through Kenol and Kambiti Town before it leaves the County towards Nyeri. This road is of relatively good quality.

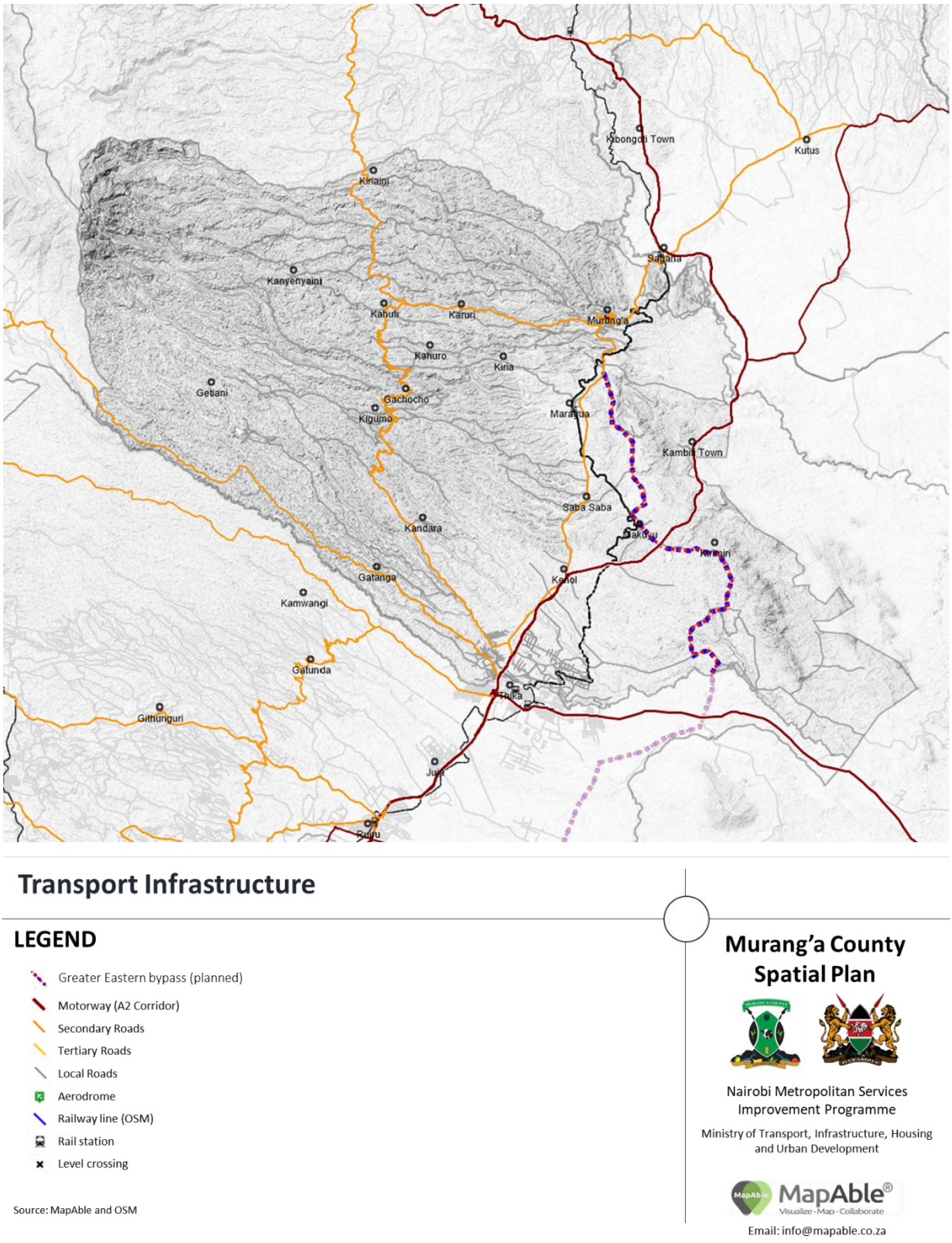
The C71 leave the A2 at Kenol and forms the main link with Murang'a via Muragua before it joins the A2 again at the county boundary at Sagana. Three other main routes are of particular importance. The first is the C70 which branches off from the A2 at the Karii at the Kenya Agricultural Institute and then running through the centre of Muranga to Kiriani before it leaves the County to Nyeri. This route is generally in good condition, but the topography of county restricts a free flow of traffic due to its winding nature trough the irregular topography crossing countless stream and ridges. The second is the C67 that runs along the southern border of the County from Thika to Njabini where it joins the C69. This is the only route that provides access to the areas west of Aberdare mountains and National Park. The last C-route in this category is the C72 which joins Murang'a with C70 in the west.

There is a well-developed system of D-routes which branches off the C-routes and service the most remote parts of the County. The one noticeable factor is that these routes are often not interconnected and tend to end in the mountains without connecting with other routes. This is a direct result of the topography with most roads running along the ridges, more or less parallel to each other.

All the C-routes converge in the south immediately north of Thika from where they feed into the A2 towards Nairobi. Although these routes should be the core of the mobility system and should improve access toward the metropolitan core, it is clear that uncoordinated development and activities along these routes detract from their functions and restricted traffic flow on these routes. The route between Nairobi and Thika is clearly designed as an interregional connector, but speed limits, adjacent developments and unrestricted pedestrian movement on and crossing this route has rendered it largely dysfunctional. The same applies to the A2 as it passes through Murang'a although the problems are not as pronounced due to lower traffic volumes as less dense development along this route. The same applies most lower order roads where there is practically no separation pedestrian use from business activities and traffic on these routes. It is dangerous and limits movement on important routes. However, one should recognise that most lower order, in many cases, higher order routes are multi-functional because of topographic that limits alternatives as well as very high-density development, even in remote rural parts of these roads.

The next map show a high-level picture of the transport network in the County.

Map 23: Transport infrastructure



The next set pictures highlight some of the most pertinent issues along these roads.

Figure 56: No provision for pedestrians along major roads

Figure 57: Poor road condition in the wet season

Figure 58: Informal traders restricting access and movement at major intersections

Figure 59: Pedestrian crossings on the A2 between Thika and Nairobi restricting traffic flow affecting access to Murang'a

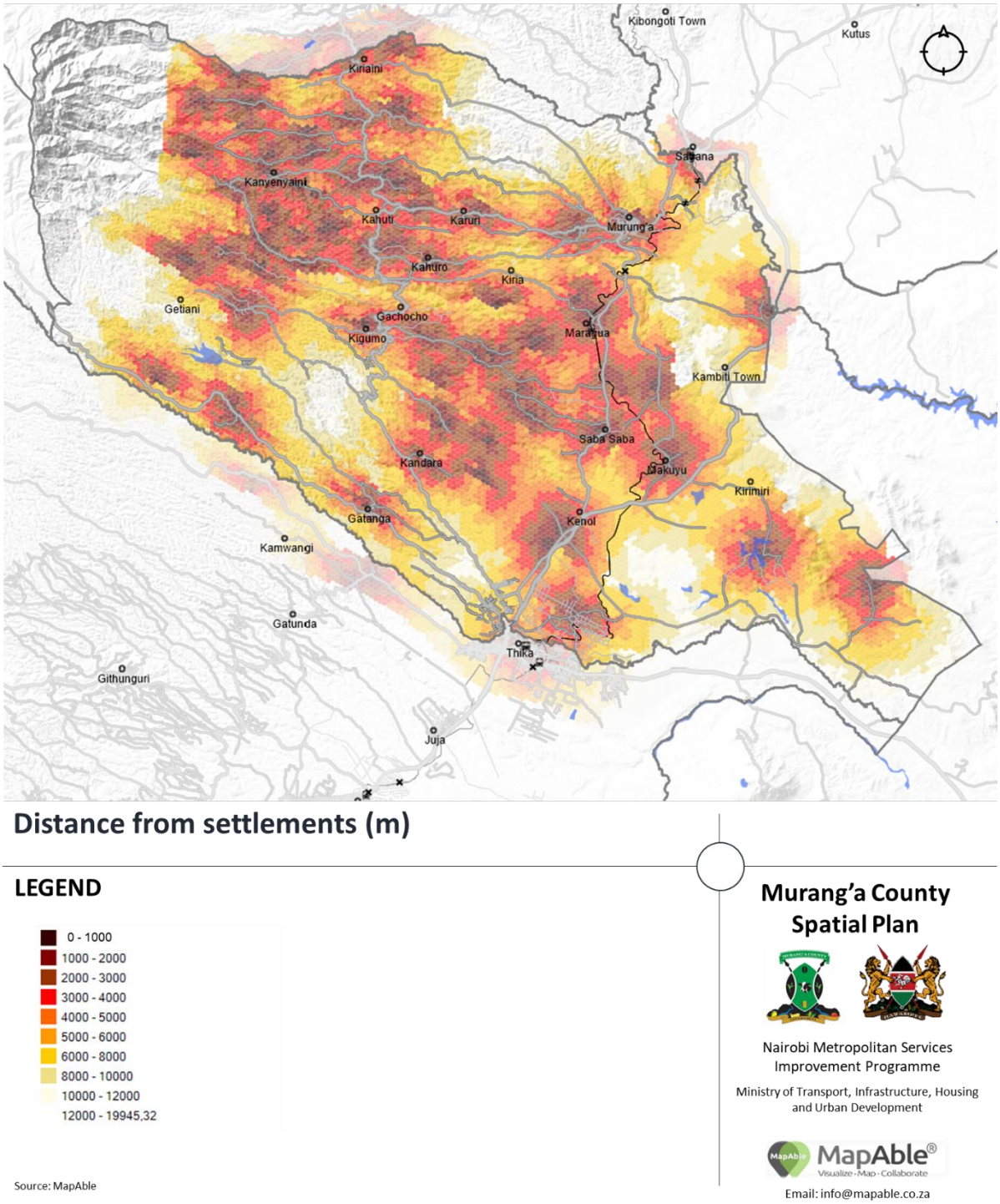
11.3.2 Mobility and access

The previous sections describe a dense and complicated road network affected by settlement patterns and largely dictated by topography and climate. The road networks mirror and reflect the settlement patterns that developed over many decades. However, the fact that the majority of people are very immobile and can only move or travel as far as it is possible or convenient to walk, it implies that access to amenities, facilities, and economic opportunities becomes limited to those in very close proximity.

In previous sections location and intensity of settlement and the average distance between settlements was considered. The outcomes have shown that there was a limited level of spatial differentiation. The next map shows the distance to settlements from the in between spaces or surfaces where the majority of economic activities, mostly in the form of small-scale farming, take place. The pattern that manifests again is that of undifferentiated access to most parts of the County. There are however exceptions. The most noticeable as one can expect, is the eastern parts dominated by lower densities and large scale farming estates, east of Murang'a as well as along the Murang'a-Kiriaini road (D428) as well as a smaller area between the C70 and C67 east of Kandara.

Figure 60: Example of undifferentiated linear settlement in central Murang'a

Map 24: Distance from a settlement (m)

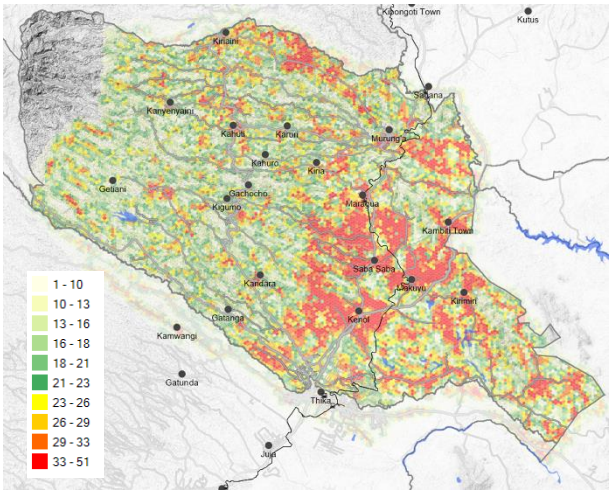


Distance to settlement is not the only measure of accessibility. Accessibility is also a function of the network density, more importantly, the intersection density which measures the connectivity in the road network. When the connectivity is measured at different distances very specific surfaces of connectivity and thus, accessibility emerges.

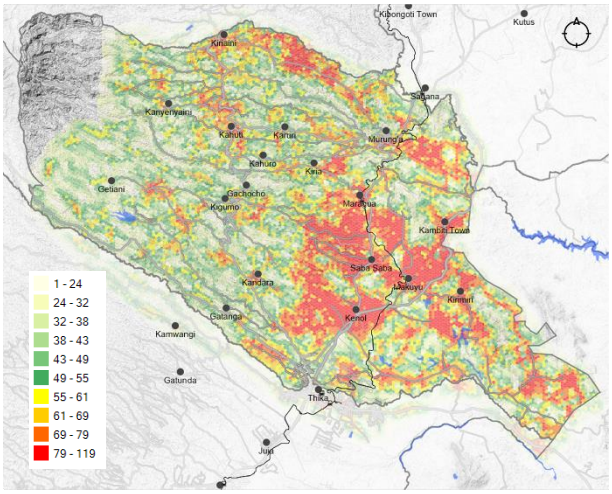
The four figures below show the index at two, three, four and five-kilometre distances. The patterns become more clear and defined as distances increase. At a five kilometre distance, which approximated about an hours' walking distance, very specific areas of high connectivity shows. These areas of high

connectivity start to show important routes while in some cases, higher order roads are not necessarily well connected. The C67 from Thika through Gatanga is very poorly connected to the rest of Murang'a although it provides an important link to the areas to the west. The same applies to the C70 from Thika to Gachocho. This might be attributed the very irregular terrain and very challenging topography. From Gachocho to Kirianini the connectivity is good. The extent of connectivity is particularly noticeable from Kenol to Muragua along the C71.

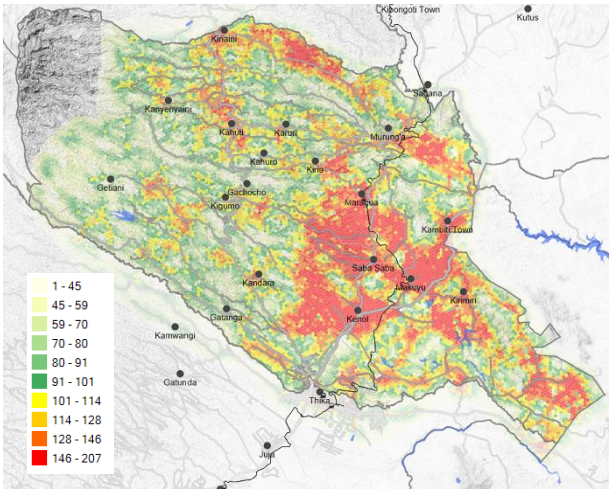
Figure 61: Index based connectivity comparisons[39]



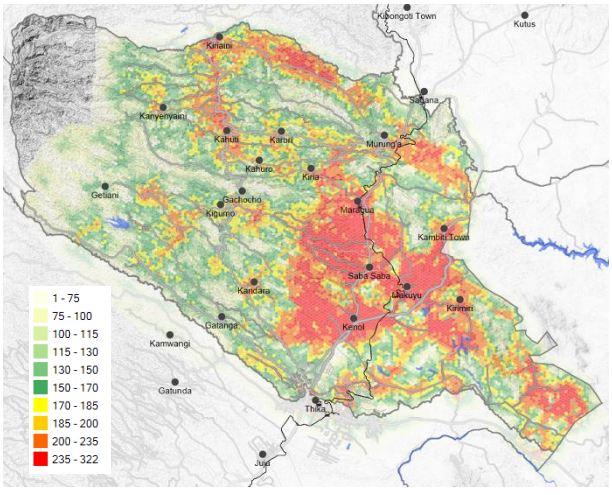
Connectivity index (2km intersection reach)



Connectivity index (3km intersection reach)



Connectivity index (4km intersection reach)



Connectivity index (5km intersection reach)

11.3.3 Proximity assessment

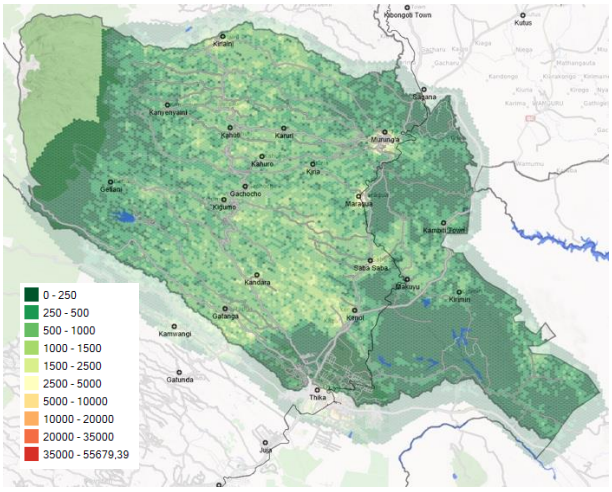
The last assessment to describe accessibility is a proximity assessment. The proximity counts indicate how many people can be reached from any given point within a specific distance. The higher the number to more accessible a point is. This assists in selecting points for optimising the location of facilities requiring or which to meet certain threshold values.

As indicated in the figures below, proximity counts at 1km confirm the general uniform and even distribution of the population. However, at a 2km distance, some points are highlighted. These points

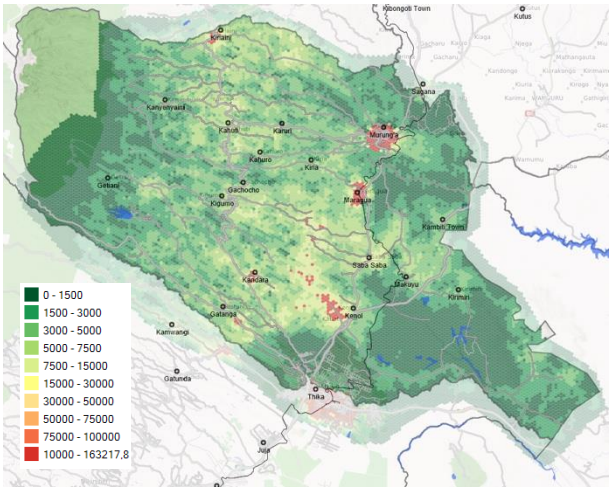
[39] The connectivity index measures number of intersections accessible from any point within a given distance.

represent the major nodes in the County. Furthermore, it shows how important Thika is for the southern parts of the county. It also confirms the importance of Murang'a, Muragua, Kabati-Kenol and Kiriaini as nodal points in the County. When measures at a 5km distance the picture again changes and shows areas of proximity rather than points of proximity. However, the position of Thika is again confirmed at this level. At a 10km distance, the previous pattern persists but is more pronounced. However, it becomes clear that proximity is not necessarily linked to the major road networks but rather to areas of high connectivity and high population densities.

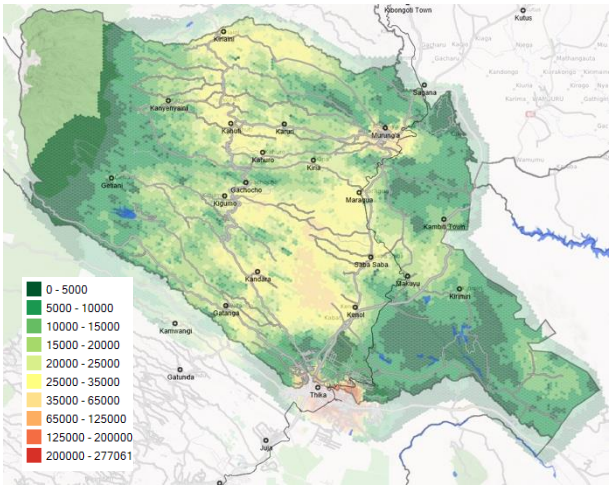
Figure 62: Proximity assessment based



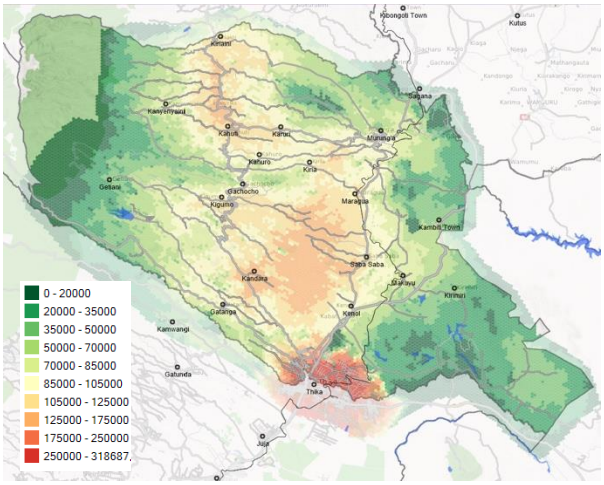
Population proximity within 1km



Population proximity within 2.5km

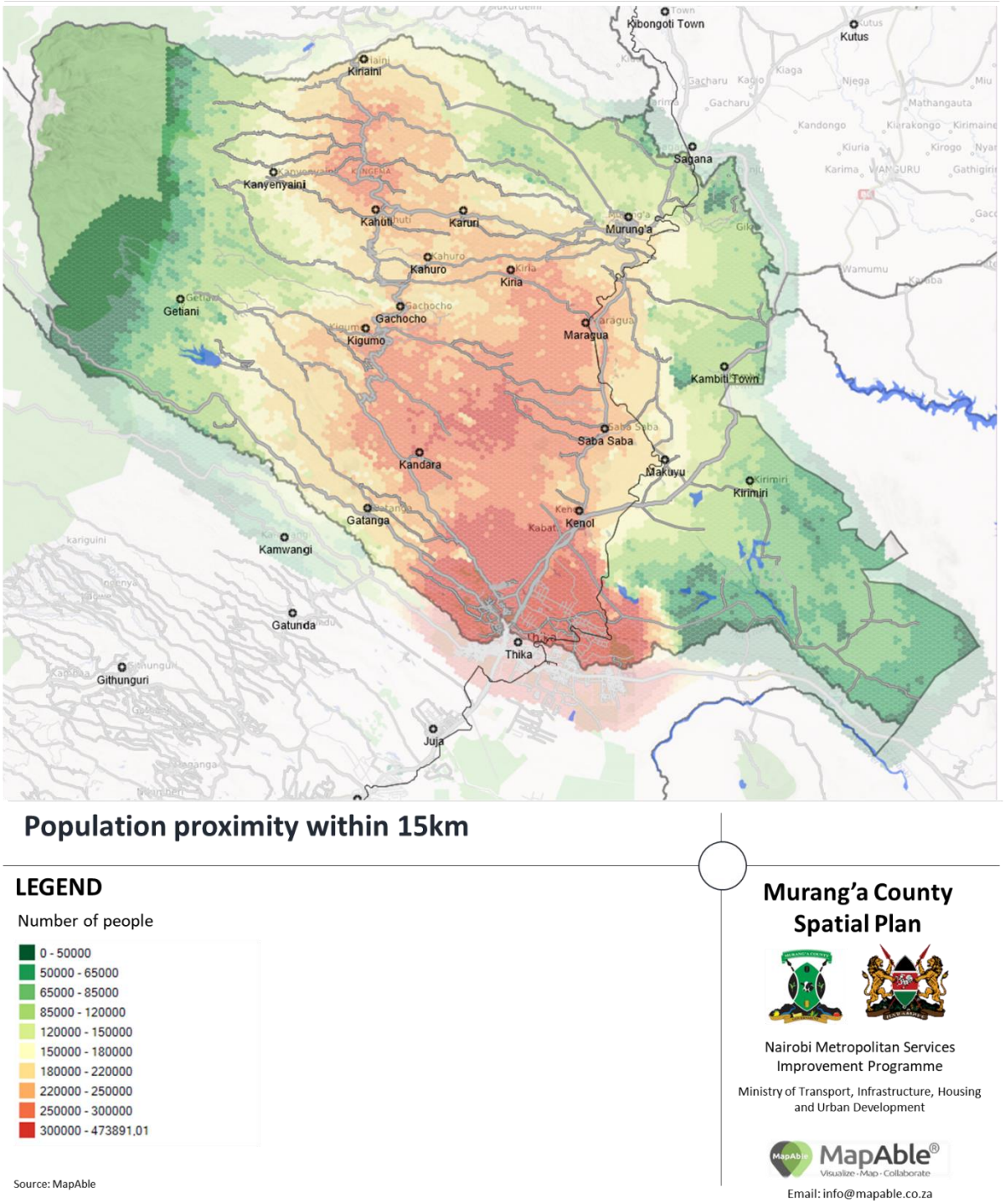


Population proximity within 5km



Population proximity within 10km

Map 25: Population proximity within 15km



The map below shows proximity at a 15km distance. It clearly describes the macro development surface of the County and shows the relationship between populations densities and connectivity. It does not align with distance to towns and settlements nor with the existing higher order roads in the County. When Thika provides the threshold values, Murang'a on the contrary scores lower at a higher level. The triangle described between Kandara, Saba Saba and Gachocho is particularly significant as the area along the C70 between Kahuti and Kiriaini.

12 Infrastructure services delivery systems

Access to basic services is one of the key indicators for assessing development. Basic services are usually defined as a level of access that ensures a minimum health standard as set by the World Health Organisation (WHO). These standards have been incorporated in the UN's Millennium Development Goals. The Millennium Development Goals (MDGs) are the world's time-bound and quantified targets for addressing extreme poverty in its many dimensions-income poverty, hunger, disease, lack of adequate shelter, and exclusion while promoting gender equality, education, and environmental sustainability.

Millennium Goal 7 targets environmental sustainability and states that it is critical that the natural resources base and ecosystems1 are managed sustainably to ensure that people's food requirements and other social, economic, and environmental needs are sufficiently met. Climate change conflicts over access to resources, and increased water scarcity all pose a threat to not only environmental sustainability but also food security. As such, millennium development goal 7 has four targets:

- To integrate the principles of sustainable development into every nation's policies and programmes, and also reverse the depletion of environmental resources
- To reduce biodiversity loss and achieve a substantial reduction in the rate of loss by 2010
- To halve the proportion of the universal population without sustainable access to clean and safe drinking water and basic sanitation by 2015.
- To achieve a substantial improvement in the lives of a minimum of 100 million slum dwellers by 2020.

12.1 Water

12.1.1 Access to water

Access to clean safe drinking water is an important component of the Millennium Goals. Regarding the Status Report for 2013, 44% of people in rural areas and 71% in urban areas have access to safe and clean drinking water[40]. Census 2009 Reported access to water as shown in the table below.

Table 19: Access to water by location - Census 2009

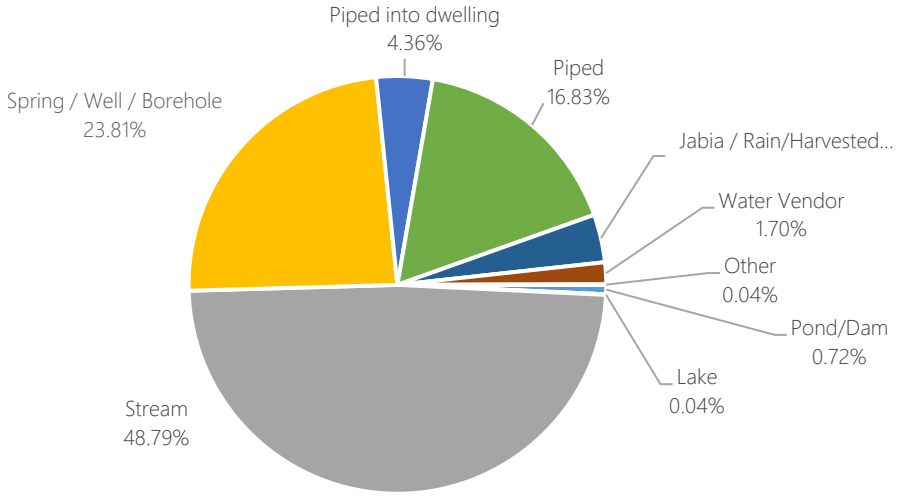
Location	Pond/Dam	Lake	Stream	Spring / Well / Borehole	Piped into dwelling	Piped	Jabia / Rain/Harvested	Water Vendor	Other	Total
Aberdare Forest	0	0	2	0	0	17	0	0	0	19
Gaichanjiru	19	0	4088	1390	17	19	127	112	0	5772
Gaturi	6	4	3053	1842	8	4	555	11	3	5486
Gikindu	16	7	3015	724	19	66	85	184	0	4116
Gitugi	11	5	4297	971	86	907	248	7	0	6532
Ichagaki	37	4	2422	3680	26	44	81	110	2	6406
Ithiru	14	1	4717	815	105	995	264	71	1	6983
Iyego	5	10	2762	439	279	901	207	11	1	4615
Kagundu-Ini	48	7	3693	3138	105	45	120	715	0	7871
Kahuhia	4	1	2652	610	15	110	384	59	0	3835
Kahumbu	9	1	3410	1587	13	31	161	19	1	5232
Kamacharia	15	2	3268	1678	30	361	684	65	0	6103
Kamahuha	5	2	2148	3330	149	549	139	123	6	6451
Kambiti	43	1	1797	1306	94	230	13	177	1	3662
Kangari	61	0	2504	788	690	3521	207	275	0	8046

[40] Ministry of Devolution and Planning, Millennium Development Goals Status Report 2013.

Location	Pond/Dam	Lake	Stream	Spring / Well / Borehole	Piped into dwelling	Piped	Jabia / Rain/Harvested	Water Vendor	Other	Total
Kanyenyaini	2	1	2111	305	316	1388	274	7	2	4406
Kigumo	22	1	4673	1449	514	1584	216	18	0	8477
Kimathi	6	0	1880	1384	3	2	165	1	2	3443
Kinyona	7	1	1735	186	520	2781	211	3	1	5445
Kiru	12	3	3726	673	251	2182	245	24	4	7120
Kiruri	3	0	1308	98	159	726	288	3	0	2585
Makuyu	892	13	4910	7169	597	1039	89	727	13	15449
Maragua Ridge	1	0	1227	374	2	13	27	14	0	1658
Mbiri	2	1	2075	802	166	1535	109	13	1	4704
Mugoiri	12	6	4880	2008	204	410	591	96	0	8207
Muguru	10	4	1151	194	906	2764	158	59	6	5252
Murarandia	11	2	5372	685	277	1243	496	35	2	8123
Muruka	6	0	4028	1880	13	41	58	202	0	6228
Muthithi	28	1	2955	2651	13	62	189	51	0	5950
Ngararia	17	1	1788	2667	19	0	85	120	0	4697
Nginda	133	1	3032	2753	83	248	172	145	1	6568
Njumbi	9	0	2056	138	208	2414	147	7	2	4981
Ruchu	36	4	5528	1610	260	1848	344	52	1	9683
Rwathia	6	3	2773	180	246	1336	404	3	5	4956
Township	23	1	473	440	2793	5199	35	78	21	9063
Weithaga	2	2	2060	610	66	1116	291	8	0	4155
Grand Total	1533	90	103569	50554	9252	35731	7869	3605	76	212279

Ponds, dams, lakes, and streams are open and exposed water sources and cannot be regarded as safe. Springs, wells, and boreholes can be regarded as safe, if specific measures are in place to protect the source, while piped and harvested water or water sold by a vendor can be safe. However, management and maintenance of supply have impacts in whether a source can be regarded as safe. Should one take these factors into account, not more than 26.6% of households have access to safe water.

Figure 63: Access to water - Census 2009



12.1.2 Water supply

According to the CIDP, there are five water and sanitation companies in Murang'a County namely: Muwasco, Gatawasco, Muswasco, Kahuti, Kandara. Ithanga water supply was handed over from Thika East and is now also part of Murang'a. The following tables summarise the status quo.

Table 20: Gatamathi water and sanitation (Located in Mathioya Sub-County)

Water Supply Scheme	Water Sources	Water Resources and Quality	Distances from the nearest point	Sanitation	Remarks
Gatango	North Mathioya River. 4km inside Aberdare forest	Fine sand particles and forest leaves. Chemicals found in the water are acceptable to the WHO/KEBS standards. Biological analysis indicates 4MPN at the intake	4 km	None	No treatment works. Constant pipeline blockages and meter blockages. To minimize the blockages, a sieve structure was installed at first Tank at Kairo Market 4km from the first consumer. Requires sedimentation tanks at the intake site.
Mathioya	Hembe a tributary of North Mathioya River. 1km from the Aberdare forest edge	Fine sand particles and forest leaves. Chemicals found in the water are acceptable to the WHO/KEBS standards. Biological analysis indicates 4MPN at the first consumer	3km	None	Partial treatment was done-chlorination. Converted the existing 800m3 concrete tank into a sedimentation tank to settle most of the sand and forest leaves. Requires sedimentation tanks
Mathioya	Hembe	Good quality	5.5km Not functional		Part of Mathioya Water Supply which used to pump water to residents near the forest boundary. High costs of pumping lead to the abandonment of the system and gravity system are in the way where an intake was constructed last year. Requires sedimentation tanks
Proposed Gaturi Water Project	North Mathioya River. To be at Gitereki in Kiru Ward/Division.	Pollution is more than the one in the forest edge.	22km to the first consumer at Gakurwe	None	The source to be in Mathioya district where water can gravitate to Gakurwe which is the first market in Gaturi and the boundary of Mathioya and Gaturi. It is also the highest point in Gaturi hence water can flow by gravity in all areas. The river is not polluted

Table 21: Gatanga Water Company

Water Supply Scheme	Water Sources	Water Resources and Quality	Distances from the nearest point	Sanitation	Remarks
Gatanga (AWSB)	Two intakes Thika and Kimakia; two boreholes Gathanji and Kiunyu.	• Thika River abstraction-2000m³ per day. • Kimakia River abstraction3000m³ per day. • Kiama forest abstraction not in use. • Kiunyu borehole24m³ per hour - not fully utilized. • Gathanji borehole11m³ per hour. Kiawahiga 20m³ per hour-not in use requires a power connection. • Gakurari 5m³ per hour not in use requires a power connection. Proposed water resources • Kiama lower sides 1000m³ per day. • Kimakia lower sides 2000m³ per day. • 2 No. boreholes at Thuita and Kagongo in Kihumbuini. Quality: in the past, coliform levels were within WHO standards, but now the coliform count has gone up hence quality is questionable.	On average 100m	Pit latrines and septic tanks. No sewage system.	Started in 1972 by the community, gravity. Serves upper areas of Gatanga. Supplies 189 km² i.e. Kihumbuini, Gatanga, Kigoro Divisions and parts of Kariara division
Construction of conventional water treatment works.		Two No. contact tanks required (capacity 450m³) for chlorine dosing.			Works of capacity 4000m³ per day have been forwarded to Athi water services board for funding.

Table 22: Mathioya

Water Supply Scheme	Water Sources	Water Resources and Quality	Distances from the nearest point	Sanitation	Remarks
Kahuti (in Kangema)	• Phase I – from river Mathioya south (Tuthu) • Phase II – from river Mathioya south (Rwathia) • Phase III – from river Mathioya south (Tuthu) • Phase IV – from river Maragua (Ichichi) Other water sources in Kangema include rivers: Maragua Mathioya South Mukungai Kayahwe, Boyo spring	Disinfected at source by chlorination for Tuthu phase (I) & (II) and phase (iv) while Rwathia source is subjected to full treatment.		No sewerage system but use septic tanks-20%, VIP toilets - 35% and local toilets -45%. An exhauster is availed t by Tana Water Services Board at a fee.	4,000m³/day Rwathia – 8,500m³ /day Tuthu – 3,500m³ /day Ichichi - 4,000m³ /day

Table 23: Murang'a South Water and Sanitation Company (Muswasco)

Water Supply Scheme	Water Sources	Water Resources and Quality	Distances from the nearest point	Sanitation	Remarks
Kandara water scheme	• Thika River • Kiriciungu river • 10 N0. Boreholes	Partially treated		VIPs latrines but no Sewerage	50% of people served
Kigumo water supply	Irati river	Treated		VIPs latrines but no sewerage	80% of people served
MURANGA SOUTH Saba Saba water supply	• Saba Saba river • Borehole	Treated	-more of Murang'a south gets water from the Kigumo water supply	VIPs latrines no Sewerage	20% of people served
Maragua water supply		Partially treated	-Maragua town gets water from the Kigumo water supply Kenol gets from Kandara supply	VIPs latrines. No Sewerage	20% of people served

12.2 Sanitation

The main objective of a sanitation system is to protect and promote human health by providing a clean environment and breaking the cycle of disease. Basic sanitation is improved sanitation facilities that ensure hygienic separation of human excreta from human contact. They include:

- Flush or pour-flush toilet/latrine to a piped sewer system, a septic tank or a pit latrine.
- Ventilated improved pit latrine.
- Pit latrine with a slab.
- Composting toilet.[41]

The table below shows access to sanitation in 2009.

Table 24: Access to sanitation - Census 2009

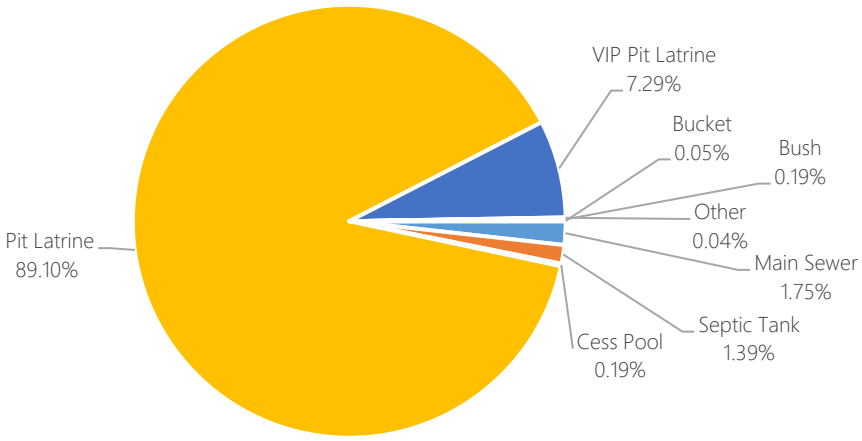
	Main Sewer	Septic Tank	Cess Pool	Pit Latrine	VIP Pit Latrine	Other	Bush	Bucket	Total
Aberdare Forest	0	0	0	18	1	0	0	0	19
Gaichanjiru	9	24	2	5 519	208	3	6	1	5 772
Gaturi	5	4	7	5 328	132	3	3	4	5 486
Gikindu	7	30	3	3 580	476	3	14	3	4 116
Gitugi	3	12	2	6 286	218	1	9	1	6 532
Ichagaki	10	96	19	5 620	636	4	16	5	6 406
Ithiru	26	103	2	6 563	284	1	2	2	6 983
Iyego	1	8	8	4 178	416	0	4	0	4 615
Kagundu-Ini	108	32	9	6 775	931	5	8	3	7 871
Kahuhia	5	19	25	3 485	293	0	8	0	3 835
Kahumbu	1	2	0	5 166	50	2	10	1	5 232
Kamacharia	3	86	7	5 613	389	0	3	2	6 103
Kamahuha	14	83	8	5 864	448	2	29	3	6 451
Kambiti	1	43	0	3 481	101	1	35	0	3 662
Kangari	78	342	35	5 723	1 851	4	7	6	8 046
Kanyenyaini	2	100	5	3 916	383	0	0	0	4 406
Kigumo	2	56	6	7 534	862	0	16	1	8 477
Kimathi	2	2	2	3 231	190	0	15	1	3 443

[41] http://www.un.org/waterforlifedecade/sanitation.shtml

	Main Sewer	Septic Tank	Cess Pool	Pit Latrine	VIP Pit Latrine	Other	Bush	Bucket	Total
Kinyona	9	50	2	4 404	976	2	2	0	5 445
Kiru	65	62	5	6 420	562	0	5	1	7 120
Kiruri	1	5	1	2 180	397	0	1	0	2 585
Makuyu	280	382	12	13 660	979	27	99	10	15 449
Maragua Ridge	2	5	0	1 591	41	0	19	0	1 658
Mbiri	22	15	29	4 340	285	3	9	1	4 704
Mugoiri	53	47	22	7 677	393	0	14	1	8 207
Muguru	65	114	3	4 389	671	5	2	3	5 252
Murarandia	67	82	17	7 650	297	7	3	0	8 123
Muruka	2	5	3	5 970	241	0	2	5	6 228
Muthithi	1	20	1	5 814	107	2	3	2	5 950
Ngararia	1	13	3	4 506	167	0	5	2	4 697
Nginda	5	75	2	6 340	104	9	19	14	6 568
Njumbi	4	39	63	4 590	278	0	4	3	4 981
Ruchu	16	51	38	8 888	678	1	10	1	9 683
Rwathia	3	13	3	4 277	656	3	1	0	4 956
Township	2 848	894	47	4 757	482	5	4	26	9 063
Weithaga	3	34	4	3 814	284	0	13	3	4 155
Grand Total	3 724	2 948	395	189 147	15 467	93	400	105	212 279

Based on the WHO norms, only access to main sewers (waterborne sanitation), septic tanks and VIP pit latrines and be regarded as meeting the standards. Regarding this, only 10% of the households in Murang'a have access to safe sanitation. Given the densities, this does not only pose health risks but has serious environmental consequences.

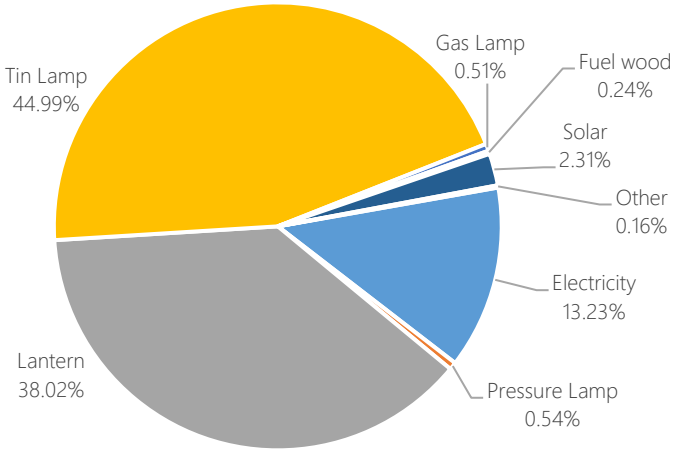
Figure 64: Access to sanitation - Census 2009



12.3 Electricity

Electricity might in some instances be regarded as a basic service. This is, however, not necessarily for health reasons as is the case with water and sanitation, but rather as an essential service to promote education, development, and growth.

Figure 65: Access to electricity - Census 2009



The source of light is usually used as an indicator. In the case of Murang'a it implies, if solar is included, that about 15.5% of households have access to electricity. This also then implies a high demand for other fuels, especially for cooking where wood and charcoal is used. This can contribute to environmental degradation (charcoal making) and air pollution in the densely populated areas. However, access to electricity does necessarily contribute to less wood burning since poor populations cannot afford white good and appliances associated with higher income electricity use.

12.4 Refuse removal and street cleaning

The dispersed nature of settlement patterns at relatively high densities makes any refuse removal services challenging. The extent of challenges with refuse removal and solid waste management is noticeable in all towns. There are particular challenges with markets and the disposal of waste from businesses. The issue is recognised in the CIDP.

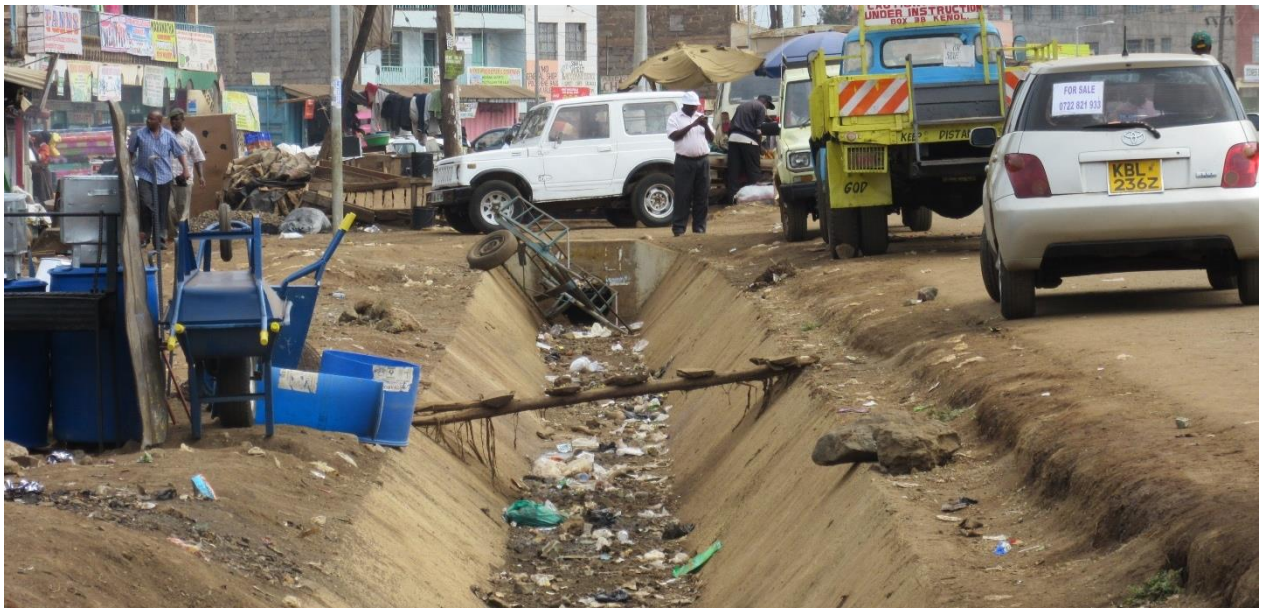
Figure 66: A lack of ablution facilities and waste removal at markets

The next figure shows the condition of storm water drains and the extent to which it is not maintained. During the rainy season, these pollutants wash into the water courses and streams and effects many

people who are dependent these sources of water for general human consumption. The CIDP confirms that solid wastes including, plastic, polythene papers, glass, human waste, animal waste, organic plant matter, synthetic material, rubber and medical waste is a challenge for the County. Dumping and management of solid waste to the environment remains a major challenge for the County. The CIDP states that Makuyu, Maragwa, Kangari and Kangema Towns as well as Kiriaini, Kahatia, Kandara, Kenol and Kigumo Markets are in dire need of solid waste management facilities.

A regional landfill site was identified at Mitubiri. (about 5km south of the A2 intersection at Kabiti). This is a major regional facility with an impact beyond the Murang'a boundaries.

Figure 67: A general lack of refuse removal and street cleaning services



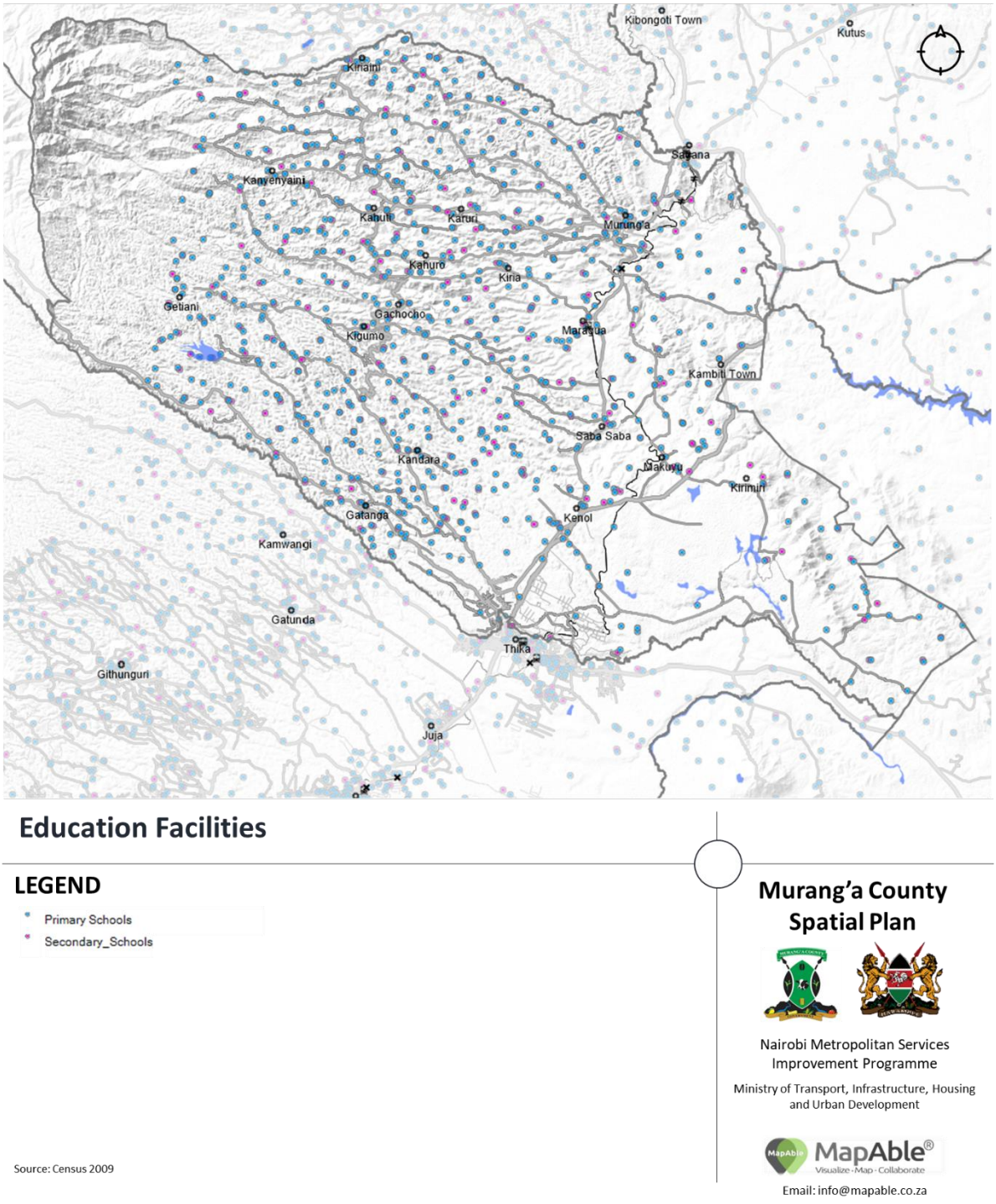
13 Social services

Education and health are two important building block of community development. These two elements are assessed from the point of access to facilities also regarding their spatial distribution and the extent to which the location of these facilities contribute to spatial differentiation and the extent to which it contributes the settlement hierarchy in the County.

13.1 Educational facilities

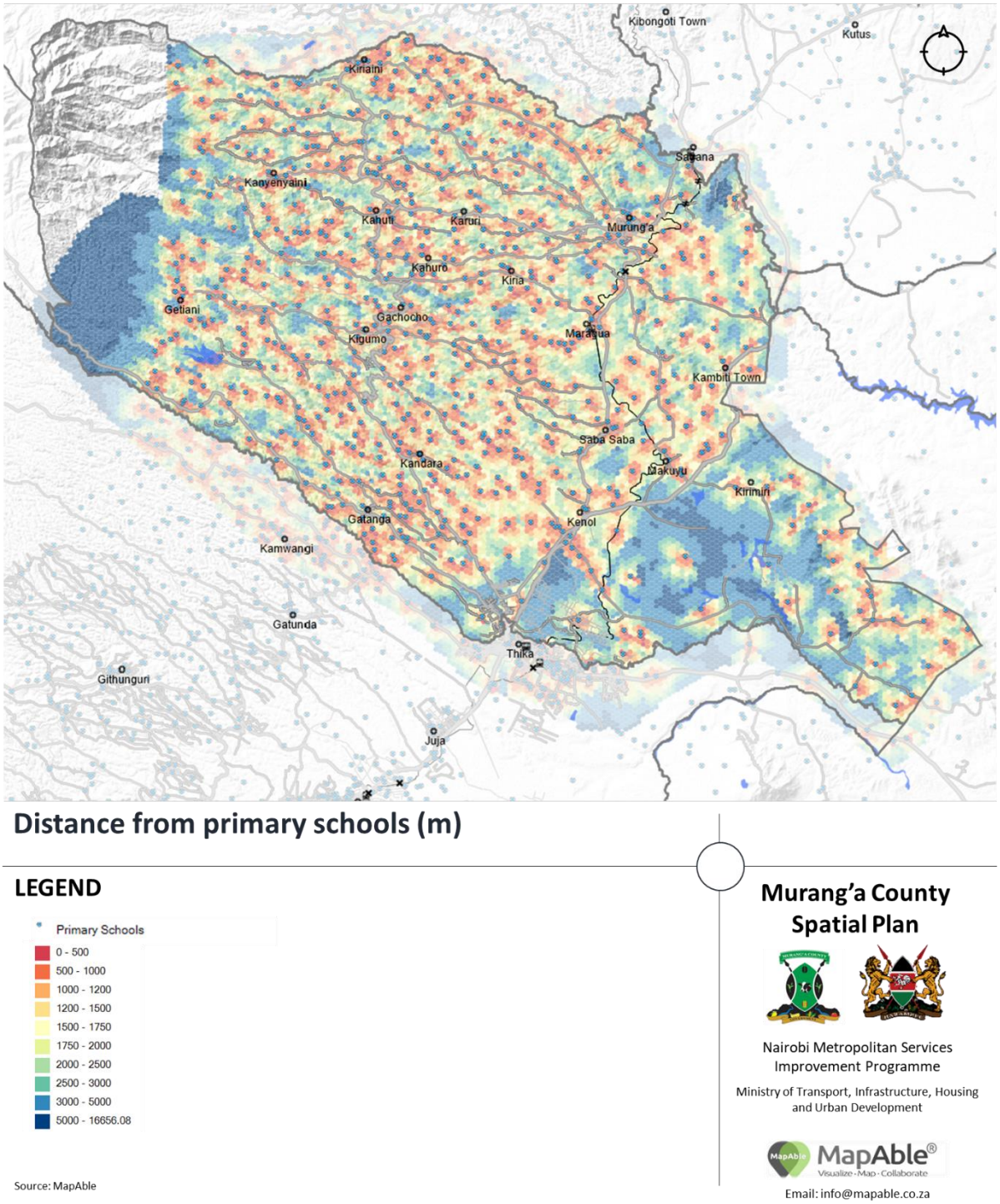
The map below shows the spatial distribution of primary and secondary schools in the County. There are 742 primaries schools and 270 secondary schools in the County.

Map 26: Spatial distribution of education facilities



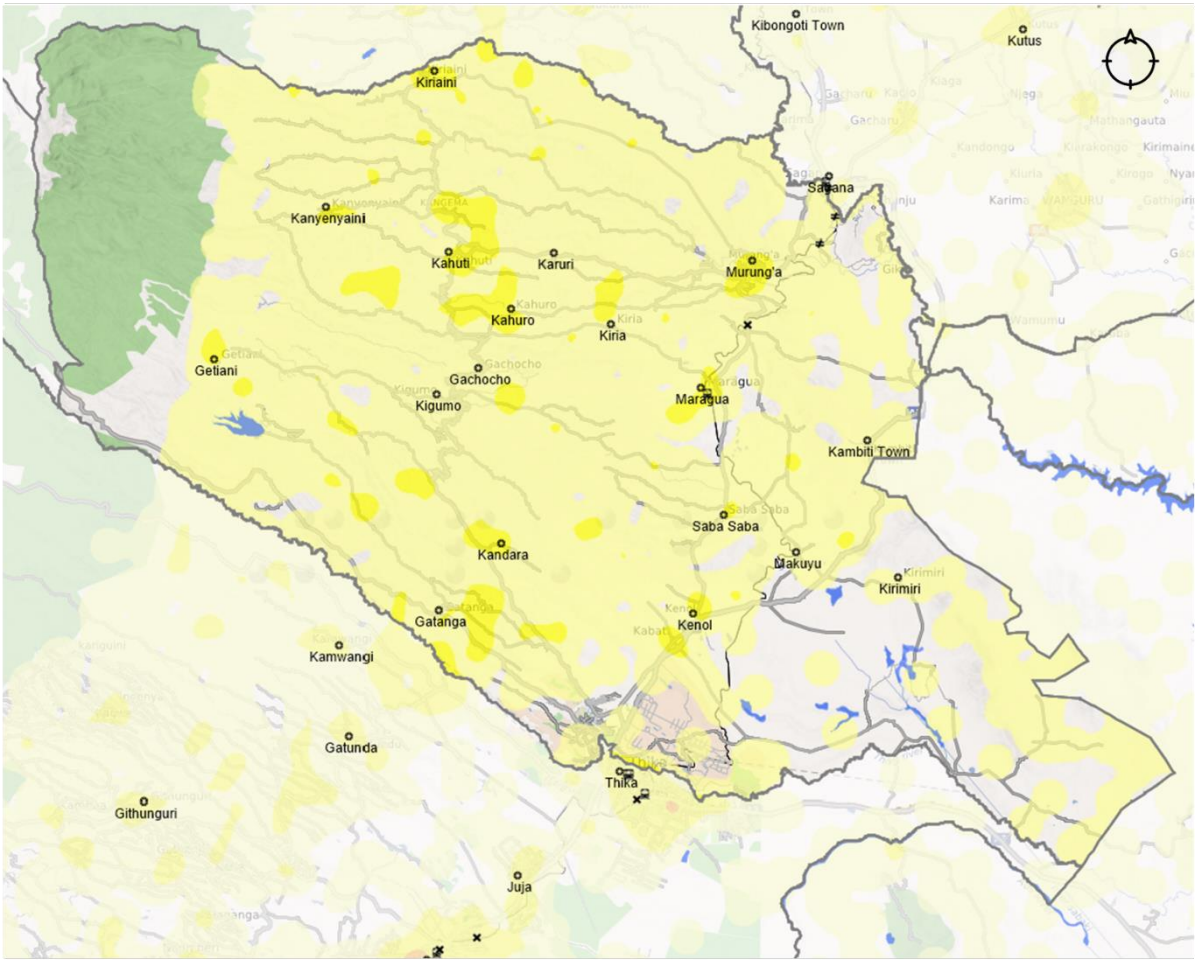
Given the population distribution and settlement patterns, schools are very evenly distributed through the County. It is only in the south-east and west of the A2 where there are clearly fewer schools. This however corresponds with settlement patterns addressed earlier. The map below shows the distances to primary schools. Regarding distance very few schools are more than 2km from any point in the County.

Map 27: Distance from primary schools (m)



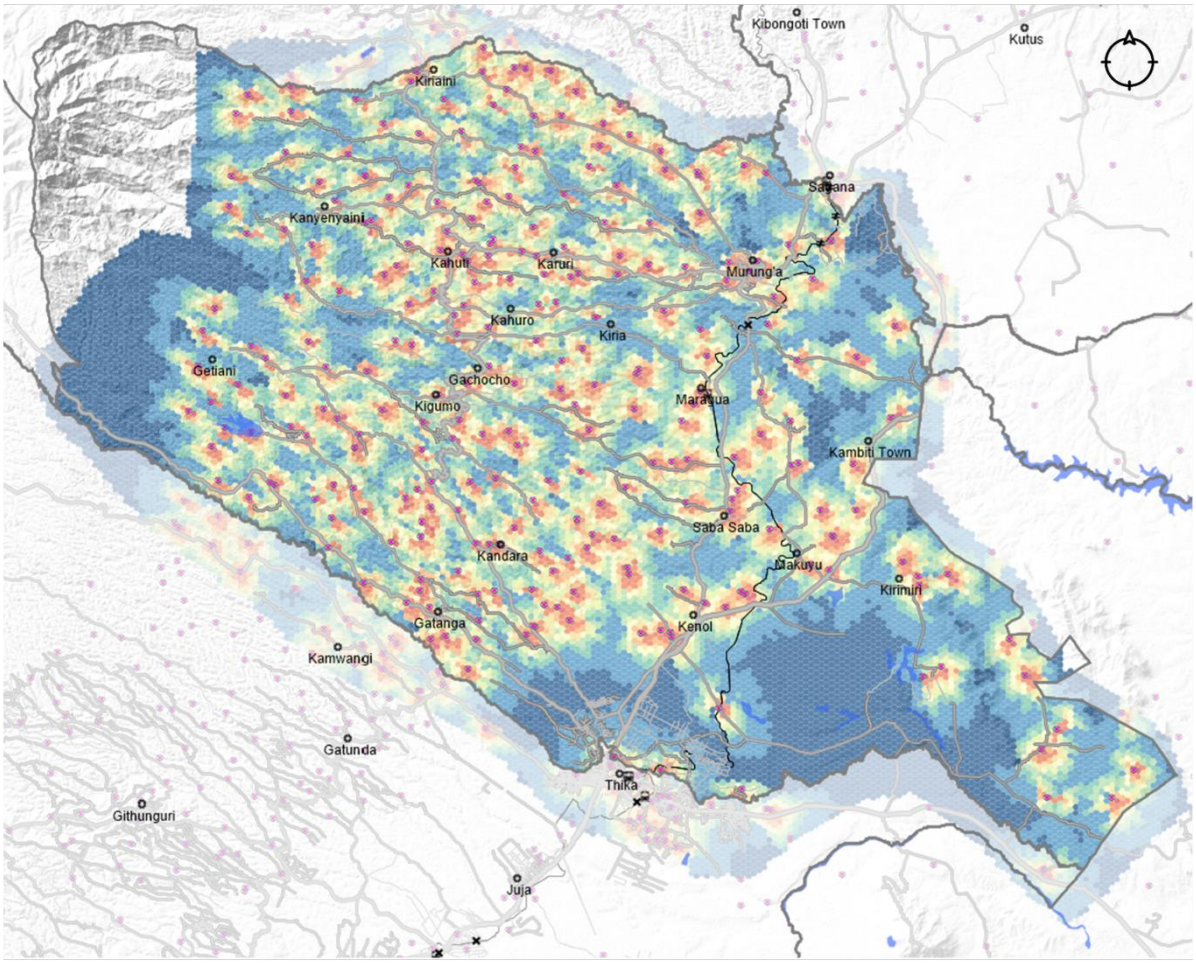
The even spread and distribution of schools are reflected in the maps below. There is very little evidence of clustering, and the distribution of schools do not contribute significantly to spatial differentiation in development and settlements in the County. As can be expected, there is some indication of clustering in the more important settlement such as Murang'a, Maragua, Kenol, Kandara, etc. as shown on the map below.

Map 28: 2km kernel densities for primary schools



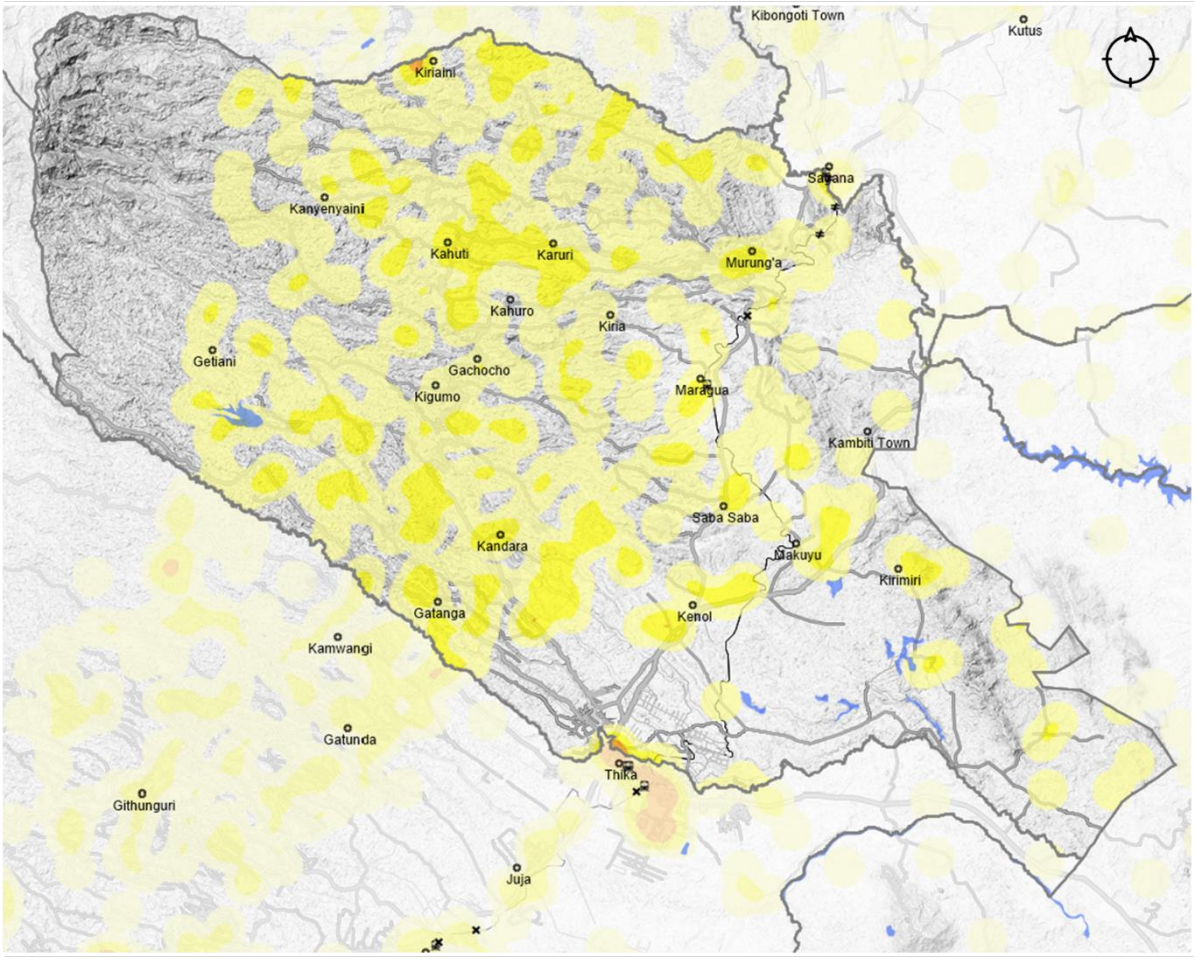
The same pattern applies to secondary schools. Being less in number they are further apart as indicated on the map below but the remain very evenly spread across the County. Again the land use patterns east of the A2 is reflected in the distribution of secondary schools.

Map 29: Distance from secondary schools (m)



Based on two-kilometre kernel densities, there is again not any evidence of any clustering in the County. The map below shows a very even distribution. Primary and secondary schools do not contribute to the spatial differentiation of the County.

Map 30: 2km kernel densities from secondary schools



2km Kernel densities* for secondary schools

LEGEND

Secondary schools within a 2km distance

2
3
4
5

*Kernel density calculates the density of features in a neighbourhood around those feature. In this case the neighbourhood is a radius of 2km from each school. The result is a smooth surface indicating the intensity of schools over the study area.

Source: MapAble

Murang'a County Spatial Plan

Nairobi Metropolitan Services Improvement Programme

Ministry of Transport, Infrastructure, Housing and Urban Development

MapAble® Visualize · Map · Collaborate

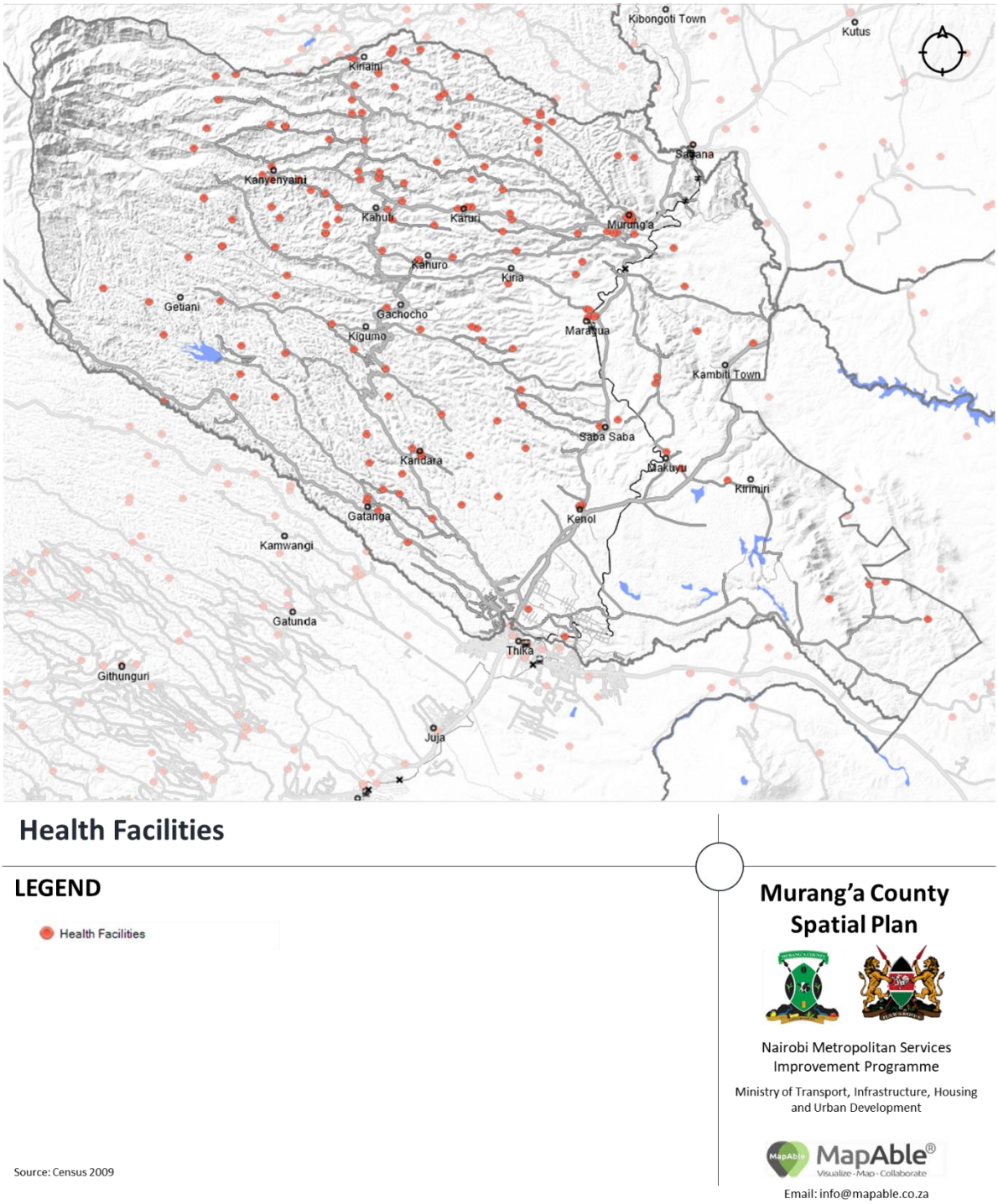
Email: info@mapable.co.za

13.2 Health facilities

There is a total of 172 health facilities in the County. Again, regarding numbers, they evenly spread out through the County. Where health facilities differ from schools is the fact that there is a range of facilities with different functions. The first is primary health care facilities, and there are also more specialised or single function facilities. The nature and distribution of these facilities becomes important. Thresholds for the different facilities differ, and it is, therefore, important to consider their location in terms population

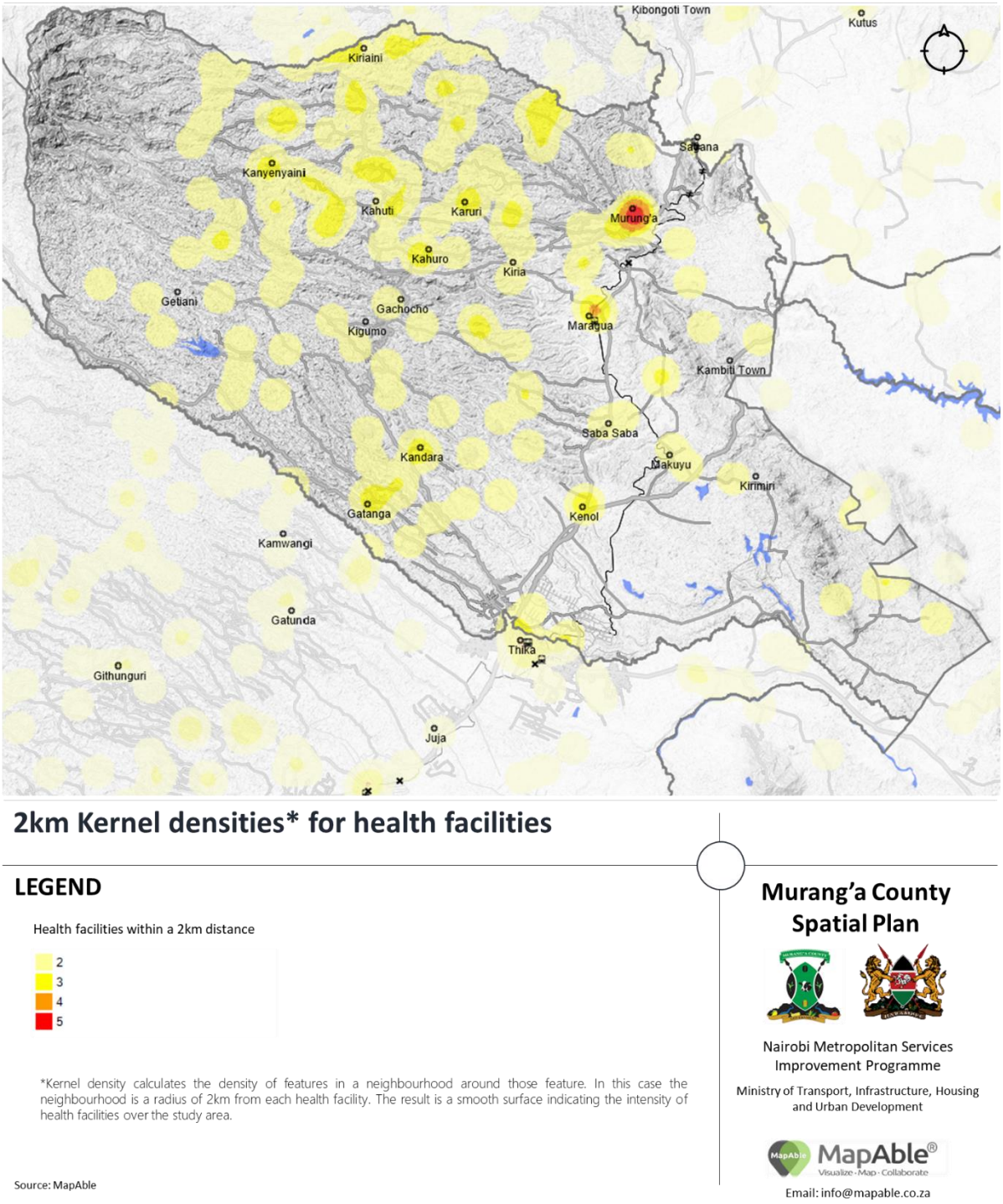
threshold requirements. The map below shows the general distribution of health facilities throughout the County.

Map 31: The spatial distribution of health facilities



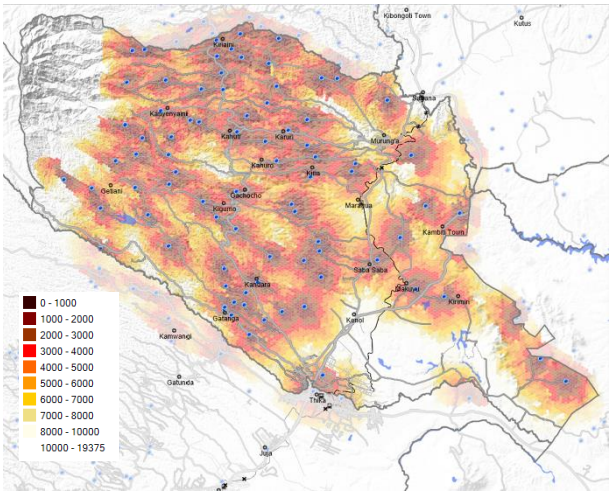
In contrast to the distribution of education facilities, there is evidence that there are concentrations of facilities in Murang'a and Muragua as well as in Thika immediately to the south. It is also evident that these facilities are associated with the larger settlements although there remains a good distribution throughout the County. It seems, as can be expected that there are more facilities in the denser settled areas in the north-west of the County.

Map 32: 2km kernels densities for health facilities

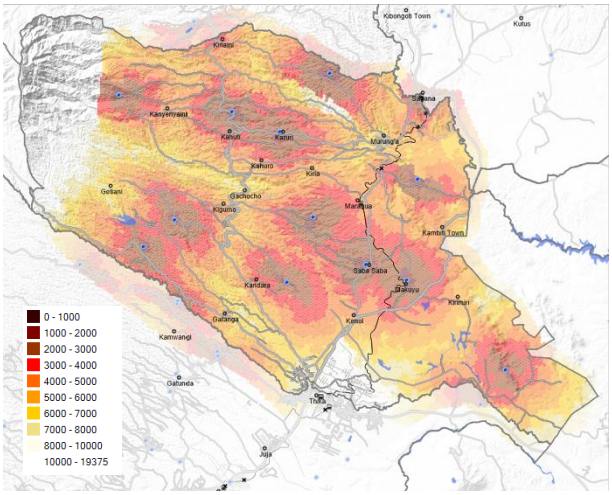


The first set of maps below shows the distance to lower order health facilities. They include dispensaries which are well distributed. Private clinics are located throughout the County but fewer in number. Health centres and hospitals are well provided and start to indicate a clear pattern of spatial throughout the county. This is assumed to be an indication of effective demand and optimising service areas between these facilities.

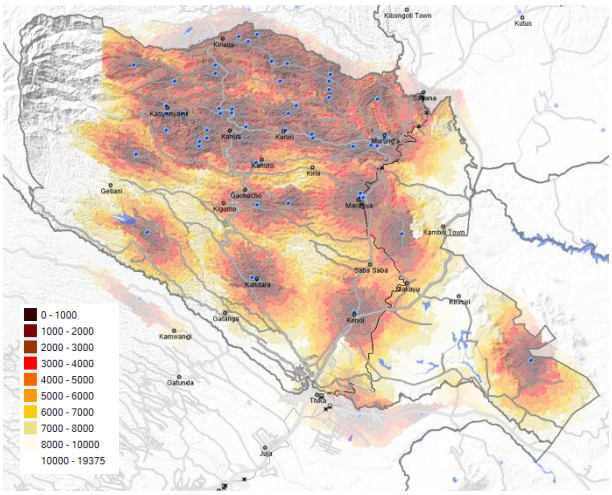
Figure 68: Distance to lower order health facilities



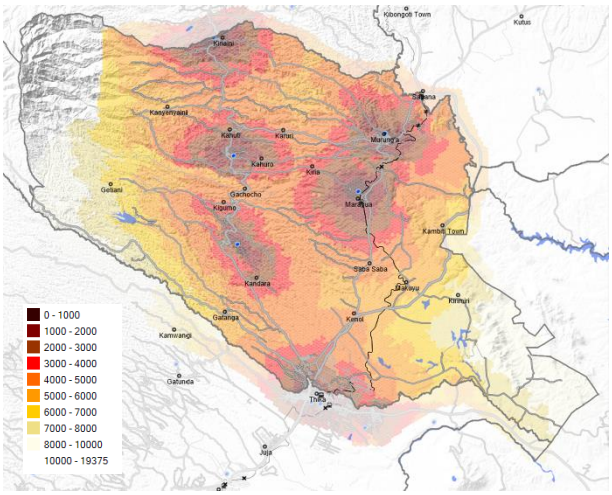
Dispensaries



Health Centres



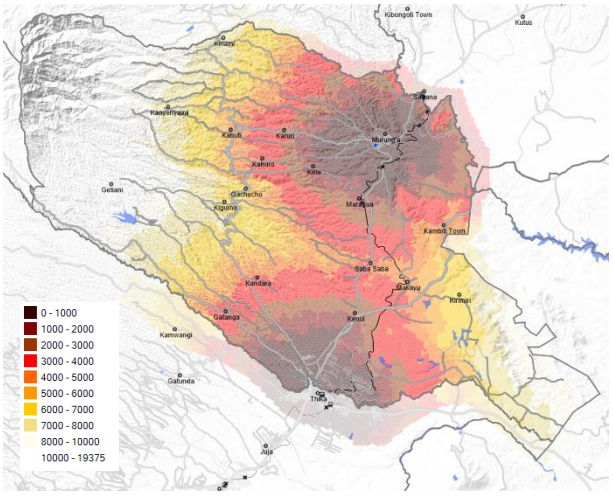
Private clinics



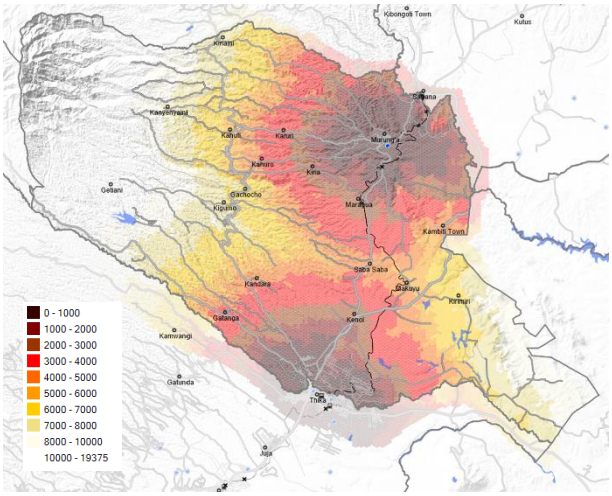
Hospitals MOH and Mission Districts

The higher order facilities mapped below, strengthen the pattern that started to emerge above. It also indicates the important role Thika is playing in serving the southern parts of the County.

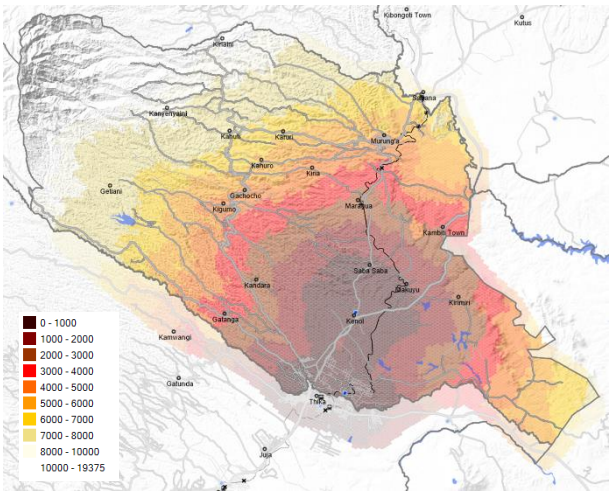
Figure 69: Distance to higher order health facilities



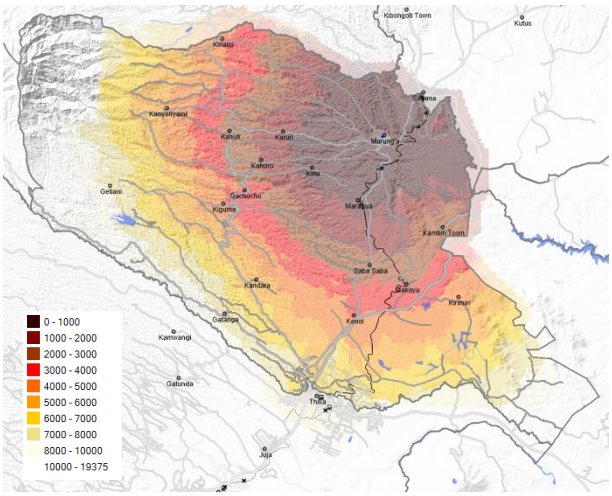
Nursing homes and maternity hospitals



Institutional health facilities



Private hospital



Special treatment hospitals

14 Stakeholder comments

A stakeholder workshop covering was held on 6 April 2018 at the Nokras Hotel. The following issues were raised during the meeting:

Table 25: Physical Infrastructure

Issues raised	Stakeholder opinion	Comments
Water		
• Inefficient supply by the water service providers • Rain water/flood water wastage • Water scarcity during dry seasons	• Clean and safe water accessibility for all residents. • Water conservation; floodwater storage e.g. using dykes/dams and community large capacity tanks. • Water service providers empowered to improve service delivery • Discouraged water tapping at the source, e.g. at rivers uphill • Water conservation through dykes	• Will be addressed as part of the planning and implementation framework insofar as it falls within the scope of the project.
Transport:		
• Road Encroachment • Lack of support infrastructure along roads; walkways, drainage, lighting • Inadequate parking spaces	• Provide road support infrastructure • Revive rail transport • County govt to own infrastructure maintenance equipment.	• Noted. Will be addressed as part of the planning framework proposals.
ICT		
• High illiteracy level relative to ICT.	• Establish ICT resource centre for every subcounty • provide free internet access in urban areas. • Digitization of government services to improve accessibility for all.	• Noted.
Liquid/Solid waste management		
• Lack of conventional sewerage systems in most parts of the county. • Inefficient solid waste management techniques by county Govt.	• Increase conventional sewer coverage area • Short term management of septic tanks before establishment of sewer systems. • Use of modern waste collection trucks to avoid spillage and air pollution • Recycling techniques at the sanitary landfill to provide employment	• Will be addressed as part of the planning and implementation framework insofar as it falls within the scope of the project.

Table 26: Social Infrastructure

Issues raised	Stakeholder opinion	Comments
Health Facilities		
• Inadequate health institutions and services	• Improvement of service delivery and staff at all health institutions. • Propose hospitals where they lack respective to administration boundaries. • Enforce regulations to control informal food vendors • Civic education on medical insurance	Noted.
Education		
• Inadequate primary, secondary and tertiary institutions in the county	• Improve all educational facilities per ward. • Facilitation of vocational and technical education institutions. • Coordination between the county and National Govts.	Noted

Issues raised	Stakeholder opinion	Comments
Housing • High cost of building permits	• Subsidizing building permits and hastening the approval process. • Encourage modern & cheaper building technology	Noted
Security • Rise in insecurity cases	• Empowerment of local leaders, chiefs • revitalize nyumba kumi initiative • County representative in the district security council	Noted.
Stadiums Poor maintenance of available infrastructure	• Improve the local stadiums and youth sports groups. • Community involvement in development and sports activities. E.g. Ndakaini marathon	Noted
Heritage • -Negligence of heritage sites	• -Revitalization of cultural sites to enhance conservation and tourism	Will be addressed as part of the planning and implementation framework insofar as it falls within the scope of the project.

Table 27: Environment

Issues raised	Stakeholder opinion	Comments
Encroachment on riparian areas	• Civic education on importance of the reserves • Developing sustainable grazing and farming techniques to prevent environmental degradation • Identification of risk prone areas and proposal of counter measures	Noted

Table 28: Local economic

Issues raised	Stakeholder opinion	Comments
Agriculture • Wastage of food due to poor preservation. • High rate of unemployment • No irrigation on the South Eastern parts	• More industries for value addition; mangoes, bananas, macadamia • Empower farmer cooperative societies • Empower individuals on agribusiness • Increase agricultural extension services • Increase irrigation projects and awareness • Expand all markets to reduce road encroachments by hawkers	Noted
Commercial • Increase in roadside vendors,	• Increase vocational institutes/polytechnics • -Set aside light industrial zones for juakali activities.	Noted and will be addressed as part of the planning and implementation framework insofar as it falls within the scope of the project.

Issues raised	Stakeholder opinion	Comments
Jua Kali Sector • The sector is rarely considered in governance	• Enforcement of regulations on education of operators.; to reduce accidents and insecurity	Noted.
Boda-boda • High illiteracy levels in the sector • Contributing to insecurity		Noted.

Section 4. The development framework

The preceding sections of the document dealt with the contextual, policy and spatial analysis of the County, to get a clear understanding of the current situation. The section comprises the development proposals in response to the analysis and comprises the following:

- An ***assessment of strengths, weaknesses, opportunities and threats***: This section provides a summary of the key issues that affect the development of the County (both positive and negative).
- ***Development Concept*** comprises the vision, mission, development goals and the spatial development concept. This section provides strategic guidance for how the County should develop in future and hence informs the specific development strategies and interventions to follow. The spatial development concept indicates the development approach (or model) that will be followed in the development of the planning area and provides a spatial interpretation of the development vision and goals by means of a high-level desired spatial structure for the planning area comprising the major structuring elements.
- The ***Spatial Development Strategies***-section takes the spatial development concept and breaks it down into the different elements that make up the overall desired spatial structure of the County. It sets out detailed development objectives, interventions and development guidelines for each of these elements.
- The ***Implementation Plan*** deals with the execution, management and monitoring of the development proposals.

15 Assessment of strengths, weaknesses, opportunities and threats

Table 29 and Table 30 highlight the strengths, weaknesses, opportunities and threats (SWOT) in the County. The SWOT analysis is derived from:

- Various policies and strategies pertaining to Murang'a County;
- The situational analysis, and
- Stakeholder engagements. The stakeholder processes helped to identify the issues in the planning environment as perceived by the stakeholders. These statements of issues and concerns are wide-ranging and supplement the technical analysis done by the planners.

The SWOT analysis forms the basis of the spatial development proposals to follow, as it is the purpose of the spatial development proposals to:

- Address, correct and mitigate weaknesses and threats, and
- Strengthen and build on strengths and opportunities.

Table 29: SWOT analysis: Environment, Settlement development and housing

Environment/ Agriculture	Strengths	Weaknesses
	• The larger part of Murang'a falls within a humid region. This makes the biggest part of the county suitable for agriculture • Soils emanating from the volcanic activity are fertile and valuable for agriculture. • The slopes in the rich volcanic soils on the higher altitudes are particularly suitable for tea growing.	• The terrain is dissected creating the menace of landslides and gulley erosion. • The numerous streams and valleys necessitate the construction of numerous bridges to connect one ridge to the other; construction and maintenance of roads are therefore made difficult and expensive
	Opportunities	Threats
	• Rehabilitation of wetlands and watercourses and conservation of riparian reserves. • Preservation of the indigenous forests • High agricultural area which can support a wide variety of farming activities • Ndakaini dam is located in the county, this is a big opportunity as this water can be used for irrigation • Promoting environmental conservation	• Pollution of water courses from settlement areas and agricultural activities • Rampant urban sprawl causing environmental degradation • Deforestation, overgrazing and encroachments in riparian reserves results to climate change in the long run • Eucalyptus planted near water catchment area , this leads to drying up of some rivers in the area.
Settlement Development	Strengths	Weaknesses
	• Murang'a has well distributed transport network • The presence of various development nodes, i.e. Kahati, Kahuro, Kandara, Kangari, Kangema, Kamahuha, Kenol, Kigumo, Kiriaini, Kirwara, Makuyu, Maragwa and Saba Saba • High number of commercial and residential developments.	• Various structuring elements e.g. the topography, slope has a great influence on the development patterns
	Opportunities	Threats
	• Strengthening of the existing nodes by service provision would highly boost economic growth.	• Very dense rural settlements in which land is sub-divided into narrow strips of land • Unplanned and uncoordinated urban/county growth- Urban sprawl • Rapid urbanisation
Housing	Strengths	Weaknesses
	• Emerging well planned integrated residential settlements with efficient amenities. • Availability of quarry and sand mines in the county thus supports easy access to construction materials.	• Poor access to housing support infrastructure and amenities.
	Opportunities	Threats
	• Densification of residential around the existing nodes. • Development control and Housing typologies in the urban areas.	• Uneconomical subdivisions of agricultural lands due to increasing population.

Table 30: SWOT analysis: Engineering services, roads and transport

Transport	Strengths	Weaknesses
	• The existing road network that facilitates access to the county and other regional centres. • Presence of A2 Highway (National trunk road) which is the main gate pass to the county. • Presence of railway line running from Nairobi to Nanyuki (Currently inactive). • Existing Infrastructure & Services	• Dissected terrain within the county renders construction and maintenance of roads expensive. • Non-uniform terrain restricting accessibility to some areas. • A general lack of pedestrian facilities resulting in pedestrians mixing with different modes of transport
	Opportunities	Threats
	• Revival of the rail transport system will open up the county for more investments.	• No maintenance of road networks thus limiting accessibility and marketing of local produce externally. • Vehicular traffic congestion due to increased settlements
Socio- cultural	Strengths	Weaknesses
	• Availability of Youth and Women Enterprise Funds. • Availability of Government empowerment programs for women and youth. • Governments campaign on women empowerment and educating the girl child.	• Inadequate business skills and financial resources. • High illiteracy level. • Poor and inadequate access to informal.
	Opportunities	Threats
	• Availability of CBOs and NGOs. • Availability of devolved funds by the county government. • Free primary Education and subsidised Tertiary Education.	• Insecurity. • Poverty. • Drug and substance abuse. • HIV-AIDS.

16 Development Concept

16.1 Vision and mission statement

The vision and mission statements are important as it provides strategic direction for the Spatial Plan and focuses the development interventions to follow on a specific outcome. The Vision Statement focuses on the desired future position or state of the County (i.e. what should the area be like in the future) and should serve as a source of inspiration. The Mission Statement in turn defines what will be done in the present in terms of the desired level of performance (i.e. what will be done now). The vision and mission encapsulate the goals and objectives.

From the technical analysis and the stakeholder participation it was possible to craft a vision and a mission statement to guide the development of a planning framework and implementation strategy in the next two phases of the process.

The following apply:

16.1.1 Vision statement

"The leading County in agricultural production, infrastructural and social economic development in Kenya"

16.1.2 Mission statement

"To promote value driven and action-oriented planning that will facilitate identification and utilization of available resources, building and nurturing of partnerships with stakeholders and development partners for overall development and wellbeing of the entire community."

17 Development goals

The development goals are statements that describe what the Spatial Plan wishes to or needs to accomplish over its lifespan.

The development goals are high-level statements that set out the key aspects that must be achieved. Development objectives in turn are concrete statements that describe a set of specific steps, deliverables or targets that are required to achieve the goals (the development goals are dealt with under each spatial element in the following section). The measurement of the objectives will therefore determine if the Spatial Plan has been successful in achieving its goals. For this reason, objectives must be specific, measurable, and attainable.

The development goals for the Spatial Plan are aligned with the Key Result Areas of the Nairobi Metro 2030 Strategy. As this area forms part of the Greater Nairobi Metropolitan Area, it will be sensible to build on and support the development focus areas of the metropolitan area, but at the same time ensuring that the goals are relevant to the County.

Table 31: Development Goals

Key Result Areas Nairobi Metro 2030 Strategy	County Development Goals
	• Protect the integrity and sustainability of the natural environment
	• Protect productive agricultural land
• Building an internationally competitive and inclusive economy for prosperity	• Support economic and social development and growth and the creation of employment opportunities
• Deploying world class infrastructure and utilities for the region	• Provide efficient infrastructure networks and services
• Optimising mobility and accessibility through effective transportation	• Improve movement and connectivity
• Enhancing the quality of life and inclusiveness in the region	• Create efficient and integrated settlements
• Delivering a unique image and identity through effective place branding	• Create a recognisable identity for the County
• Ensuring a safe and secure region	• Create an attractive and safe environment

Key Result Areas Nairobi Metro 2030 Strategy	County Development Goals
• Building world class governance systems	• Strengthen the capacity of the land management system

18 Guiding principles

This section sets out the overarching guiding development principles that inform the Spatial Plan for the County. Principles are the fundamental norms, rules, or values that represent what is desirable and positive for the development of the planning area, and act as yardsticks for determining what is right and what is wrong. There are five (5) guiding principles for the County, namely (i) sustainability, (ii) resilience, (iii) equity, (iv) integration and (v) accessibility.

18.1.1 Sustainability

Sustainability refers to the preservation of renewable and non-renewable environmental resources, while at the same time promoting economic and social sustainability. A sustainable planning area reduces the impact on the environment through reducing the use of resources and the production of waste while improving the liveability of the settlement.

18.1.2 Resilience

Resilience is about the planning area's capacity to withstand shocks and disturbances such as climate change or economic crises, and to use such events to catalyse renewal and innovation. Resilient areas are those places that are able to quickly adapt to changing circumstances, albeit economic, climate or social conditions. Resilience is about the protection of natural infrastructure (rivers, wetlands etc.) but also about how we design and build the man-made environment to allow for (i) protection against outside shocks as far as possible, but also (ii) flexibility and adaptiveness in the face of change.

18.1.3 Equity

An area that is equitable is one where all residents enjoy (i) fair access to livelihood, education, and resources, (ii) full participation in the political and cultural life of the community, and (iii) self-determination in meeting fundamental needs.

18.1.4 Integration

Integration, whether spatial, sectoral or socio-economic, is fundamental to sustainable development, i.e.:

- Spatial integration refers to the proximities and functional relationships between different functions and elements within a particular area, with the aim of creating the greatest degree of synergy.
- Socio-economic integration refers to the proximity of different socio-economic groups so as to create socially cohesive communities.
- Sectoral integration refers to the vertical and horizontal integration among the various levels of government and agencies involved in spatial governance.

Development proposals need to ensure integration of all development issues including transport, planning, economic development etc.

18.1.5 Accessibility

Accessibility can be defined as the ease with which a place, facility or service can be reached by people. An accessible County is one where there is equitable physical and functional access to services, facilities, employment, training and recreation, including a choice of safe and efficient transport modes (e.g. public

transport, private vehicle, bicycle, walking and wheelchair). Accessibility also comprises convenient and dignified access to private and public spaces.

19 Spatial development concept

19.1 Introduction

The spatial development concept indicates the development approach (or model) that will be followed in the development of the County and provides a spatial interpretation of the development vision and goals by means of a high-level desired spatial structure for the planning area comprising the major structuring elements.

The spatial development concept is presented as a schematic representation of the spatial vision for the planning area, and therefore indicates the **intention** of spatial restructuring in the planning area.

The spatial development concept follows a focused and strategic approach in identifying development opportunities. This means that, taking into consideration current growth dynamics, it is better to make a few key development proposals that will focus development energy to areas where agglomeration advantages can be achieved, and a difference can be made in the spatial structure as opposed to identifying every possible development opportunity and never reaching critical mass with any of those.

19.2 Alternative Development Approaches for Murang'a County

Four possible development alternatives were considered for Murang'a County, based on different development approaches, namely:

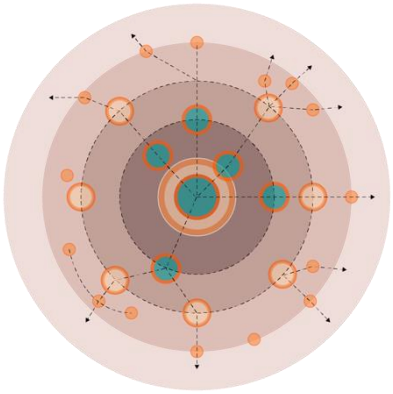
- A central radial development model
- Accessibility/corridor model
- A nodal based approach
- Population location based approach

19.2.1 Central Radial Development Model

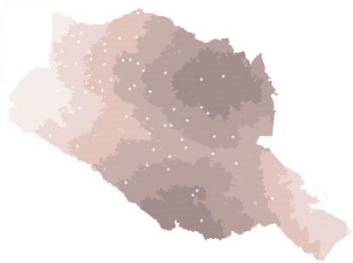
The first development approach is the **Central Radial Development Model**. In this approach, the majority of growth is focused on the two main nodes in the county (i.e. Thika and Murang'a Town) where currently the bulk of economic activity is located, with future development of the County seeing the outward or radial growth of predominantly these two towns. In this model, economic development gravitates towards these towns, with economic potential diminishing as distances from the towns increase. Settlements located furthest away from Thika and Murang'a will therefore have the smallest economic function in the County.

Figure 70: Central Radial Development Model

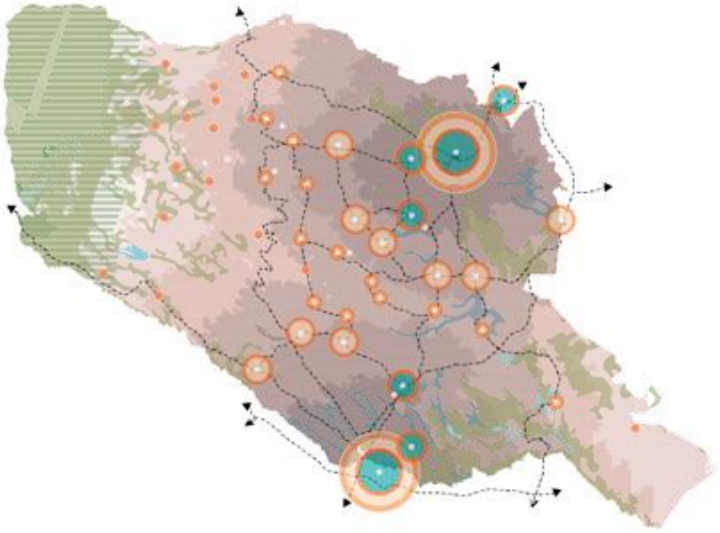
The model



The spatial concept



Aligning the spatial concept to the model

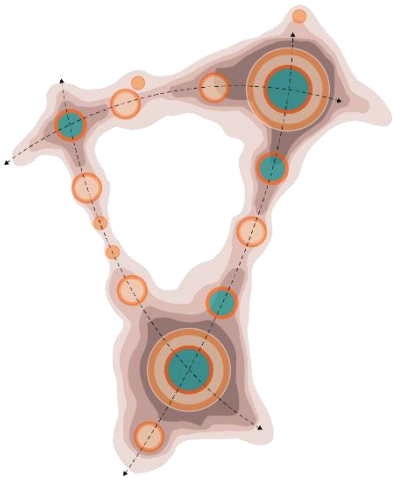


19.2.2 Accessibility/corridor model

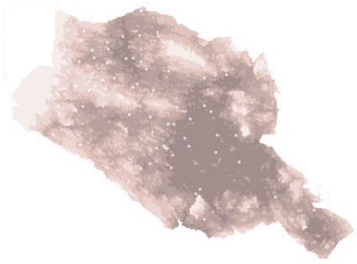
The second development approach is the **Accessibility/Corridor Model**, that looks at the points of highest accessibility in the County (based on the existing movement network), and focuses new development at those points that are most accessible. The result is a strong network of major nodes and corridors related directly to the major movement routes in the County.

Figure 71: Accessibility Model

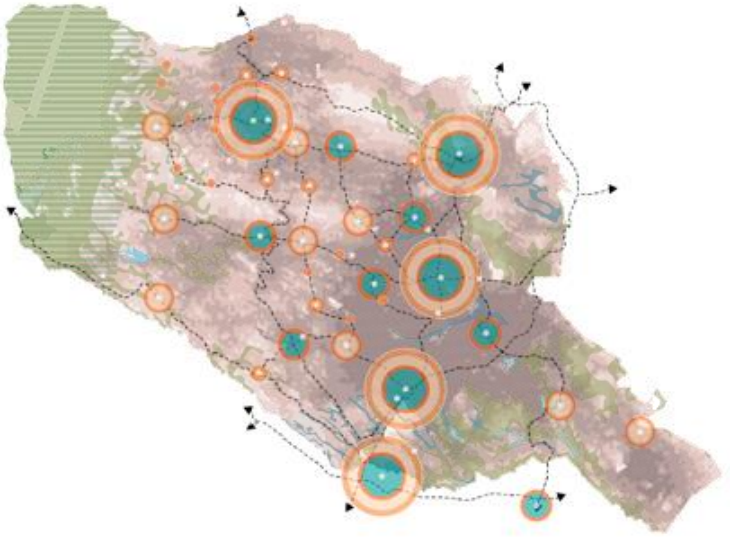
The model



Th spatial concept



Aligning the spatial concept to the model

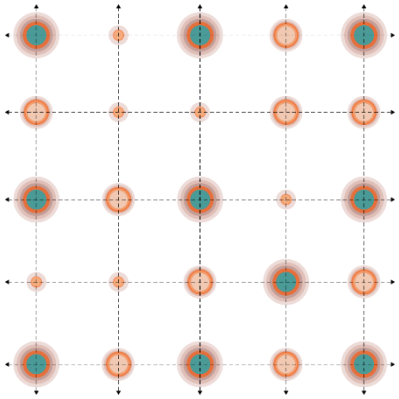


19.2.3 Balanced nodal development model

The third alternative approach is the **Balanced Nodal Development Model**, that looks at the balanced and equitable distribution of a hierarchy of nodes throughout the County at approximately equal distances. In this model, there are no nodes that are significantly larger or more important than other nodes (as is the current situation with Thika and Murang'a). The focus is rather on ensuring that no person in the County has to travel significantly further than another to access business, administrative and social services in the County.

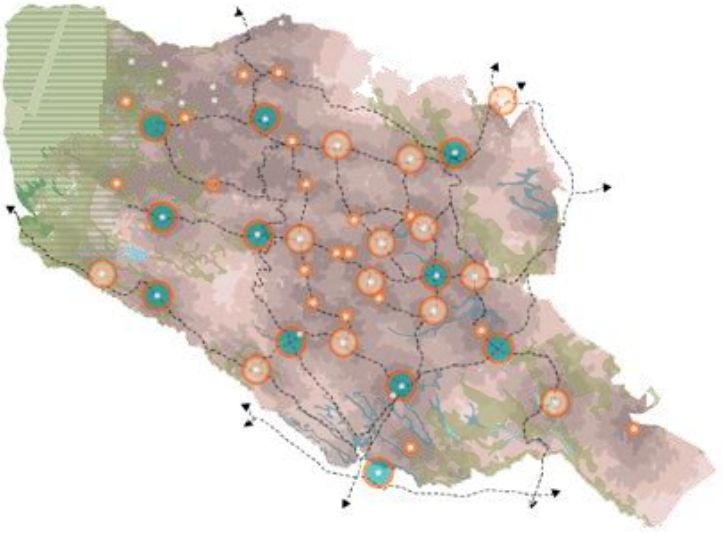
Figure 72: Balanced Nodal Development Model

The model



The spatial concept

Aligning the spatial concept to the model

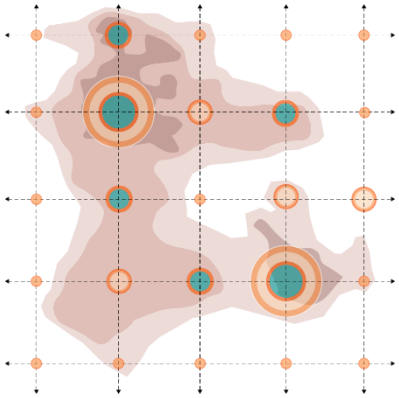


19.2.4 Population concentration model

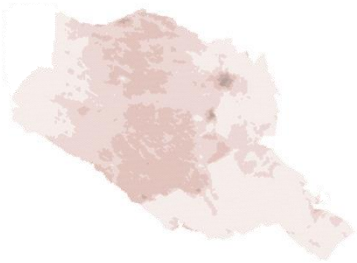
The fourth, and final, alternative development approach is the **Population Concentration Model**. Whereas the first two development approaches were concerned with where existing growth and infrastructure are located, and the third development approach were concerned with distance, the fourth alternative looks at where the existing concentrations of population exist. The intention is therefore to focus development and investment where the majority of people are currently located. Looking at the population concentration in the County, it is evident that the majority of people are concentrated in the central part of the County as well as around Thika and Murang'a.

Figure 73: Population Concentration Model

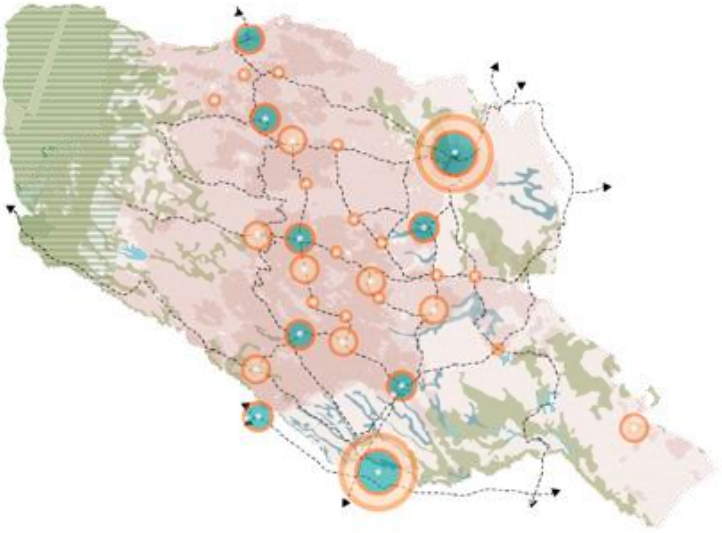
The model



The spatial concept



Aligning the spatial concept to the model



19.3 Preferred spatial development model

The preferred spatial development model is based on a system of interrelated and integrated spatial elements that together make up the desired spatial development form for the County. These spatial elements are made up of nodes, networks, and surfaces.

The essence of development in this system is the movement of people, goods and services that produces the basic impetus for developing functional relationships between otherwise independent and unrelated elements. The movement of people, goods and services are channelled along specific routes that describe a network of interaction. Where networks intersect the opportunity for people, goods and services to interact develop and this gives rise to activity nodes. The intensity of interaction gives rise to the development of a hierarchy of nodes of different sizes depending on the level of interaction taking place

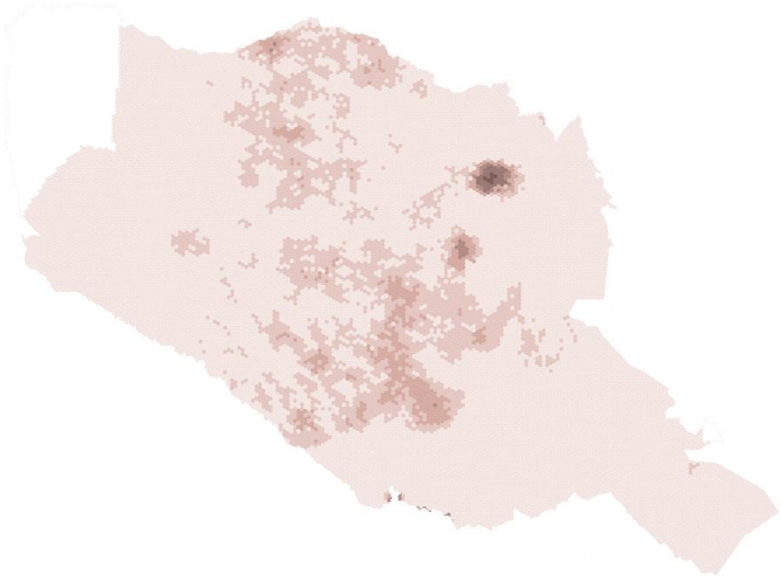
in a node. This system of networks and nodes are tied together through surfaces that fill the areas between the nodes and networks.

The preferred spatial development model considers the premises of the four alternatives described above and combine it into a spatial development concept for the County. The aspects that were considered for the preferred spatial model are:

- The current concentration of economic development;
- Accessibility in terms of existing movement networks;
- Accessibility in terms of distance; and
- Existing population concentrations.

Overlaying these elements shows a clear structure of areas of highest development potential emerging for the County, as indicated in Figure 74.

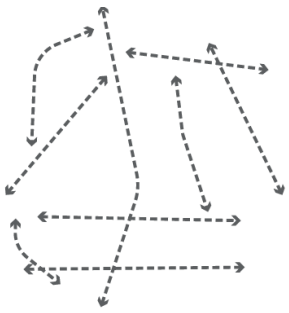
Figure 74: Areas of Highest Development Potential in Murang'a County



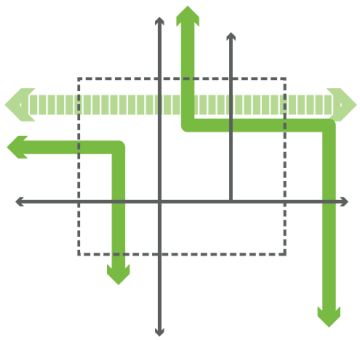
19.4 Spatial development concept

The spatial development concept that reflects the long-term vision is built through a systematic layering process consisting of a broad number of steps:

Figure 75: The elements of the spatial development concept

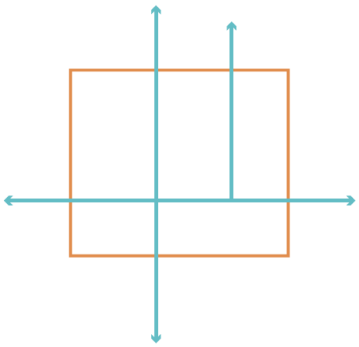


MOVEMENT



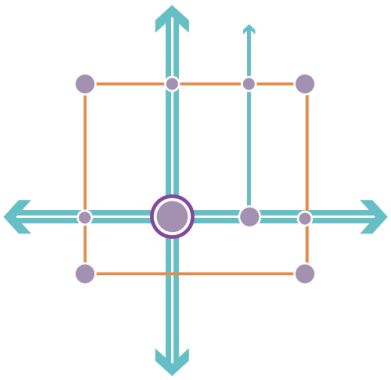
NATURAL FEATURES

Recognise the movement of people and goods to optimise spatial interaction in order to create opportunities



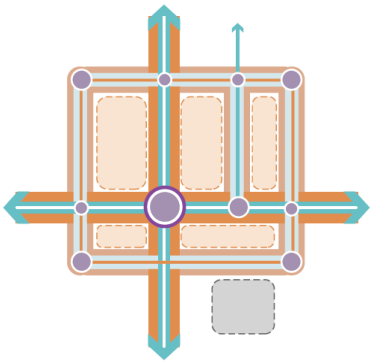
HIERARCHY OF NETWORKS

Identify a hierarchy of networks that describe the movement of goods, services and people through the planning area



HIERARCHY OF NODES

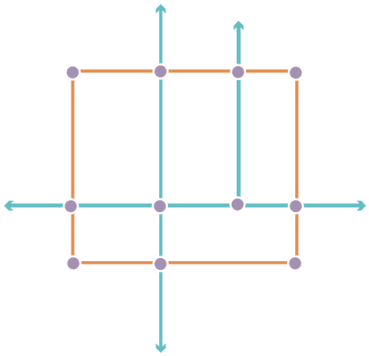
The less restricted movement is along a network the higher the accessibility where the network elements interact. This describes a structure of focused interaction forming a hierarchy of nodes



ACTIVITY AREAS

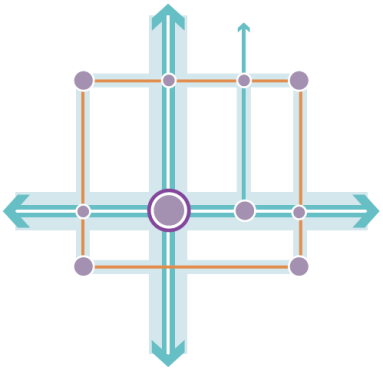
Not all surfaces are equal in terms of environmental and accessibility factors. Based on the extent and type of activities in a nodal point, specialised areas tend to develop around these points. The areas between the networks and nodes respond to the demands and stimuli from the interaction in these high points of accessibility. This creates development surfaces that compete for a location as close to the nodes as possible. The higher the return on the use of land the better location a surface related activity will acquire.

Identify natural elements that give form to development



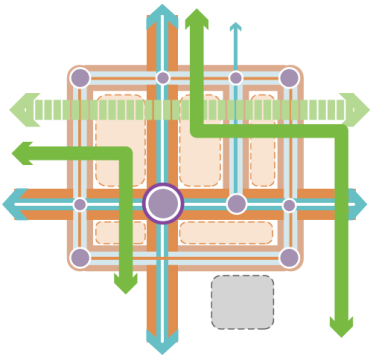
NODES

The interaction along networks of movement creates opportunity and accessibility.



CORRIDORS

Movement along the networks, stimulated by the movement generated in the nodes leads to an intensification of development along the networks. This gives rise to the development of a system of corridors in relation to the networks connecting nodes.



ADAPTIVE SPATIAL CONCEPT

By integrating these different elements and understanding the environment and the socio-economic demands of the area, a spatial concept develops that shows a rational framework for long-term development. This spatial concept becomes the basis for detailing the long-term spatial development framework for the area

The spatial development concept for the County is based on the following main restructuring interventions (refer to Map 33):

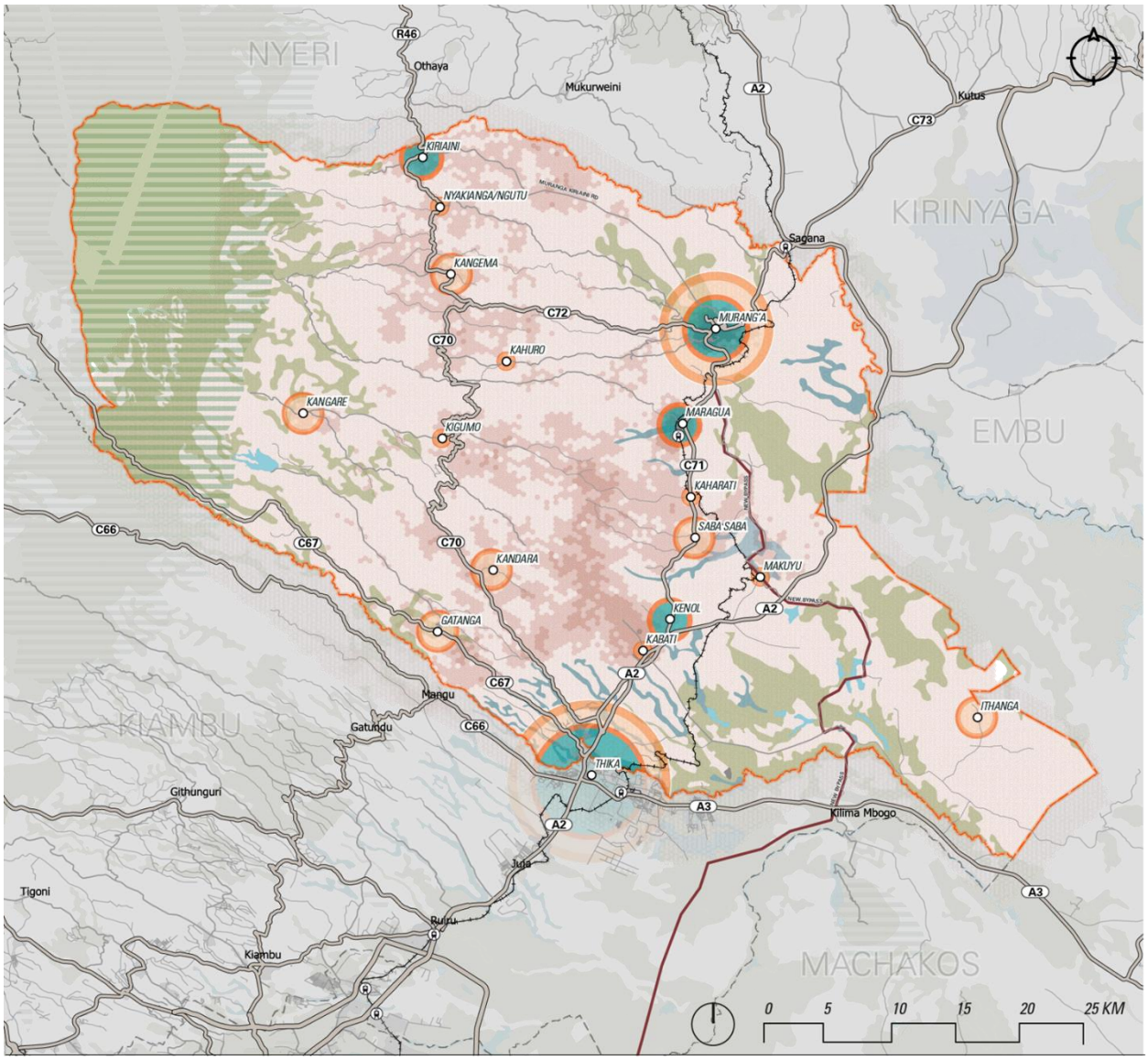
- Creating an efficient internal movement network that connects all parts of the County for a range of transport modes, with a strong focus on public transport and Non-Motorised Transport;
- Directing economic development into a network of nodes and corridors, harnessing the development potential of existing areas of opportunity; and
- Protecting sensitive natural environments and high-potential agricultural land.

From Map 33 it is clear that the proposed spatial structure for Murang'a County is based on two strong north-south development axes leading into Nairobi City, namely -

- Along the A2 and C71 with a number of key nodes along the axis, including Thika, Kabati, Kenol, Saba Saba, Maragua and Murang'a Town, and
- Along the C70, with Kandara, Kigumo, Kangema, Nyakianga/Ngutu and Kiriaini forming the anchor nodes along the axis.

With the exception of a few nodes, the network of nodes are therefore directly linked to the proposed corridors. The intention is to create a strong functional hierarchy of nodes in the County that are linked to the regional movement system, and at the same time ensuring a reasonably equitable spread of nodes linked to the population distribution across the County.

Map 33: Spatial development concept



Spatial Development Concept

LEGEND

Boundaries
- Murang'a County
- County Boundary

Transportation
- Major Roads
- Minor Roads
- Small Roads
- Railway Line
- Railway Station

Natural Features
- Natural Land
- Protected Areas
- Wetlands
- Floodways

Development Intensity Index
- Level 1
- Level 2
- Level 3
- Level 4
- Level 5
- Level 6

Node Hierarchy
- Primary Node
- Secondary Node
- Teriary Node
- Market Centre

NamSIP: IUSDP
Murang'a County

Nairobi Metropolitan Services Improvement Programme

Ministry of Transport, Infrastructure, Housing and Urban Development

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19.5 Benefits of the Spatial Development Concept

The implementation of the proposed spatial development concept will achieve the following benefits for the development of the County:

- Concentrating economic activity in a network of nodes and corridors (as opposed to having scattered economic activity throughout the County) –
    - creates agglomeration advantages that lead to greater economic efficiency for businesses;
    - creates a more convenient and accessible spatial form for residents as they are able to conduct multiple transactions in one location, thereby reducing the amount of travel that is necessary; and
    - investment in infrastructure can be directed to strategic locations where the greatest benefits and spin-offs can be achieved.
- The clustering of community facilities such as education, health and public transport in the network of nodes will further enhance the degree of convenience and accessibility for residents. Nodes therefore become multi-functional in nature where residents can access many different services.
- Densification around the network of nodes and corridors allows for a larger percentage of the population to live closer to employment, social and transportation opportunities, and also creates a larger population base to support commercial activities and community facilities within the nodes and corridors.
- A clear spatial structure leads to greater efficiency and cost-effectiveness as infrastructure investment and the provision of services and facilities are focused.
- A clear spatial structure prevents haphazard development that becomes difficult to manage and even more difficult to service.

20 Spatial Development Strategies

This section deals with the development proposals and interventions for creating a sustainable, equitable and efficient spatial structure in the planning area. Spatial structure refers to the way the different physical elements in the planning area is put together. Together with the physical and functional connections between the parts, these elements make a coherent, functioning whole. A good structure supports the type of activities, development and growth that is desirable in the planning area.

The section is structured according to the different spatial elements and attempts to build a spatial logic through a layering process (i.e. each element building on and integrated with the previous).

Each of the sub-sections will deal with:

- The rationale for addressing the particular element or issue (i.e. why it is important);
- The objective(s) for the particular element or issue; and
- Development proposals, interventions and guidelines.

The four main spatial structuring elements on County level are:

- The natural environment;
- Regional movement network;
- Hierarchy of nodes; and
- Agricultural land

20.1 Protecting the natural environment

20.1.1 Rationale

The development strategy for the natural open space system deals with the designation, protection and management of biodiversity and important ecosystems. The natural open space system generally comprises rivers, dams, riparian zones, wetlands, ridges and other environmentally sensitive areas.

Sensitive ecological environments on the one hand pose a constraint to development, as these parcels of land must remain free of development. In addition, movement linkages across these areas are limited (due to cost and the need to minimise any form of intrusion into these areas) which in turn limits the spatial structuring possibilities.

Ecologically sensitive areas however provide immense opportunities and value from an ecological, identity, place- making, attractiveness, tourism and property value perspective. Wetlands in particular perform a number of critical ecological functions. They moderate impacts from flooding, control erosion, purify water and provide habitat for fish and wildlife. Natural areas are often also the most important tourism destinations in the County.

The Spatial Plan therefore aims to safeguard the functionality of the County's life-supporting ecosystem services and to ensure development around natural open spaces is appropriate and sensitive.

20.1.2 Objectives

The following are the objectives for the natural open space system:

- To introduce policies that will restrict degradation and promote the preservation of the environment;
- To improve water quality in rivers and water courses through the management of solid waste, waste water and industrial effluent;
- To prevent illegal dumping in open spaces and rivers; and
- To protect the County's indigenous forests.

20.1.3 Development proposals, interventions and guidelines

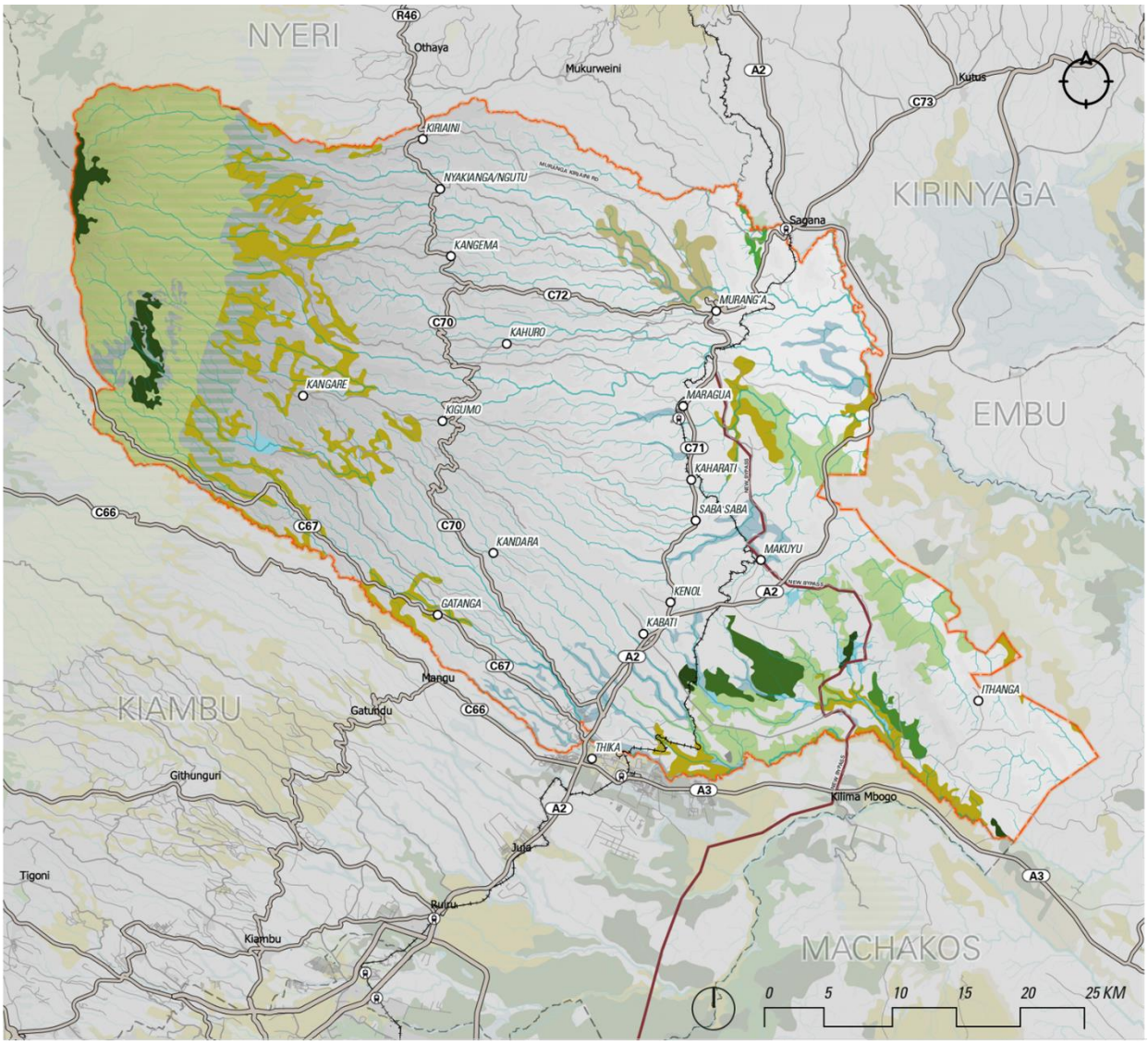
Map 34 indicates the most significant regional natural features. These include (i) hydrological features such as rivers, dams and wetlands, (ii) areas for the conservation of vegetation such as grasslands and forests, and (iii) ridges. The most significant natural (and tourism) feature in the planning area is the Aberdares National Park which covers the western part of the planning area.

The following are the main interventions required to protect the sensitive natural features in the County.

- Watercourses and wetlands must be rehabilitated to restore the ecological integrity of these environments.
- Watercourses must be protected from pollution resulting from development through the creation of open space buffers along watercourses that must remain free from development.
- Remove eucalyptus trees from riparian zones.
- Wetlands must be protected from development through the introduction of a buffer around wetlands that must remain free from development. The acceptable minimum standard is a 30 metres buffer along the edge of the wetlands that will provide additional habitat for indigenous fauna and flora.
- Steep slopes that exceed 25 degrees should be protected as ridges in accordance with the prescriptions of the Kenya Planning Handbook (refer to Table 32 below).
- Rehabilitate degraded areas in order to ensure the optimum functioning of ecosystem services.

- Mining and quarrying activities may not be permitted within sensitive natural areas, high potential agricultural areas or near areas of high tourism potential.

Map 34: Protecting the Natural Open Space System



Protecting the natural environment

LEGEND

Boundaries
- Murang'a County
- County Boundary

Transportation
- Major Roads
- Minor Roads
- Small Roads
- Railway Line
- Railway Station

Natural Features
- Natural Land
- Protected Areas
- Wetlands
- Floodways

Natural Features
- Grassland
- Tree Savannah
- Shrub Savannah
- Shrubland
- Open Woody Vegetation
- Closed Woody Vegitation
- Woodland
- Forest
- Protected Areas

Topography
- Elevation (High – Low)

Source: MapAble

Murang'a County Spatial Plan

Nairobi Metropolitan Services Improvement Programme

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The following development guidelines apply to development around sensitive natural open spaces.

Table 32: Development and design guidelines for natural open space system

Environmental Feature	Definition		Guidelines
Riparian (River) Reserve	Land on each side of a watercourse as defined. Has a minimum of 2m, or equal to the full width of the river as measured between the banks of the river course up to a maximum of 30m for seasonal and perennial rivers		Every development must provide 3%-5% of the area for water retention reservoir • Natural flow of rivers and tributaries should be preserved and conserved. River reserves should become green networks (buffer zones to control pollution, surface erosion, squatters' intrusion) • Sanitation services must be provided to settlements located within the catchments of water sources to avoid pollution due to surface run-off and groundwater seepage of sewerage and other harmful effluents • Development along the Riparian Reserve should only be considered if strict measures for riverbank protection, wastewater treatment plants, storm water control and erosion control are put in place and enforced. No development shall take place directly adjacent to the Riparian Reserve without an Environmental Management Framework indicating measures for the conservation of the ecological integrity of the shoreline as well as measures to repair damage to the shoreline and its vegetation caused by construction. • The natural drainage channels and banks of rivers must be protected up to the 100-year flood line. No development may be permitted within the 100-year flood line from rivers, streams and wetlands without the written consent of the relevant environmental and water authorities.
Slope	0 to 2%	Area where slope does not constrain development	• Development in hill areas requires several conditions that must be observed not to endanger stability, balance and the harmony of the natural environment • Between 5 degrees to 15 degrees are considered as medium slopes and could be developed with the implementation of slope control measures • Between 15 degrees to 25 degrees could be developed with the implementation of control measures • Areas with slopes that exceed 25 degrees are not allowed any development from a safety perspective • Natural vegetation should be preserved on steep slopes to prevent soil erosion • A slope analysis should be conducted on all ridges and mountains in order to determine development restriction areas • All scenic vistas should be protected from development
	2 to 9%	Medium slopes which are developable although slope should be considered in site development plan and storm water management	
	9 to 21%	Maximum slopes for motor vehicle access provided that all weather paved surfaces are available	
	21 to 27%	Urban development is seriously constrained, and slopes of more than 21% do not allow for motor vehicle access	
	27 - 45%	No development allowed	
Natural Open Space System	The natural open space system comprises rivers, dams, riparian zones, wetlands, ridges and environmentally sensitive areas		• All natural open spaces should as far as possible be linked to form a continuous system of green open space through the demarcation of green corridors throughout the urban environment, which are then linked to public open spaces

Environmental Feature	Definition	Guidelines
		• The natural open space system must be kept visible and "public" and not be privatised in development enclaves. This is important from both a social equity perspective (i.e. that members of the community and visitors can have the visual enjoyment of the open spaces) and from a safety perspective (i.e. that these areas which could potentially become dangerous areas can always be monitored by the public) • All land uses along green open spaces must face onto the open space with active facades including windows and/or balconies and visually permeable fencing. No high walls may be permitted. • Pedestrian and cycling paths should as far as possible be incorporated into linear open space systems to increase the recreational value of the open space system and also to enhance safety through increased activity in or along the open space system

20.2 Creating improved accessibility and connectivity

20.2.1 Rationale

Economic development in the County is dependent on the ability to move between and access different places and settlements in the County, as well as areas outside of the County. It is therefore important to create a functional and efficient regional movement network as the basis for economic development.

A key factor of a successful regional economic network is network density, meaning the degree to which different parts of the region are functionally linked. *"From the point of view of the economy of urban regions, lack of connectivity is translated into lack of competitiveness."*[42]

20.2.2 Objectives

The following are the development objectives from a movement and connectivity perspective:

- To ensure a clear hierarchy of roads that connect all the different parts of the County;
- To improve public transport facilities and networks;
- To improve the use of rail as a mode of public transport; and
- On a local level, to improve and support non-motorised transport.

20.2.3 Development proposals, interventions and guidelines

The development interventions required to improve accessibility and connectivity in the County are focused on the creation of a number of strong movement corridors.

- There are two proposed north-south corridors, namely:
  - The A2-C71 route that must be developed as the Primary Corridor in the County, as an extension of the proposed A2 Corridor, and
  - The C70 route that must be developed as the Secondary Corridor.
- There are three proposed east-west corridors, linking (i) Murang'a Town with Kiriaini, (ii) Murang'a Town with the C70 corridor via Route C72 and (iii) Kaharati with Kigumo and Kangare.

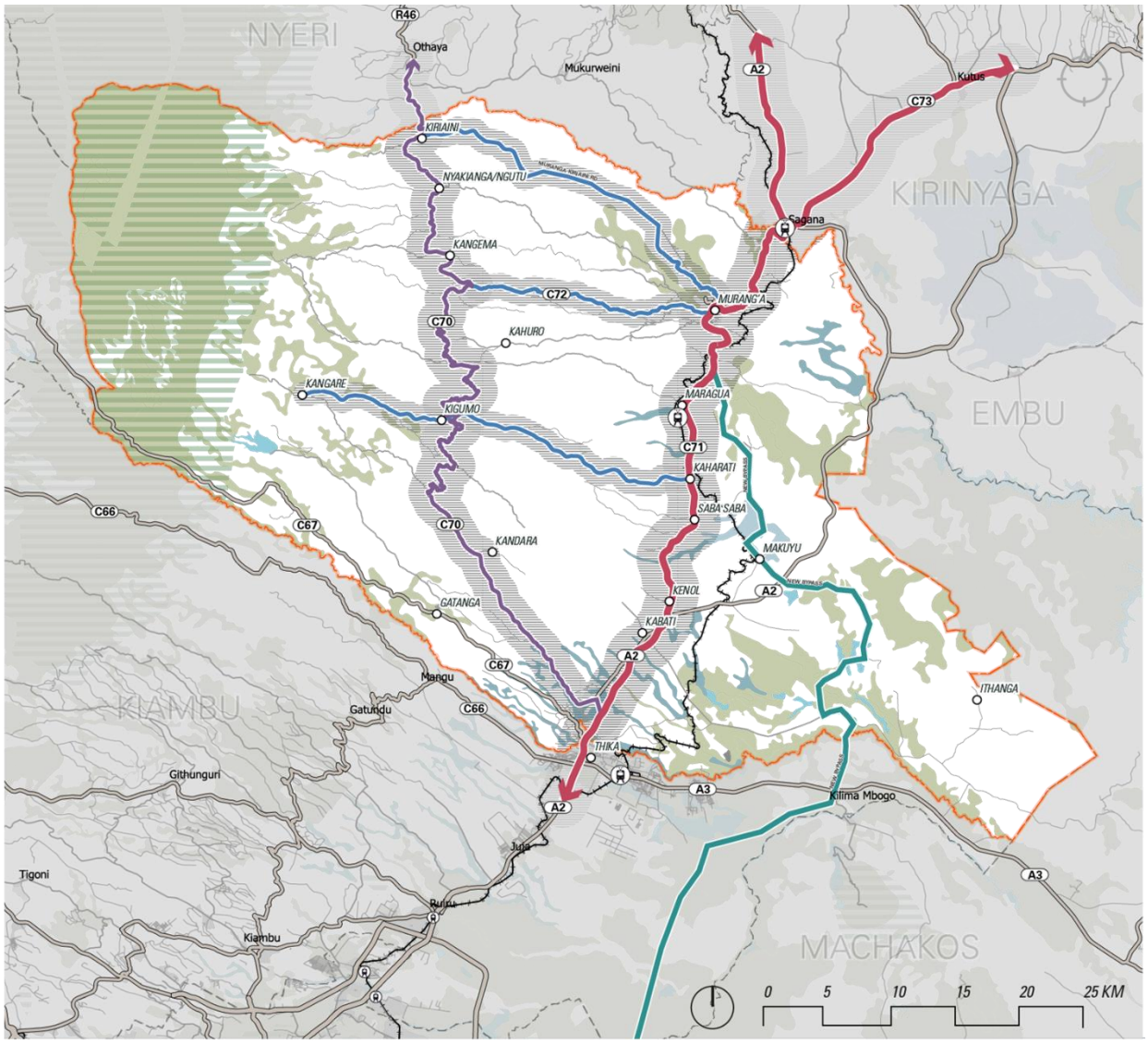
[42] Source: Young, D., & Keil, R. 2010. Reconnecting the disconnected: The politics of infrastructure in the in-between city. Cities , 27, 87-95.

- The function of the corridors are both mobility and economic in nature, as they will provide access to all the major nodes in the County as indicated in the Spatial Development Concept.
- The corridors must also be developed as the main public transport (i.e. bus) routes in the County, with stops in all the nodes along the corridors.
- The proposed Eastern Bypass will have a strong mobility function, linking the County with areas to the south.
- The railway line must be upgraded to facilitate the use of rail as a mode of passenger transport, in particular for commuting to Nairobi.
- All the major roads in the County must have supporting pedestrian infrastructure such as pedestrian crossings/bridges, signage, bus stops and pedestrian paths that are separate from the vehicular road lanes.
- The regional movement network must support the rationalised regional nodal network insofar as transport infrastructure and services to and from these nodes must be improved to allow people to access employment, education, health and other services in these nodes.

The regional movement interventions are indicated on Map 35.

Within the nodes, the local movement network should complement regional connectivity by ensuring good local accessibility and permeability. Table 33 sets out development and design guidelines that will apply to local movement networks within the nodes.

Map 35: Regional Movement Corridors and Networks



Improved accessibility and connectivity

LEGEND

Boundaries
- Murang'a County
- County Boundary

Transportation
- Major Roads
- Minor Roads
- Small Roads
- Railway Line
- Railway Station

Natural Features
- Natural Land
- Protected Areas
- Wetlands
- Floodways

Proposed Corridors
- Primary Corridor
- Secondary Corridor
- Tertiary Corridor
- Proposed Bypass

Murang'a County Spatial Plan

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Table 33: Development and design guidelines for the movement network within corridor nodes

Policies	Guidelines
Establish a multimodal transportation system to efficiently, effectively, and safely move people, goods and services	• The design and layout of internal movement in the area should promote an open, permeable and legible movement network that allows for ease of vehicular and pedestrian movement. • Well-located and well-managed road based public transport facilities, linked to the business and employment areas, must be available and accessible throughout the area • Development of linkage roads between residential areas to enhance integration and accessibility • As far as possible avoid dead-end streets and roads • Limit block sizes to a maximum length of 150m for ease of pedestrian movement • Maintain a road hierarchy that readily distinguishes between routes of local and regional importance
Make the nodes more walkable and bicycle friendly, in particular, improving and extending pedestrian and bikeway amenities to better connect residential areas, activity centres, and employment zones.	• Improve and expand facilities for pedestrians and cyclists, initially focusing investment in local urban corridors and activity streets. • Make streets walkable by providing enhanced crosswalks, sufficiently wide sidewalks, shade trees, and other street furniture (e.g., benches and pedestrian-scale light fixtures) throughout the community, most importantly along local urban corridors and activity streets. • Introduce a network of off-street pathways and routes, encompassing shared use paths that are integrated with the node's green network. • Require bicycle parking in conjunction with public amenities and commercial development projects that will attract a significant number of users, including the provision of bicycle lockers at major transit hubs. • Ensure that a minimum sidewalk width of 1,5m is provided on all identified pedestrian and cycling priority routes • Ensure that safe pedestrian crossing points are provided at a minimum of 75m intervals within the street network

20.3 Creating a regional network of nodes

20.3.1 Rationale

Nodes refer to the places in the County where economic and social activity are concentrated. As indicated in the Spatial Development Concept, the nodes around which development in the County should be structured are predominantly linked to the two north-south corridors. These nodes are therefore located at the most accessible points within the regional movement network and provide a hierarchical framework or logic for locating public facilities, community facilities and economic opportunity as well as access to transport services over time.

The intention is to create a rationalised network of economic concentration, i.e. focus on those locations that are realistic in terms of development potential in the long term and will achieve the most economic and social benefits for the County as a whole. The approach is therefore to take people to the services rather than take all services to the people. Due to the dispersed nature of many settlements in the County, it is inefficient and costly to attempt to duplicate services in multiple locations. If movement networks are

improved and nodes are well-connected, people will be able to access services within the regional nodal network within a reasonable distance and time.

A hierarchy of four nodes are proposed for the County, namely:

- Primary Nodes;
- Secondary Nodes;
- Tertiary Nodes; and
- Market Centres.

Table 34 shows how this hierarchy corresponds to the typologies currently used in the Kenya Planning Handbook. A more rationalised approach towards the nodal typology will enable better service delivery to local communities and more efficient and financially sustainable investment in infrastructure.

20.3.2 Objectives

The following are the objectives for the development of the regional nodal network:

- To create a clear network of regional nodes supporting the development concept;
- To concentrate and cluster economic activities in the regional nodes to create agglomeration advantages;
- To optimise the location of social and community facilities by clustering them together in nodes; and
- To support the development of agro-processing in the regional network of nodes, in support of agricultural development.

20.3.3 Development proposals, interventions and guidelines

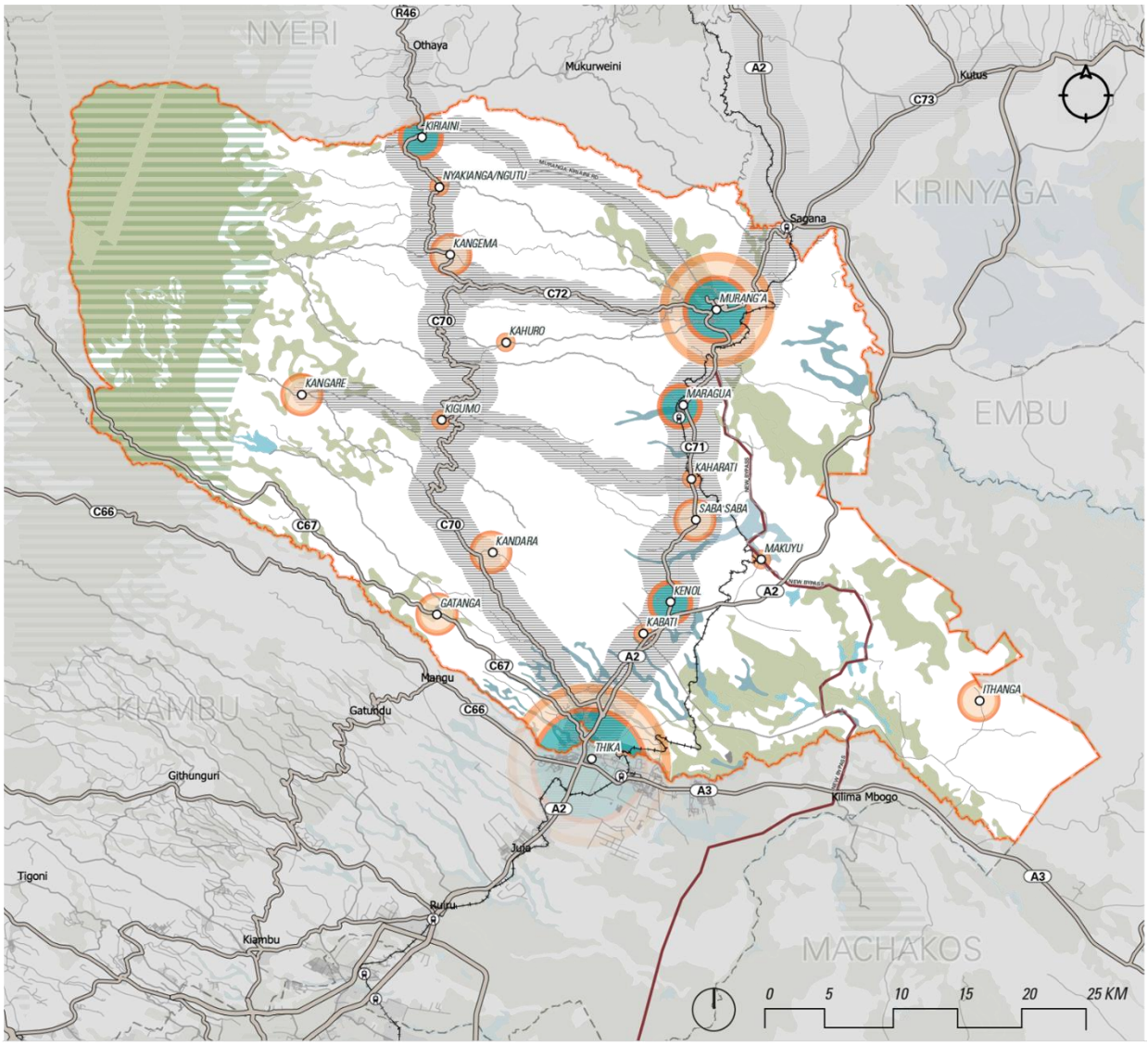
Map 36 shows the proposed hierarchy and distribution of the network and hierarchy of nodes in the County, and Table 34 sets out the towns that fall in each category, as well as broad development guidelines for each of the categories.

Table 34: Development guidelines for the regional network of nodes

	Primary Nodes	Secondary Nodes	Tertiary Nodes	Market Centres
Corresponding hierarchy in terms of Kenya Planning Handbook	Principal Town	Urban Centre	Rural Centre	Local Centre Market Centre
Names of towns	Thika (outside county) Murang'a	Kenol Maragua Kiriaini	Kangare Kangema Kandara Garanga Saba Saba Ithanga	Nyakianga/Ngutu Kahuro Kigumo Kaharati Makuyu Kabati

	Primary Nodes	Secondary Nodes	Tertiary Nodes	Market Centres
Function	• County function • Must comprise the highest order business, civic and social activities and services • These two nodes are also the main anchors on the proposed Primary Corridor.	• Sub-county function • Important anchors on the proposed Primary and Secondary Corridors	• Serve specific sub-regions	• The main function of Market Centres is as central places in the rural environment where basic day-to-day services are delivered to rural and agricultural communities.
Activities and land uses	• Government administrative offices • Primary, secondary and tertiary education facilities • Provincial hospitals • Retail and offices • Sports facilities and public parks • Entertainment • Public transport services	• Government administrative offices • Primary and secondary education facilities • Agro-processing and other agriculture related activities • District hospitals • Retail and offices • Market • Sports facilities and public parks • Entertainment • Public transport facilities	• Agro-processing and other agriculture related activities • Primary and secondary education facilities • Health clinic and dispensary • Retail • Market • Sports facilities and public parks • Public transport facilities	• Municipal satellite offices • Social support Services • Primary education facilities • Health clinic and dispensary • Retail • Market • Transportation services
Residential density	• Higher density residential development	• Medium density residential development	• Medium density residential development	• Low density residential development

Map 36: Regional Network of Nodes



Creating a regional network of nodes

LEGEND

Boundaries
- Murang'a County
- County Boundary

Transportation
- Major Roads
- Minor Roads
- Small Roads
- Railway Line
- Railway Station

Natural Features
- Natural Land
- Protected Areas
- Wetlands
- Floodways

Proposed Nodes
- Primary Node
- Secondary Node
- Teriary Node
- Market Centre

Source: MapAble

Murang'a County Spatial Plan

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Ministry of Transport, Infrastructure, Housing and Urban Development

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20.4 Protect and strengthen the agricultural economy and the rural hinterland

20.4.1 Rationale

The agricultural and rural hinterland has decidedly different characteristics, challenges and development needs from the urban nodes, and is often either neglected or marginalised in spatial planning. The Spatial Development Concept designates agricultural areas as an important structuring element in the County, as agriculture forms the economic base of the County. These areas should be reserved as prime agricultural land and be protected from any development or land uses that may have a negative impact on the agricultural potential of the area.

Figure 76 and Map 37 show the main agricultural zones in the County.

20.4.2 Objectives

The following are the objectives for agricultural development:

- The protection of high potential agricultural areas from urban development;
- The identification of opportunities for viable and appropriate economies and sustainable livelihoods in the hinterland;
- The strengthening of agriculture through economic and infrastructure investment;
- The creation of linkages between the hinterland and urban nodes to facilitate the flow of people, goods, services and capital between these areas; and
- The creation of sustainable tourism opportunities linked to natural, cultural and recreation assets in the rural hinterland.

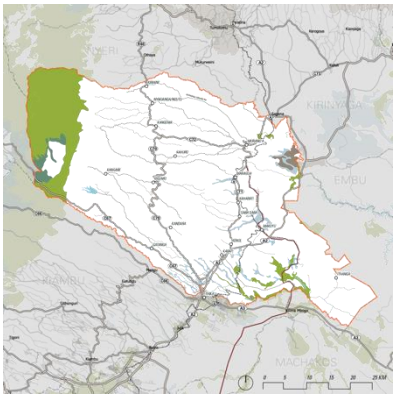
20.4.3 Development proposals, interventions and guidelines

The following are the main development interventions for agricultural zones in the County:

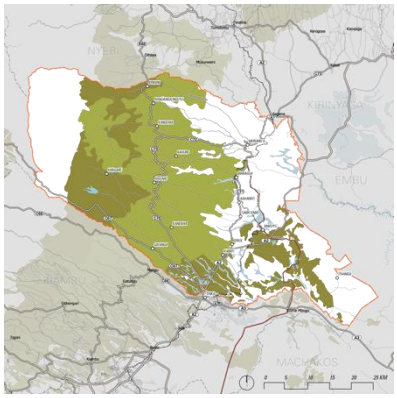
- Economically viable agricultural activities in the County must be protected.
- Attention should be given to the development of cooperatives, commonages and agri-villages in the agricultural areas.
- Agri-villages must be promoted throughout the rural hinterland as a sustainable manner in which to integrate local economic development and residential settlement development;
- The subdivision of agricultural land into small, uneconomical land parcels, must be prevented.
- Illegal land uses on farm portions, such as industrial and commercial developments that have no direct relation to agriculture, should be eradicated and moved to nodes.
- Mining and quarrying activities may not be permitted within sensitive natural areas, high potential agricultural areas or near areas of high tourism potential.
- Locate small-scale agriculture in closer proximity to nodes in order to ensure that small-scale farmers can easily access essential services as well as urban markets
- Promote sustainable agricultural technologies and practices in order to limit negative externalities
- Subdivisions of agricultural land for urban development should only be permitted around and contiguous to existing nodes in order to prevent leap-frog development and the inefficient development of service and movement networks

Table 35 sets out activities that may typically be permitted in high potential agricultural areas.

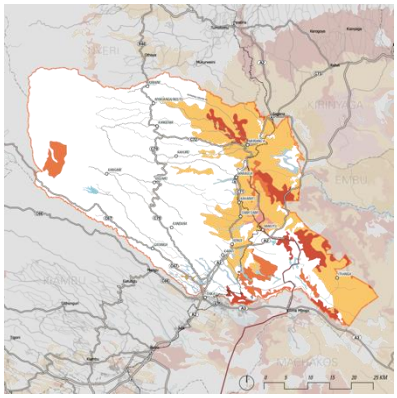
Figure 76: Main Agricultural Zones



Agricultural typology: tree crops



Agricultural typology: shrub crops



Agricultural typology: herbaceous crops

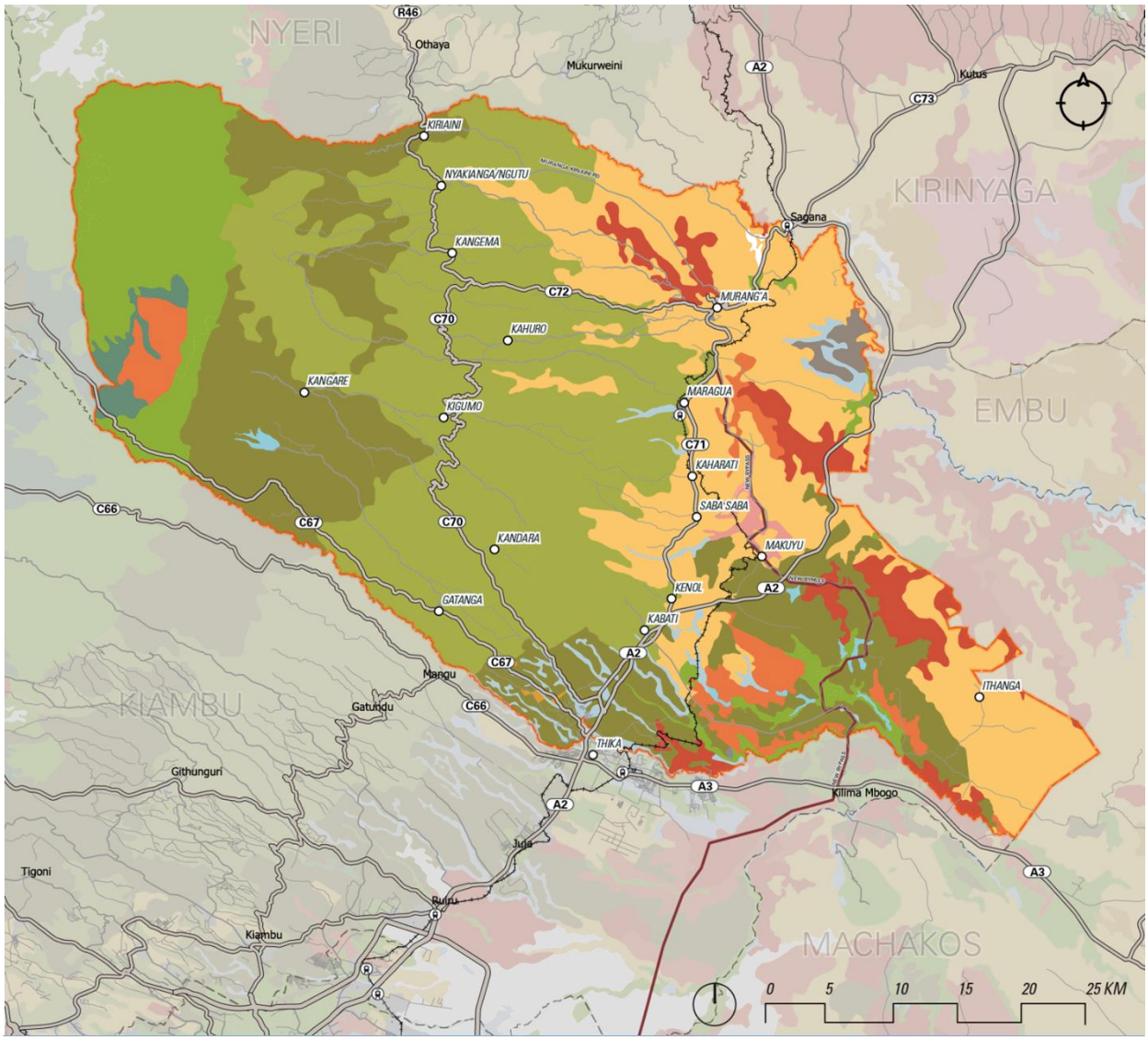
Table 35: Activities permitted on agricultural land

Activity	Definition
Agriculture	The cultivation of land for crops or the breeding of animals or the operation of a game farm on an extensive basis on natural land
Agri-Industry and Agri-Processing	The processing of agricultural products on a farming unit or within a rural area owing to the nature, perishableness and fragility of such agricultural products (e.g. wineries, farm pack stores, etc.).
Agri-Village	A settlement within an agricultural area and where residence is restricted to bona fide farm workers and their dependents of the farms involved in the development.
Agri-Tourism	A type of tourism in which travellers travel to rural areas to experience the activities and lifestyles of people living and working in the agricultural sector

20.5 Composite development framework

Map 38 shows the composite development framework for the County.

Map 37: Protection of Agricultural Zones



Protect and strengthen the agricultural economy and the rural hinterland

LEGEND

Boundaries
- *Murang'a County*
- *County Boundary*

Transportation
- *Major Roads*
- *Minor Roads*
- *Small Roads*
- *Railway Line*
- *Railway Station*

Agriculture
- *Forest Plantation Undifferenciated*
- *Rainfed Tree Crop*
- *Rainfed Shrub Crop (20 - 40% Field Density)*
- *Rainfed Shrub Crop*
- *Rainfed Herbaceous Crop (20 - 40% Field Density)*
- *Rainfed Herbaceous Crop Isolated (10 - 20% Field Density)*
- *Rainfed Herbaceous Crop*
- *Irrigated Herbaceous Crop*
- *Rice Fields*

Source: MapAble

Murang'a County Spatial Plan

Nairobi Metropolitan Services Improvement Programme

Ministry of Transport, Infrastructure, Housing and Urban Development

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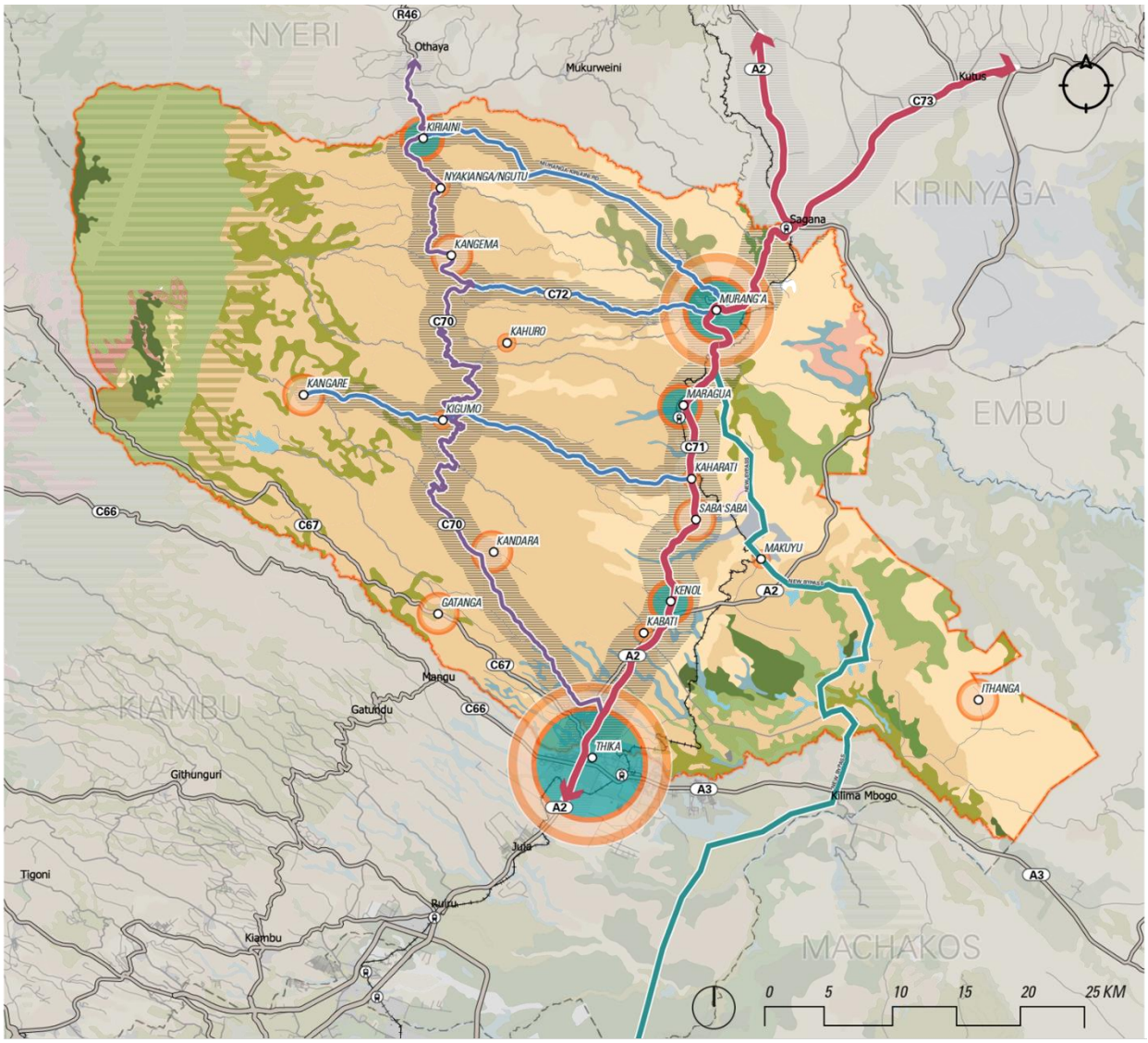
Map 38: Composite Development Framework



Consolidated Development Framework

LEGEND

Boundaries
- Murang'a County
- County Boundary

Transportation
- Major Roads
- Minor Roads
- Small Roads
- Railway Line
- Railway Station

Hydrological Features
- Rivers
- Wetlands
- Floodways

Node Hierarchy
- Primary Node
- Secondary Node
- Teriary Node
- Market Centre

Proposed Corridors
- Primary Corridor
- Secondary Corridor
- Tertiary Corridor
- Proposed Bypass

Important Natural Features
- Grassland
- Tree Savannah
- Shrub Savannah
- Shrubland
- Open Woody Vegetation
- Closed Woody Vegitation
- Woodland
- Forest
- Protected Areas

High Potential Agricultural Land
- Forest Plantation Undifferenciated
- Rainfed Tree Crop
- Rainfed Shrub Crop
- Rainfed Herbaceous Crop
- Rice Fields

Murang'a County Spatial Plan

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Section 5. Implementation plan

21 Thinking implementation from the start[43]

Good planning is measured by the success and outcomes of its implementation. To become successful in implementing plans, leaders and planners should consider the following:

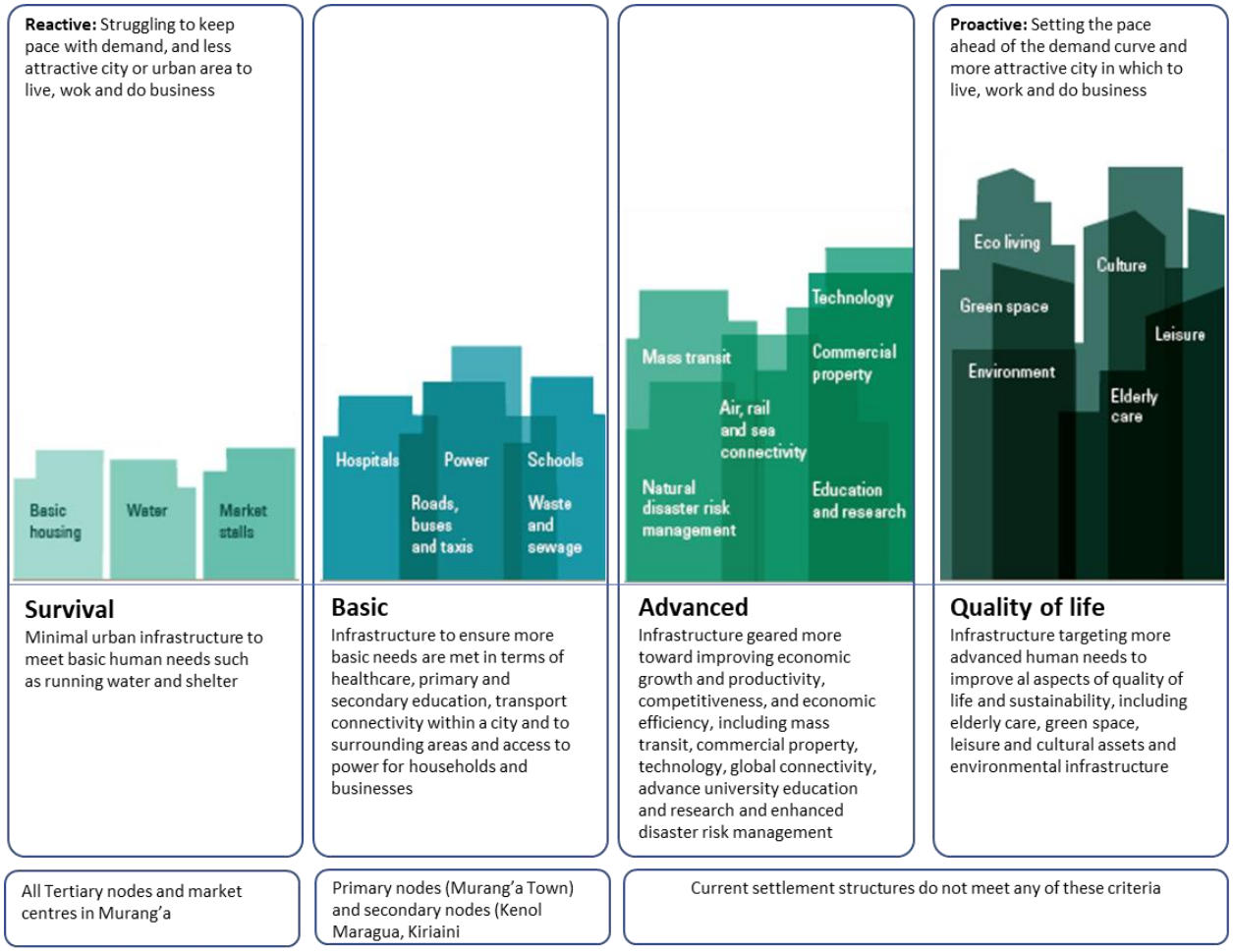
- ***Make planning simpler***: The planning system can be complex, time-consuming and expensive, featuring duplications and gaps. It can take long time to create comprehensive plans, which may be outdated before they are executed. Plans that overlook institutional, technical, and financial constraints may eventually need to be abandoned. Adopting a demand-driven approach by developing a pragmatic and modular framework can increase positive impacts during a plan's implementation.
- ***Be strategic:*** Responding to real, long-term needs, through concrete and well-phased action steps, ensures successful implementation and longevity of plans. Plans that lack vision, or do not respond to local realities are easily side-lined and forgotten when political agendas change. Choosing which key issues to address and which assets to develop amidst constraints and challenges is not easy. It requires insight and a capacity to ask the right questions.
- ***Identify responsibilities and set performance indicators:*** Accountability is impossible without concrete roles, or targets and the resources needed to realize them. Lack of accountability makes goals unreachable.
- ***Build inter-departmental teams:*** Transformative projects require holistic thinking to overcome governance bottlenecks and fragmented implementation. Urban authorities that promote functional integration and teamwork enable formulation of urban development frameworks with mutually supportive sector policies. Designating a specific group responsible for strategic thinking and coordination and institutionalizing inter-departmental cooperation and day- to-day work alignment may require systemic and behavioural change, but will ultimately prove more efficient.
- ***Deal with the legal dimension early:*** A plan approved by a city council is a legally-binding document. It is important to determine whether a local government will implement a plan alone, or rely on agreements with other levels of government or private partners.
- ***Calculate the plan capital and running costs and its impact on municipal revenue***: It is critical to develop a clear assessment of lifecycle costs. Long-term costs associated with policy decisions are often overlooked, especially operation and maintenance (O&M) costs. In some cities, the latter can be heavy financial burdens. Planning decisions and their implementation also impact the revenue base. Sound management practices must be introduced to recover resources
- ***Obtain early support to increase the likelihood of a positive impact:*** Cities which reach out to stakeholders are able to set priorities which reflect real needs, thus increasing the impact of investments. If stakeholders are involved from the beginning, the likelihood of later opposition to proposals is reduced. A well-supported plan aligns a local agenda with that of other levels of government, and also enlists the private sector.
- ***Phase implementation in terms of space and resources:*** Taxpayers' money should be managed carefully and used transparently with accountability. The same principle should apply to plan implementation. A plan's financial feasibility with dictate the phasing of programme components, and determine which will require funding from an external source. Evaluating results and making necessary policy adjustments then enables effective scaling-up

[43] Source: Adapted from UN-Habitat (2013) Urban Planning for City Leaders

The Implementation Plan deals with the execution, management and monitoring of the development proposals in order to give effect to the Spatial Plan. The following are key components of the Implementation Plan:

- Priority Development Areas
- Infrastructure Development
- Urban and Development Management

Figure 77: Four stage urban infrastructure evolution[44]



Any implementation is by its very nature a phased approach. Resource and institutional capacity constraints are obvious challenges. The pace at which implementation is furthermore determined by general economic growth conditions, not necessarily determined locally but rather through national growth and the international economic climate.

22 Priority development areas

The Priority Development Areas for government intervention are:

- The upgrading of the roads that form part of the proposed primary, secondary and tertiary corridors; and
- The consolidation of social and community services into the network of nodes;

[44] UNHABITAT, urban planning for city leaders a handbook for Kenya, p.92

Given the limited resources in the County, the focus should be on the primary and secondary nodes while maintaining the current levels of service delivery in the other nodes. In this regard, the impact of Thika on the development of Murang'a should be a priority consideration. Although Thika is not part of the county, its impact on development is clear. Should one add the natural drawing power of Nairobi, demand satisfaction channels towards Nairobi through Thika. This have a direct impact on centres farther north and in particular on Murang'a Town and Maragua. However, Kenol can play an important role in future and should be considered a priority investment area.

23 Infrastructure and service delivery strategies

The extent if infrastructure backlogs and the challenges are clear from the assessment of the areas. Service backlogs and specifically the need for basic services is clear. Basic services are services required to meet minimum health standards. These services then usually focus on water sanitation and refuse removal. A basic service delivery approach needs to be developed to meet local and international service delivery targets. However, infrastructure provision and the development of the road network are important levers in shaping the long-term development of the County.

24 Urban and Development Management

Beyond investing in capital projects, the best way of ensuring an efficient, safe and sustainable planning area is through effective urban and development management. Urban Management refers to how well the planning area is looked after on a day-to-day basis by both the local authority and residents. The better an area is managed and looked after, the more likely it is to attract investment and the less likely it is to attract crime. Places that are well looked after send out a message that the local authority and the community care. Places that are deteriorated and badly managed on the other hand attract criminal activity.

The function of Urban Management is to -

- **Regulate** the use of public spaces (i.e. ensure that the public may use them at their discretion);
- **Improve** and **maintain** public spaces and infrastructure (i.e. making public spaces make more attractive and more enjoyable); and
- **Govern** public spaces (i.e. government, private and community inputs to create sense of ownership, consensus about priorities etc.).

Aspects included under Urban Management include:

- Enforcement of regulations (including land use management, building control, policing and traffic management)
- Crime prevention
- Cleaning
- Greening
- Repair and maintenance of infrastructure and streets
- Maintenance of public spaces, including maintenance of landscaping and street furniture
- Addressing land invasion

One of the critical issues that must be addressed from an urban management perspective is littering, in particular around market areas. The following are some strategies that could be employed for the eradication of littering:

- Imposing a community penalty system where people who litter have to pay a fine to the community (which money should then be used for community purposes again);
- Ensuring the provision of adequate street dustbins and regular refuse removal;
- School programmes where learners go out and clean public spaces in their communities; and

- Recycling programmes as part of a green economy in the County.