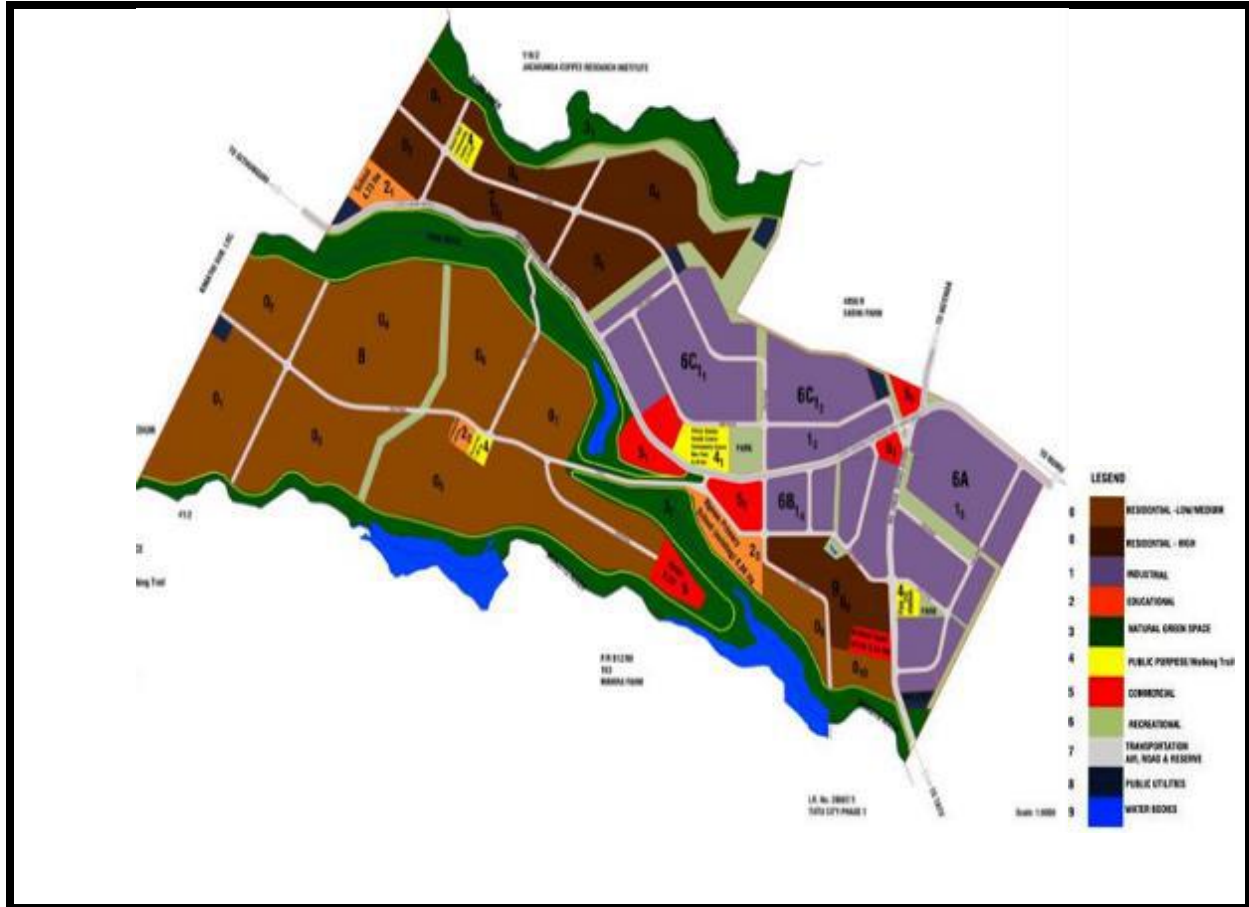


**FINAL STRATEGIC ENVIRONMENTAL ASSESSMENT (SEA) REPORT
FOR THE PROPOSED TATU CITY EXTENSION (MCHANA ESTATE) MASTER PLAN
WITHIN PLOT L.R. NO. 31327 ADJACENT TO
TATU CITY (PHASE 1) IN KIAMBU COUNTY**



PROPONENT



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FEBRUARY, 2020

DECLARATION PAGE

DECLARATION BY THE ENVIRONMENTAL CONSULTANT

I, **Prof. Jacob K. Kibwage** on behalf of Africa Waste and Environment Management Centre (AWEMAC) submit this Final Strategic Environmental Assessment (SEA) Report for the proposed Tatu City Extension (Mchana Estate) Master plan on 885.22 hectares of land adjacent to Tatu City (Phase 1) in Kiambu County. To my knowledge, all information contained in this Final SEA report is accurate and a truthful representation of all findings as relating to the proposed Master Plan Development as per information provided by the proponent.

Signed at NAIROBI on this day of 2020

Signature:

Designation: SEA Team Leader/EIA & Audit Lead Expert Reg. No. 0126

DECLARATION BY THE PROPONENT

I on behalf of **TATU CITY LIMITED** submit this Final Strategic Environmental Assessment (SEA) Report for the proposed Tatu City Extension (Mchana Estate) Master Plan on 885.22 hectares of land adjacent to the Tatu City (Phase 1) in Kiambu County. To my knowledge, all information contained in this Final SEA report is accurate and a truthful representation of all findings as relating to the proposed Master Plan Development as per information we provided to the SEA consultant.

Signed aton this day of2020

Signature.

Designation:

TEAM OF SEA EXPERTS

Table below highlights the qualifications and roles for the team of experts involved in the SEA process.

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LIST OF ACRONYMS

ac	Acre
AIDS	Acquired Immunodeficiency Syndrome
BTL CICC	BTL Christian International Conference Centre
CBD	Central Business District
CBO	Community Based Organization
CEC	County Environment Committee
CECM	County Executive Committee Member
CEMMP	Construction Environmental Management and Monitoring Plan
CIDP	County Integrated Development Plan
CO ₂	Carbon dioxide
CV	Curriculum Vitae
DOE	Department of Environment
DOSHS	Directorate of Occupational Safety and Health Services
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Co-ordination Act
EMU	Environmental Management Unit
ESIA	Environmental and Social Impact Assessment
ESMMP	Environmental and Social Management and Monitoring Plan
GHGs	Greenhouse Gases
GIS	Geographic Information System
GoK	Government of Kenya
GPS	Global Positioning System
Ha	Hectare
HIV	Human Immunodeficiency Virus
ICT	Information and Communications Technology
IFC	International Finance Corporation
IPPM	International Project Planning and Management Consultants
ISWM	Integrated Solid Waste Management
JKIA	Jomo Kenyatta International Airport
K. U	Kenyatta University
KEBS	Kenya Bureau of Standards
KeNHA	Kenya National Highways Authority
KFS	Kenya Forest Service
KIRDI	Kenya Industrial Research and Development Institute
KM	Kilometer
KWS	Kenya Wildlife Service
m a.s.l	Metres above sea level
M ³	Cubic Metres
MEAs	Multilateral Environmental Agreements
MM	Millimeter
NCA	National Construction Authority
NCC	Nairobi City County
NCCAP	National Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NEAP	National Environment Action Plan
NEC	National Environmental Council
NEMA	National Environment Management Authority
NET	National Environment Tribunal
NGO	Non-Governmental Organisation

NIUPLAN	Nairobi Integrated Urban Development Master Plan
NMP	Northlands Master Plan
OSHA	Occupational Safety and Health Act
PPP	Policies Plans and Programs
PWDS	Persons with Disabilities
RUJUWASCO	Ruiru - Juja Water and Sewerage Company
SDGs	Sustainable Development Goals
SEA	Strategic Environment Assessment
SERC	Standards and Enforcement Review Committee
STP	Sewage Treatment Plants
SWMS	Safe Work Method Statements
TODs	Transit Oriented Development
UN habitat	United Nations habitat
UNCBD	United Nations Convention on Biological Diversity
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
WIBA	Work Injury Benefit Act
WRA	Water Resources Authority

DEFINITION OF TERMS

Archaeological impact assessment: required where potential conflicts have been identified between archaeological resources and a proposed development.

Biological diversity: means the variability among living organisms from all sources including terrestrial ecosystems, aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, among species, and of ecosystems

Buffer Zone: means distinct or established areas that separate potentially competing users and that serves to lessen the danger of potential conflicts.

Chemical: means a chemical substance in any form whether by itself or in a mixture or preparation, whether manufactured or derived from nature and includes industrial chemicals, pesticides, fertilizers and drugs

Cumulative Impacts: IFC defines cumulative as those impacts that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.

Cumulative Impact Analysis: a systematic procedure for identifying and evaluating the significance of effects from multiple activities.

Cultural Impact Assessment : assessment of the impact of a planned project on culture, traditions, values and norms

Environmental Audit means a systematic evaluation of activities and processes of an ongoing project to determine how far these activities and programmes conform with the approved environmental management plan of that specific project and sound environmental management practices

Environment Impact Assessment: means a systematic examination conducted to determine whether or not a programme, activity or project will have any adverse impacts on the environment.

Environmental Management Plan: means all details of project activities, impacts, mitigation measures, time schedule, costs, responsibilities and commitments proposed to minimize environmental impacts of activities, including monitoring and environmental audits during implementation and decommissioning phases of a project.

Environmental Monitoring: means the continuous or periodic determination of actual and potential effects of any activity or phenomenon of the environment whether short-term or long-term;

Health Impact Assessment (HIA): is defined as the potential effects of a project on the health of a population/ local communities. Health is a state of complete physical, mental, social and spiritual wellbeing and not merely a study on diseases.

High water mark means the historical recorded point of the highest level of contact between the water and the shore or bank, as the case may be.

Low water mark means the historical recorded point of the lowest level of contact between the water and the shore or the bank as the case may be.

Integrated Environmental Assessments: includes Environmental Impact Assessment, Archeological Assessment, Social impact assessment, Health Impact Assessment and Cultural Impact Assessments.

Master plan: a dynamic long-term planning document that provides a conceptual layout to guide future growth and development. Master planning is about making the connection between buildings, social settings, and their surrounding environments.

Mitigation measures include engineering works, technological improvements, management and ways and means of minimising negative aspects, which may include socio-economic and cultural losses suffered by communities and individuals, whilst enhancing positive aspects of the project.

Plan: A purposeful, forward-looking strategy or design, often with coordinated priorities, options, and measures that elaborate and implement policy.

Riparian land: means land being a minimum of 6 metres and up to a maximum of 30 metres on either side of a riverbank from the highest water mark.

Social Impact Assessment (SIA): is the process of identifying and managing the social / human impacts of projects

Stakeholder: Those who may be interested in, potentially affected by, or influence the implementation of a PPP. In the context of a SEA applied to development co-operation, stakeholders may include government, donor agencies, local communities, NGOs, and civil society.

Strategic Environmental Assessment (SEA): A range of analytical and participatory approaches that aim to integrate environmental consideration into policies, plans, and programs and evaluate the interlinkages with economic and social considerations.

Sustainable Development means development that meets the needs of the present generation without compromising the ability of future generations to meet their needs by maintaining the carrying capacity of the supporting ecosystem.

Trade-offs: Refers to losing one quality or aspect of something in return for getting another quality or aspect. It implies a decision made with the full comprehension of both the up- and down-side of a particular choice.

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NON-TECHNICAL SUMMARY

Background Information

The Strategic Environmental Assessment of Tatu City Plan (2011) had been approved by the National Environment Management Authority (NEMA) to provide strategic direction to the City Plan and individual development of the precincts and phased development of Tatu City. The SEA study report was approved by NEMA on 6th of September 2011. Subsequently, Environmental Impact Assessments have also been undertaken for the various project phases to address the site-specific impacts of the specific projects and EIA licenses issued by NEMA.

Due to increasing demand for the various land uses, Tatu City Limited realised the need to expand the city by additional 885.22 Hectares on Mchana Estate, the land adjacent to the Tatu City (Phase 1). Upon development, it is anticipated that Tatu City will be a large new city redefining the quality and scale of urban development in Kenya, massively reducing congestion in central Nairobi and reverse traffic flows between the centre and Kiambu County. With living and working spaces, communities, schools and hospitals, Tatu City will help sustain and accelerate Africa's economic growth, meet the aspirations of Africa's burgeoning middle classes, and serve as a catalyst for further urban development. Tatu City phase 1 covers an area of approximately 965.66 Hectares (2385 acres) whereas Tatu City Phase 2 - Tatu City Extension (Mchana Estate) is 885.22 Hectares (2,186.49 acres). Accumulatively, Tatu city phase 1 and 2 development will cover an area of approximately 1850.77 hectares (4,571 acres).

Africa Waste and Environment Management Centre (AWEMAC) was contracted by Tatu City Limited to carry out a Strategic Environmental Assessment (SEA) of the proposed Tatu City Extension (Mchana Estate) Master Plan in fulfilment of Regulation 42 of the Environmental (Impact Assessment and Audit) Regulations of 2003 that requires all Policy, Plans or Programmes to be subjected to a SEA. The SEA commission entailed carrying out the study in accordance with the set regulations and guidelines, submission of the scoping, draft and final SEA reports to NEMA for review, and follow up to provide any additional information to enable approval of the Master Plan.

The purpose of this Final SEA report is to share the findings of the possible impacts on the bio-physical and socio-economic environment upon implementation of the proposed Tatu City Extension (Mchana Estate) Master Plan. It also sought to provide information on the plan proponent, an outline of the proposed plan, mitigation measures for identified negative impacts, an environmental management and a monitoring plan to ensure effective implementation of the mitigation measures, and a description of the SEA process including the assessment's outcomes and recommendations.

Methodology and Criteria for undertaking the SEA

The SEA was carried out in line with the provisions of the Environmental Management and Coordination Act, (EMCA, Cap 387), the Environmental (Impact Assessment and Audit) Regulations 2003, Draft Environmental Management and Coordination (Strategic Assessment, Integrated Impact Assessment and Audit) Regulations 2018, the 2012 National Guidelines for Strategic Environmental Assessment in Kenya, as well as international guidelines on SEA.

The main activities in this SEA study include:

- a) Description of the proposed Plan including the objective, purpose, and rationale;
- b) Identification of alternative options and strategies, implementation plan and time scale;
- c) Areas and sectors affected by the proposed Plan;
- d) Field missions for baseline environmental analysis;

- e) Collection of baseline data including data on ecological processes and services, resilience and vulnerability of these processes and their significance to human well-being;
- f) Review and analysis of existing policy and legislative frameworks for environmental protection and existing environmental protection programs and their objectives;
- g) Review of all relevant development plans for the area within the study boundaries;
- h) Identification of alternatives options and justification of preferred alternatives and linkages between ongoing projects and proposed plan;
- i) Integration of climate change vulnerability assessment, adaptation and mitigation actions;
- j) Prediction and evaluation of impacts, including cumulative effects;
- k) Preparation of an Environmental and Social Management and Monitoring Plan (ESMMP)
- l) Institutional Strengthening/ Capacity Building;
- m) Identification of gaps and alternatives actions;
- n) Stakeholder consultations and public participation;
- o) Presentation of findings and stakeholder dialogue;
- p) Compilation, validation and submission of final SEA report;

Objectives of Tatu Phase II (Mchana Estate) SEA

The general objective of the SEA report is to present strategic recommendations that will guide environmental and socio-economic planning during implementation of the Tatu Phase II (Mchana) Masterplan.

The specific objectives of the SEA are outlined below.

- i. To enhance proper forward-thinking in planning and zonation of various land uses in order to avert the risks and consequences of a poorly planned city.
- ii. To identify environmental and poverty-combating priorities and how these may be influenced by the proposed Masterplan.
- iii. To ensure that conservation of biodiversity is at the core of the Masterplan formulation and implementation.
- iv. To ensure that the proposed Masterplan is compatible with sustainable environmental planning and management.
- v. To ensure the consideration of alternative Masterplan options, including the do-nothing option, at an early stage when an agency has greater flexibility.
- vi. To enhance the consistency of the Masterplan across different sectors including the Big Four Agenda (Enhancing Manufacturing, Food Security and Nutrition, Universal Health Coverage, Affordable Housing)
- vii. To support decision-making and incorporate emerging environmental issues into sustainable development of the proposed city.
- viii. To identify environmental impacts and integrate mitigation measures during Masterplan formulation, and in the process, enhance Environmental Management
- ix. To ensure the consideration of cumulative, indirect, or secondary impacts and other unintended consequences when planning multiple, diverse activities of the Masterplan.
- x. To support time-efficient and cost-effective development planning by avoiding the need to reassess some issues and impacts at project level.
- xi. To inform decision makers by evaluating alternative options that meet the Masterplan's objective(s), while also being the best-practicable-environmental-option(s);
- xii. To integrate environmental principles into the development, appraisal, and selection of Masterplan's options e.g. selection of green technologies for the city.

- xiii. To provide an early opportunity to check whether the Masterplan complies with County, national and international environmental policy and consequent legislative obligations.

Objectives of the Master Plan

The proposed Tatu City Extension (Mchana Estate) Master Plan aims to safeguard integration of all the facets of a sustainably developed entity by ensuring that the economic, social and environmental factors are its guiding principles. The specific objectives of the plan are;

- i) To develop a housing development with low, medium and high-density units targeting both middle and high-income earners.
- ii) To establish industrial development that includes light and heavy industries.
- iii) To develop educational institutions including pre-primary, primary and secondary schools, middle level college, research centre and university.
- iv) To designate recreational and sports facilities and services providing various sports and recreational activities with public amenities such as green open spaces.
- v) To provide commercial centre and services with various and mixed-use developments.
- vi) To design infrastructure and utilities and services with reliable power supply network that includes renewable sources.
- vii) To establish a transportation system with a comprehensive road network system that includes transit and local roads.
- viii) To designate natural green open spaces, wetlands & water bodies.

Proposed Master Plan description

Tatu City Limited intends to develop a Tatu-Mchana Master Plan on Plot L.R. NO. 31327 on 885.22 Hectares of land adjacent to the Tatu City (Phase 1) comprising of different zones including:

i) Residential Zone - Low / Medium	263.16 ha
ii) Residential Zone - High	111.67 ha
iii) Industrial Zone	163.97ha
iv) Educational Zone	15.24 ha
v) Natural Green Spaces	168.58 ha
vi) Public Purpose / Walking Trail	12.44 ha
vii) Commercial Zone	27.8 ha
viii) Recreational Zone	47.41 ha
ix) Transportation Zone	55.46 ha
x) Public Utilities Zone	7.1 ha
xi) Water Bodies	12.39 ha

TOTAL **885.22 ha**

The proposed Tatu City Extension Master Plan is anticipated to interlink with other regional and local policies, plans and programmes. Some of the key interlinking regional plans, include;

- Tatu City Phase 1;
- Gulmarg- Sasini Master Plan;
- Kenyatta University Master Plan;
- Kiambu County Integrated Development Plan 2010-2022;
- Nairobi Integrated Urban Development Master Plan (NIUPLAN) - 2014-2030;
- Nairobi Metro 2030 (GoK, 2008);
- Ruiru Local Physical Development Plan 2005 – 2020;
- The Northlands Master Plan;
- The Two Rivers Development;

Baseline Environmental Analysis

During the SEA study, it was noted that Tatu City Phase 1 has an undulating topography but in general comprises a very gradual gradient. There are raised grounds distributed around the site and steeper slopes down towards the river areas. The topography for Tatu City Extension (Mchana Estate) is undulating, and it generally slopes from Northwest to Southeast. The site slopes gradually towards the river valleys. No aspect of the topography however presents a major restriction for development.

There are four perennial rivers, namely the Ruiru River, Gaia River, Mukuyu River, and Kamiti River and Earth dams which run along the northern and southern boundaries of Tatu City Phase I and II. The Comte and Mchana Earth dams are within the proposed Tatu City Extension (Mchana Estate) and are utilized for irrigation purposes. Wetlands (seasonally moist grasslands) occur in the low-lying areas between the currently cultivated parcels of land.

The flora of the area proposed for Master Plan is largely characterized by coffee plantations as well as stands of large gum trees and young plantations of silver oak, gum trees and pine tree species. The remaining natural vegetation is mostly limited to the rivers, open grassed areas and some savannah/wooded grassed areas. On the 885.22 hectares (2,186.49 acres) of land proposed for Tatu City Extension (Mchana Estate), land cover under coffee plantations is estimated to be 1,090 acres.

Several pockets of wildlife habitats exist within the proposed Master Plan area including hippopotami, which occupy the perennial rivers and earth dams which run along the northern and southern boundaries of the site and make use of the seasonally moist grasslands and riparian areas (including wetlands) for foraging purposes and as ecological corridors for movement. During the SEA study, no amphibian species were identified. However, the amphibians can be spotted during the wet season. Many bird species exist in the study area including secretary bird, crowned cranes, pelicans, marabou storks, and eagles.

Relevant policy, plan, legislative and regulatory framework

The proposed Tatu City Extension (Mchana Estate) was subjected to a comprehensive analysis based on the environmental obligation's framework developed for the SEA. Key legislations and pertinent regulations were studied and reviewed in detail in the draft SEA report. This included: The Vision 2030, Sessional Paper No. 10 of 2014 on the National Environment Policy, Sessional Paper No. 9 of 2012 on the National Industrialization Policy Framework for Kenya 2012 – 2030 and The Kenya National Climate Change Response Strategy of 2010 among others.

Stakeholder Engagement and Public Participation

Household surveys were conducted within the entire neighborhood of the area proposed for Master planning. Survey tools were prepared for effective and systematic interviews by the environmental and socio-economic consultants assisted by a team of technical field assistants from the area on the baseline survey. The tools included; structured and non-structured household interview schedules, key informant guidelines, mapping, sampling of the areas to be surveyed, field visits and observations, and triangulation of field data which focused specifically on the communities who stay within and around the area designated for Master Planning. Household interviews and site visits were conducted during the period of May to June 2018. As part of the scoping exercise, thirty (30) key stakeholders from government ministries and lead agencies, Kiambu County Government officials, private investors, interested and affected individuals and institutions within and neighbouring the proposed Tatu City Extension (Mchana Estate) Master Plan were identified, consulted and interviewed during the period of May to June 2018.

In order to ensure effective stakeholders’ participation, a technical key stakeholders meeting was held on Friday 5th of July 2019 at Tatu Primary School Playgrounds in Kiambu County. In attendance were eighty five (85) key stakeholders including representatives from National Environment Management Authority (NEMA), Kenya Forest Service (KFS), Kenya Urban Roads Authority (KURA), Kenya Rural Roads Authority (KeRRA), State Department of Housing, Kenya Power, Water Resources Authority (WRA), Kenyatta University (KU), Kiambu Institute of Technology, County Executive Committee Members -Kiambu County, youth leaders, local chiefs and Kenya Police.

Following the submission of the draft SEA report to NEMA on 20th September 2019; advertisements appeared in the Daily Nation of November 2019 and 29th October 2019 and the Kenya Gazette on 29th November 2019 which allowed for the public disclosure period. In view of the expiry of the public disclosure period, Tatu City in coordination with NEMA organised for a validation workshop that was held on 30th January 2020 with a total of 65 participants. Key stakeholders’ recommendations during the SEA process for Tatu City management to consider are:-

- Biodiversity conservation / Protection of riparian land / zones / wetlands
- Habitat and wildlife management in collaboration with KWS
- Water conservation and wastewater management
- Designation of space for solid waste management processing facilities
- Protect vulnerable groups (aged, disabled, disadvantaged groups in society, etc) during the master plan implementation)
- Promotion of Non-Motorised Transport (NMTs) facilities
- Implement a sustanbale a Corporate Social Responsibility program
- Establishment of a Cemetery/crematorium in one of their properties
- Harnessing power from renewable energy sources to supplement supply from the National Grid
- Empower the local population (especially youths) through active participation in the implementation of the master plan
- Integrate all environmental and social safegurds and international best practices in the implementation of the master plan

Impacts Identification and Analysis

The following table presents the anticipated key negative impacts and proposed mitigation measures for the proposed Tatu City Extension (Mchana Estate) Master Plan

Possible Impacts	Mitigation Measures
Habitat Alteration / Loss of agricultural land	<ul style="list-style-type: none"> ▪ EIAs to be undertaken for all development activities ▪ Maintain the proposed green spaces as per the Master Plan ▪ Where clearance of natural vegetation is inevitable; ensure replacement with indigenous species in landscaped sections and other green spaces ▪ Formulation and implementation of a Wildlife Management Plan in collaboration with KWS ▪ Ensure protection of the riparian environment and establishment of a riparian reserve management plan ▪ Formulation and implementation of a Biodiversity Management Plan ▪ Undertake ecological assessment including site specific invertebrate assessment during EIAs

Possible Impacts	Mitigation Measures
	<ul style="list-style-type: none"> ▪ Ensure all projects comply with the Environmental Management and Co-ordination (Conservation of Biological Diversity and Resources, and Access to Genetic Resources and Benefits Sharing) Regulations, 2006.
<p>Generation of solid and effluent waste from residential, commercial and industrial areas</p>	<ul style="list-style-type: none"> ▪ Adoption of an integrated solid waste management plan through a hierarchy of options that includes reduction at source, reuse, recycling, incineration, composting and land filling ▪ Implementation of a solid and effluent waste management plan ▪ Domestic, commercial and industrial waste to be managed separately ▪ Provide mechanisms to segregate wastes at source to enable recycling ▪ Provision of transfer stations from where waste will be disposed in designated areas ▪ Designation of a modern and well-maintained solid waste management facility ▪ Conduct waste Audits for various land use zones annually and other statutory and non-statutory reports ▪ Pre-treatment of industrial effluent before discharge into sewers ▪ Connection of standalone projects to existing trunk sewers in Tatu City ▪ Establishment of storm water treatment / filtration systems ▪ Compliance to Environmental Management and Co-ordination (Waste Management) Regulations 2006 and (Water Quality) Regulations 2006
<p>Increased demand on water sources / Decline in ground water levels / Pollution of rivers and earth dams</p>	<ul style="list-style-type: none"> ▪ Implementation of Water Resources Management Plan ▪ Promote rainwater harvesting ▪ Promote recycling and reuse of water as much as possible ▪ Conservative water use in low volume fixtures in buildings ▪ Use of recycled and harvested storm water in cleaning and Landscaping ▪ Incorporate water accounting systems and metering for all areas ▪ Ensure limited abstraction of river water ▪ Pre-treatment of all effluent before discharge into rivers ▪ Undertake a hydrogeological study in collaboration with WRA to determine the sustainable ground water abstraction levels ▪ Protection of riparian land / zones / wetlands ▪ Ensure protection of upstream river basins ▪ Ensure all project comply to the Water Act, 2016 and Environmental Management and Co-ordination (Water Quality) Regulations 2006
<p>Increased Energy Demand</p>	<ul style="list-style-type: none"> ▪ Institution awareness programmes to conserve energy ▪ Energy conservation through installation/use of energy efficient appliances / fittings ▪ Adoption of Green Energy Sources e.g. solar energy, waste to energy projects

Possible Impacts	Mitigation Measures
	<ul style="list-style-type: none"> ▪ Use of green building designs that allow for passive heating and cooling, and maximum utilization of natural light in buildings ▪ Continually seek avenues for energy conservation as international best practices evolve ▪ Implementation of an Energy Management Plan ▪ Carry out Energy Audits and ensure all projects comply with The Energy Act 2019 and its subsidiary legislations
Environmental Pollution / Landscape Changes	<ul style="list-style-type: none"> ▪ Ensure adequate tree cover and gardens within developed areas to provide shade and cooling effect ▪ Ensure vegetation cover (trees and shrubs) as buffers between land-uses ▪ Enforcement of pollution control measures for air, water and soil pollution sources ▪ Tarmacking all major roads to enhance movement in all-weather and to avoid dust generation
Traffic /Transport Congestion	<ul style="list-style-type: none"> ▪ Ensure a good connection between spine roads, the Thika Superhighway, Northern and Eastern bypasses ▪ Provision of adequate vehicular circulation space and parking areas ▪ Provision of pedestrian walkways along all roads within the development ▪ Paving all pedestrian walkways with robust, durable, and non-slippery materials ▪ Provision of all necessary street furniture along all roads within the development to accommodate users (including the disabled, elderly, and children) and to enhance security. ▪ Provision of bollards in appropriate areas to prevent vehicles from encroaching into the pedestrian domains. ▪ Provision of streetlights to provide sufficient light for both pedestrian areas and carriage ways. ▪ Provision of trees along pedestrian walkways for shading and that require minimum maintenance, preferably indigenous for ecological and cultural advantages. ▪ Ensure Installation and maintenance of all construction signs, signals, markings, and other devices used to regulate traffic, including posted speed limits, warnings of sharp turns, or other special road conditions ▪ Development and implementation of a Traffic Management Plan and compliance to Traffic Act, 2014
Greenhouse Gases Emissions	<ul style="list-style-type: none"> ▪ Use of renewable sources of energy such as solar harnessing technologies ▪ Retention of green spaces/landscaped spaces as carbon sinks ▪ Adoption of green buildings technology ▪ Adoption of efficient transport system ▪ Annual air quality monitoring ▪ Ensure compliance of The Environmental Management and Co-ordination (Air Quality) Regulations, 2014
Socio- Economic Concerns	<ul style="list-style-type: none"> ▪ Maximize the recruitment of locals where possible ▪ Develop an elaborate Corporate Social Responsibility Programme to ensure the local community are engaged.

Possible Impacts	Mitigation Measures
	<ul style="list-style-type: none"> ▪ Consult with the public and the locals during implementation of proposed developments ▪ Sensitize coffee workers about the proposed mixed-use development and allow for smooth transition ▪ Develop and implement a Livelihood Restoration Plan (LRP) for the coffee workers whose career will be affected during implementation of the proposed Tatu City Extension (Mchana Estate) master plan

Alternative options of the Master Plan

The land use zoning for the proposed Tatu City Extension (Mchana Estate) Master Plan was done after considering several suitability factors to meet the social, economic, environmental, cultural and even political aspirations of the respective planning jurisdictions. As a result, different land uses were opted for ranging from, among others, residential, commercial, industrial, open spaces, transportation public amenities and infrastructure in a balanced manner that promotes sustainable development

The SEA team identified four possible alternatives/ options to which the land could be used. They include: Option 1-No Intervention Option (Carbon sink), Option 2-Farmland/Agriculture Use, Option 3-Wildlife Conservancy and Option 4-The Proposed City Use. The likely environmental and socio-economic impacts of each option were assessed.

A justification for the preferred alternative; Tatu City Extension (Mchana Estate) development was based on the assessment of the compatibility of Tatu City Extension (Mchana Estate) to immediate surrounding land uses. The development further conforms to the zoning provisions of the land since incompatible land uses such as residential and industrial have been clearly separated. Land uses have been provided in an integrative manner ranging from among others, residential, commercial, industrial, open spaces, transportation public amenities in order to promote sustainable development as envisioned by the Kenya Vision 2030. Implementation of the Master Plan will lead to loss of agricultural land as agriculture (coffee plantations) is the predominant economic activity in the proposed Tatu City Extension (Mchana Estate). However changing use from agricultural to residential and commercial use has often proved to be more economically viable as development comes with positive effects such as employment and business opportunities leading to improved economy. This further leads to increased urban land uses as well as population creating further opportunities into the rural areas.

Climate change vulnerability assessment, adaptation and mitigation actions

Cities are major contributors to climate change: although they cover less than two per cent (2%) of the earth's surface, cities consume 78% of the world's energy, and produce more than 60% of all carbon dioxide and significant amounts of other greenhouse gas emissions, mainly through energy generation, vehicles, industry, and biomass use (UN habitat). Together with local authorities, Cities have the potential to diminish the causes of climate change (mitigation) and effectively protect themselves from its impacts (adaptation).

The adaptation and mitigation measures that should be considered during the execution of the Tatu City (Mchana Estate) include:

- i) Developing strategies to enable efficient means of transport that have a low GHG footprint
- ii) Put in place measures to enhance energy conservation, efficiency and use of renewable energy
- iii) Develop strategies to enhance the agricultural and forestry zones which aid in carbon dioxide sequestration

- iv) Mainstreaming of climate change into development planning and management for sustainability
- v) Develop strategies for waste reduction at source
- vi) Promoting and institutionalizing payment for ecosystem services schemes to support watershed protection initiatives in the upland's zones
- vii) Establishment of rainwater harvesting reservoirs

Conclusion and recommendations

From the foregoing, the proposed Tatu City Extension (Tatu Mchana Master Plan) by Tatu City Limited is a worthy investment by the proponent and will contribute significantly to the improvement of living standards among the investors and by extension spur economic development to the population within Kiambu County and Kenya at large. The developments envisioned by the proposed Master Plan will bring along numerous positive impacts ranging from creation of employment, supply of the much-needed office, retail/commercial/industrial and residential spaces, decongestion of the nearby towns and cities, optimized land use among other benefits, all aimed at attaining the vision 2030. Further, the Master Plan aligns well with the Big Four Agenda on enhancing manufacturing sector, providing affordable housing, providing universal health coverage and enhancing food and nutrition security through the agricultural zone. The Kiambu CIDP objective of creating and transforming systems, structures and institutions within the County based on five key pillars of security, employment, education, health and urban planning echoes well with the proposed Tatu City Extension Master Plan specifically growth of industries and trade; and other sectors of the economy such as housing, education, agriculture, hospitality, natural resources conservation amongst others. It is our recommendation that NEMA approves this SEA report to allow for the execution of the Master Plan and realization of envisioned developments.

For the proposed Master Plan to achieve its intended strategic objectives and be compatible with sustainable environmental planning and management, the following recommendations should be incorporated in the design.

- Establishment of a Cemetery/crematorium
- Designation of a modern and well-maintained solid waste management facility
- Establishing an industrial waste treatment facility
- Location of Industrial uses away from residential uses
- Establishment of storm water treatment / filtration systems

Further is suggested that the following mitigation measures be incorporated;

- Protection of riparian land / zones / wetlands
- Protection of upstream river basins
- Leverage for controlled urban planning on the Master Plan boundary
- Harnessing power from renewable energy sources
- Incorporating Green Building Techniques in construction of individual projects
- Develop a comprehensive Livelihood Restoration Plan for the coffee plantation workers whose career will change in the long-term during implementation of the proposed master plan

It is worth noting that this SEA is for the proposed Tatu City Extension (Mchana Estate) Master Plan; hence, the developments and projects envisioned by the Master Plan will require to undergo individual *integrated environmental and social impact assessment* (includes Environmental Impact Assessment, Archeological Impact Assessment, Social impact assessment, Health Impact Assessment, Cumulative Impact Assessment, Visual Impact Assessment and Cultural Impact Assessment) as per second schedule of EMCA (Cap 387), and Environmental Impact Assessment (Assessment and Auditing) Regulations of the year 2003 and 2019 amendments.

1 INTRODUCTION

1.1 Background Information

Tatu City is a new upcoming development by Tatu City Limited which portrays images of a new world class, mixed use and mixed income satellite city for Nairobi. On execution, Tatu City will consist of a comprehensive mix of land uses including low, medium and high residential developments, commercial, industrial, educational and recreational developments, tourism and social facilities, public utilities and open spaces with natural green zones and water bodies.

The Strategic Environmental Assessment of Tatu City Master Plan - Phase 1 (2011) had been approved by the National Environment Management Authority (NEMA) to provide strategic direction to the City Plan, individual development of the precincts and phased development of the city. The SEA study report was approved by NEMA on 6th of September 2011. Subsequently, Environmental Impact Assessments (EIA) have also been undertaken for the various project phases to address the site-specific impacts of the projects with EIA licenses being issued by NEMA. Due to increasing demand for the various land uses, Tatu City Limited has seen the need to expand Tatu City by additional 885.22 Hectares of land adjacent to Tatu City Phase 1. The proposed Tatu City Extension (Mchana Estate) is estimated to have a final population of approximately 75,000 people and an additional 25,000 daily visitors with construction split into various phases.

The vision for Tatu City, which affects Tatu phase 1 and 2, is anchored on specific principles and values. The factors forming the foundation of the development plan for phase 2 - Tatu City Extension (Mchana Estate) are:

- A mixed-use and vibrant urban environment, which embodies the notion of live, work, and play.
- Public transport and pedestrian friendliness.
- Flexibility and accommodation of a variety of lifestyles.
- Spatial integration with the Tatu City Phase 1, immediate urban context and greater Nairobi as a whole.
- Maximizing self-sufficiency.

Strategic Environmental Assessment (SEA) is undertaken for policies, plans and programmes. This proposed SEA is for a Master Plan. World Bank (2018) defines a Master Plan as a dynamic long-term planning document that provides a conceptual layout to guide future growth and development. Master planning is about making the connection between buildings, social settings, and their surrounding environments. A Master Plan includes analysis, recommendations, and proposals for a site's population, economy, housing, transportation, community facilities, and land use. It is based on public input, surveys, planning initiatives, existing development, physical characteristics, social and economic conditions.

Master planning can assume some or all these roles:

- Develop a phasing and implementation schedule and identify priorities for action.
- Act as a framework for regeneration and attract private sector investment.
- Conceptualize and shape the three-dimensional urban environment.
- Define public, semiprivate, and private spaces and public amenities.
- Determine the mix of uses and their physical relationship.
- Engage the local community and act as builder of consensus.

The proposed Tatu City Extension (Mchana Estate) Master Plan is generally a long-term proposition. It is important to consider the Master Plan as a dynamic document that can be altered based on changing project conditions over time. To fully understand the concerns of the Master Plan on the society and environment, a Strategic Environmental Assessment (SEA) was proposed to provide a framework of recommendations to guide the plan.

The SEA entailed carrying out the study in accordance with the set regulations and guidelines, and submission of relevant reports to NEMA for review and follow up to provide any additional information to enable approval of the Master Plan. This Final SEA report provides information on the Master Plan proponent, an outline of the proposed Tatu City Extension (Mchana Estate) Master Plan, and a description of the SEA process including the assessment's outcomes and recommendations.

1.2 Strategic Environmental Assessment Definition

Strategic Environmental Assessment (SEA) refers to a range of analytical and participatory approaches to integrate environmental consideration into Policies, Plans and Programs (PPP) and evaluate the inter-linkages with economic and social considerations (NEMA, 2012). SEA is a combination of approaches that uses a variety of tools, rather than a single, fixed, prescriptive approach. The SEA process extends the aims and principles of Environmental Impact Assessment (EIA) upstream in the decision-making process, beyond the project level, when major alternatives are still possible. SEA is a proactive approach to integrate environmental considerations into the higher levels of decision-making. During a SEA process, the likely significant effects of a Policy, Plan, or Program (PPP) on the environment are identified, described, evaluated, and reported.

1.3 Basic Principles for SEA

The Environmental (Impact Assessment and Audit) Regulations of 2003 provide for SEA in compliance to the following principles:

- The sustainable use of natural resources;
- The enhanced protection and conservation of biodiversity;
- Interlinkages between human settlements and cultural issues;
- Integration of socio-economic and environmental factors;
- The protection and conservation of natural physical surroundings of scenic beauty and the protection and conservation of built environment of historic or cultural significance;
- Public and stakeholder engagement.

1.4 Objectives of the SEA

SEA aims to systematically integrate environmental considerations into planning and decision-making processes in an effort to:

- i. Ensure that a proposed PPP is compatible with sustainable environmental planning and management;
- ii. Ensure the consideration of alternative policy options, including the do-nothing option, at an early stage when an agency has greater flexibility;
- iii. Enhance the consistency of a PPP across different policy sectors, and when relevant, make explicit the trade-offs to be made between different sectoral policy objectives;
- iv. Evaluate the regional environmental impacts of multi-sectoral developments over a specified time;
- v. Support decision-making and incorporate emerging environmental issues into sustainable development;
- vi. Guide investment programs that involve multiple sectoral policies or sub-projects;
- vii. Assess the environmental impacts of policies that do not have an explicit environmental dimension;
- viii. Identify environmental impacts and integrate mitigation measures during program formulation, and in the process, enhance Environmental Management Plans;
- ix. Ensure the consideration of cumulative, indirect, or secondary impacts and other unintended consequences when planning multiple, diverse activities;
- x. Support time-efficient and cost-effective development planning by avoiding the need to reassess some issues and impacts at project level (e.g. when an issue or impact was effectively dealt with at a strategic level);

- xi. Inform decision makers by evaluating alternative options that meet the PPP objective(s), while also being the best-practicable-environmental-option(s);
- xii. Integrate environmental principles into the development, appraisal, and selection of policy options;
- xiii. Give adequate attention to environmental considerations in decision making, at par with economic and social concerns, and with a view that trade-offs may be necessary in some situations;
- xiv. Provide an early opportunity to check whether a proposal complies with national and international environmental policy and consequent legislative obligations;
- xv. Establish a context that is more appropriate for subsequent development proposals;
- xvi. Provide a transparent and accountable decision-making framework;

1.5 Purpose / Rationale of Tatu Phase II (Mchana Estate) SEA report

The general objective of this SEA report is to present strategic recommendations that will guide environmental and socio-economic planning during implementation of the Tatu Phase II (Mchana) Masterplan.

1.6 Specific Objectives of Tatu Phase II (Mchana Estate) SEA

The specific objectives of the SEA are outlined below.

- I. To enhance proper forward-thinking in planning and zonation of various land uses in order to avert the risks and consequences of a poorly planned city.
- II. To Identify environmental and poverty-combating priorities and how these may be influenced by the proposed Masterplan.
- III. To ensure that conservation of biodiversity is at the core of the Masterplan formulation and implementation.
- IV. To ensure that the proposed Masterplan is compatible with sustainable environmental planning and management.
- V. To ensure the consideration of alternative Masterplan options, including the do-nothing option, at an early stage when an agency has greater flexibility.
- VI. To enhance the consistency of the Masterplan across different sectors including the Big Four Agenda (Enhancing Manufacturing, Food Security and Nutrition, Universal Health Coverage, Affordable Housing)
- VII. To support decision-making and incorporate emerging environmental issues into sustainable development of the proposed city.
- VIII. To identify environmental impacts and integrate mitigation measures during Masterplan formulation, and in the process, enhance Environmental Management
- IX. To ensure the consideration of cumulative, indirect, or secondary impacts and other unintended consequences when planning multiple, diverse activities of the Masterplan.
- X. To support time-efficient and cost-effective development planning by avoiding the need to reassess some issues and impacts at project level.
- XI. To inform decision makers by evaluating alternative options that meet the Masterplan's objective(s), while also being the best-practicable-environmental-option(s);
- XII. To integrate environmental principles into the development, appraisal, and selection of Masterplan's options e.g. selection of green technologies for the city.
- XIII. To provide an early opportunity to check whether the Masterplan complies with County, national and international environmental policy and consequent legislative obligations.

1.7 Tatu City Extension (Mchana Estate) Master Plan Specifications/ Elements

The proposed Tatu City Extension (Mchana Estate) will comprise of several spatial land use development activities patterns (Tatu City, 2019) which will include the following elements:

- Controlled and integrated city development that is governed by a development control code and rules;

- Security that integrates both physical and technological aspects to provide advanced security surveillance systems that include non-controlled ingress and egress into the city and individual buildings;
- Reliable water distribution networks and sewerage facilities in the city, including storm water drainage network ;
- Sustainable and sanitary system of solid waste management;
- Provision of reliable power distribution with minimal break outs, back-up generators and provide up to 30% of the city power demand from renewable energy sources;
- Provision of 24 hours medical and emergency facilities to be incorporated in the Master Plan; this includes ambulance and fire brigades;
- Provision of a zone for the development of health care city and research centre within the development;
- Allocation of a zone for the development of universities, primary and tertiary education facilities;
- An adequate traffic design that ensures a walkable environment that is not hampered by vehicular traffic.

1.8 Definition of the Master Plan Boundaries / Scope

Tatu City Limited proposes to expand Tatu City development by 885.22 Hectares of land under Phase 2 - Tatu City Extension (Mchana Estate) Master Plan, adjacent to Tatu City Phase 1. The Master Plan proposes a comprehensive mix of land uses including low, medium and high residential developments, industrial, commercial, educational and recreational developments, tourism and social facilities, infrastructure and transport networks, public utilities and open spaces with natural green zones and water bodies. The proposed Tatu City Extension (Mchana Estate) Master Plan lies to the North of Tatu City Phase 1 as shown in figure 1:1.

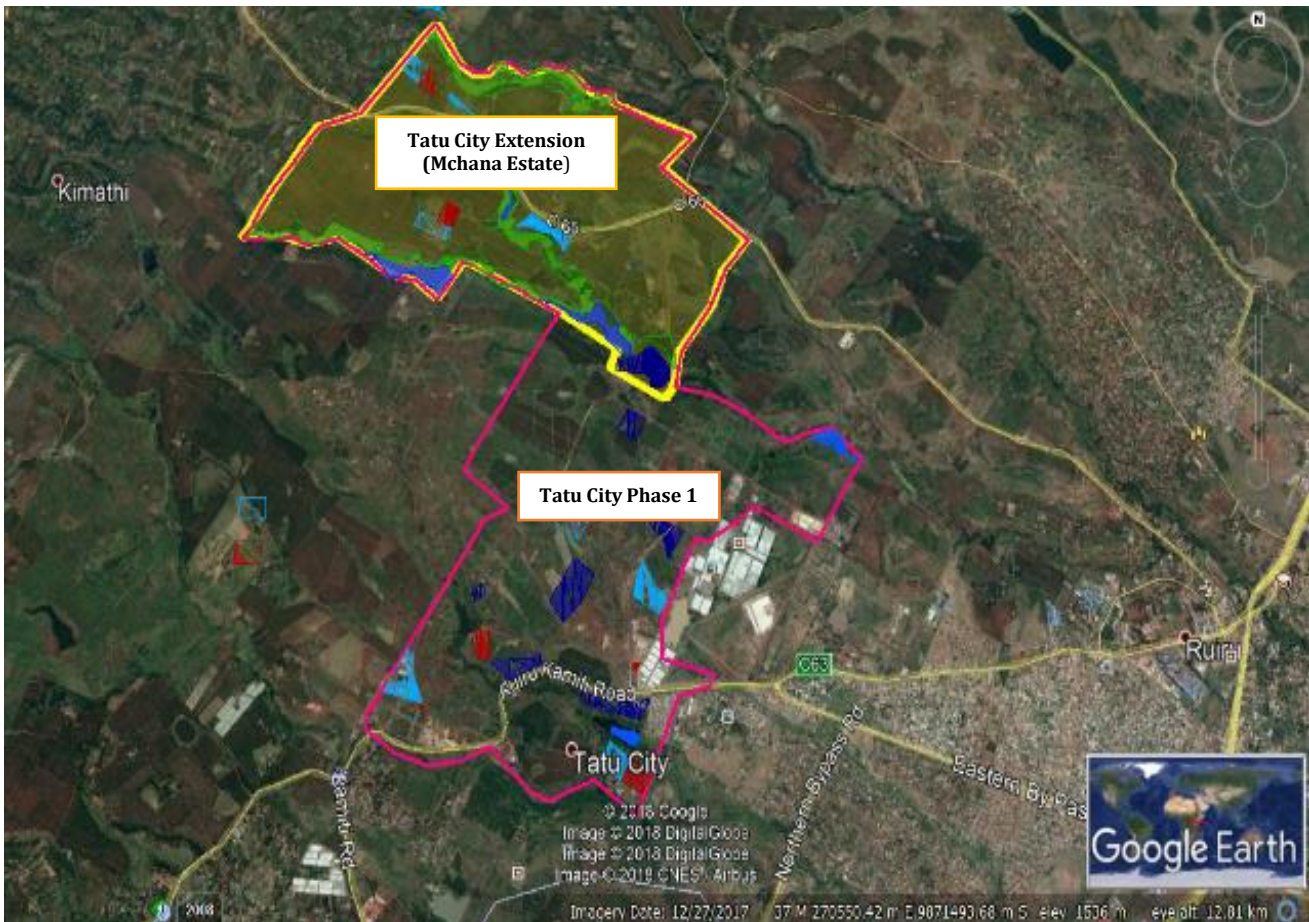


Figure 1.1 Proposed Tatu City (Mchana Estate) Master Plan boundary Vis-à-vis Tatu City Phase 1

Tatu City mixed use development is situated North of Nairobi City County, in Gitothua ward, Ruiru Sub County, Kiambu County (which forms part of the Nairobi Metropolitan Region). Tatu City is located thirty five (35) kilometers from Jomo Kenyatta International Airport (JKIA), 24 kilometers from Nairobi's Central Business District (CBD), five (5) kilometers from exit 11 on Thika Superhighway and two (2) kilometers from both the Northern and Eastern Bypasses, along the Ruiru - Kamiti Road.

Developments surrounding Tatu City include:

- Kenya Prisons Staff Training College - Ruiru - to the East and South of the phase 1 and phase 2 - Tatu City Extension (Mchana Estate) respectively;
- Sasini Estate (proposed mixed use development) to the East of phase 2;
- An informal settlement directly South-East corner of the phase 1;
- A formal residential settlement to the south-west corner of the phase 1; and
- Farmland and Jacaranda Coffee Research Institute to the west and north of the phase 1 and phase 2 respectively.

The proposed Tatu City Extension (Mchana Estate) neighbours Kenyatta University to the South East (approximately 3 kilometers) and to the East is Ruiru Town. It is dissected by Ruiru - Kamiti Road in the far South and Ngendo - Githunguri Upland road to the center. To the West of the proposed development is Kwa Maiko/Ngewa and Kimathi area is to the South West. Wamuguthuko to the North East, Ruiru Town to the East and Kahawa West to the South. Tatu City Extension (Mchana Estate) borders Jacaranda Coffee Research Estate, Sasini farm, Doondu farm and Manira farm

The key road linking Tatu city Phase 1 and Phase 2- Tatu City (Mchana Estate) is Ngenda Road (D399). Other major road linkages between the proposed development and Nairobi are:

- The A 2 (Thika Road) it can be reached via the Ruiru Kiambu Road (C63).
- The C 65 Road which traverses through Mchana.
- The Eastern and Northern Bypasses.

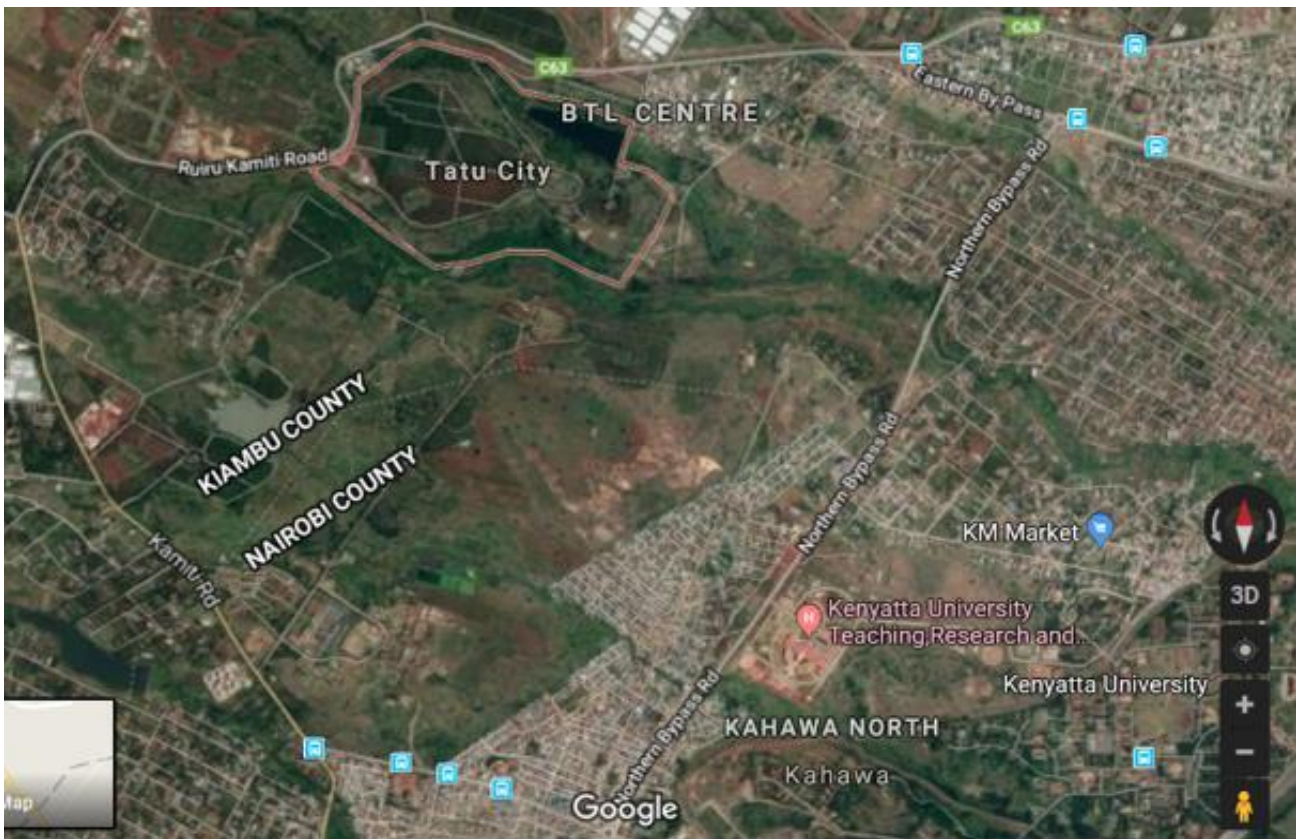


Figure 1.2 Existing major roads connecting to Tatu City

1.9 Methodology and Criteria for undertaking the SEA

The SEA was carried out in line with the provisions of the Environmental Management and Coordination Act, (EMCA, Cap 387), the Environmental (Impact Assessment and Audit) Regulations 2003, Draft Environmental Management and Coordination (Strategic Assessment, Integrated Impact Assessment and Audit) Regulations 2018, the 2012 National Guidelines for Strategic Environmental Assessment in Kenya, as well as international guidelines on SEA.

Generally, the SEA process was phased into two: Phase 1 – Screening and Scoping, and Phase 2 (Tatu City Extension Mchana Estate– the SEA Study. The Screening and Scoping Phase was aimed at establishing the spatial and technical focus and content of the SEA and the relevant criteria for assessment. The proposed Tatu City Extension (Mchana Estate) Master Plan underwent a SEA study. The purpose of the SEA is to identify, describe and assess at a strategic level the environmental and socio-economic opportunities and constraints of implementing the proposed Master Plan. Further the process developed practical mitigation measures for addressing the identified limitations as well as the enhancement of opportunities. The SEA is intended to ensure that environmental and social considerations are included in the planning, implementation and operation phases of the proposed Master Plan. The main activities in this SEA study include:

- i. Description of the proposed Master Plan including the objective, purpose, and rationale;
- ii. Identification of alternative options and strategies, implementation plan and time scale;
- iii. Areas and sectors affected by the proposed Plan;
- iv. Field missions for baseline environmental analysis;
- v. Collection of baseline data including data on ecological processes and services, resilience and vulnerability of these processes and their significance to human well-being;
- vi. Review and analysis of existing policy and legislative frameworks for environmental protection and existing environmental protection programs and their objectives;
- vii. Review of all relevant development plans for the area within the study boundaries;
- viii. Identification of alternatives options and justification of preferred alternatives and linkages between ongoing projects and proposed plan;
- ix. Integration of climate change vulnerability assessment, adaptation and mitigation actions;
- x. Prediction and evaluation of impacts, including cumulative effects;
- xi. Preparation of Environmental and Social Management and Monitoring Plans (ESMMPs);
- xii. Institutional Strengthening/ Capacity Building;
- xiii. Identification of gaps and alternatives actions;
- xiv. Stakeholder consultations and public participation;
- xv. Presentation of findings and stakeholder dialogue;
- xvi. Compilation, validation and submission of final SEA report;

1.9.1 Key Stages in the SEA preparation

The following table summarizes the key stages in the SEA preparation;

Table 1-1 SEA Actions and Decisions

<p>STAGE 1: ESTABLISHING THE CONTEXT</p> <p>Screening:</p> <ul style="list-style-type: none"> • A brief of the Master Plan is submitted to NEMA by the client’s approved SEA Expert, • NEMA screens the Master Plan to determine whether a SEA is required; the screening results are communicated to the Master Plan owner (Client) within 7 working days. <p>Establishing the context to conduct the SEA and other preparatory tasks:</p> <ul style="list-style-type: none"> • Understanding the Master Plan; • Other preparatory tasks - constituting the SEA team.

STAGE 2: IMPLEMENTING THE SEA

Scoping:

- NEMA advises the Master Plan owner (Client) to select licensed SEA experts.
- The licensed SEA experts prepare the scoping report.
- The Master Plan owner submits three (3) copies of the scoping report to NEMA.
- NEMA reviews the adequacy of the scoping report.
- NEMA communicates the decision to approve the scoping report or to request more information to the Master Plan owner within 21 days.

Detailed SEA Study and Draft SEA Report:

- Once the scoping report is approved, the SEA experts conduct the SEA process and prepare the draft SEA report. The Master Plan owner or SEA team leader should subject the Draft SEA to a quality-assurance procedure before it is submitted to NEMA.
- Along with the prescribed fees, the Master Plan owner submits to NEMA at least ten (10) hard copies and one (1) electronic copy of the Draft SEA Report (which includes a non-technical summary and a Submission Form)

STAGE 3: INFORMING AND INFLUENCING DECISION-MAKING

Review:

Administrative Review:

- NEMA shall within 14 days of the receipt of the report conduct an Administrative Review of the Draft Report to ensure that the Draft SEA is adequate to enter the stakeholder-review process.
- Once the draft report passes the Administrative Review, NEMA distributes the Draft SEA Report to stakeholders for comments.

Stakeholder Reviews:

- NEMA sends the draft SEA report to relevant stakeholders. Stakeholders generally have 30 working days (from the date of dispatch) to submit comments on a Plan or Program-level SEA, and 45 working days to comment on a Policy-level SEA. NEMA may extend this review period in some instances.

Public Review:

- A *notice* regarding the draft SEA is published for 2 successive weeks in both the Kenya Gazette and a newspaper with a nationwide circulation. The public generally has working 30 days (from the date of the first advertisement) to submit comments on a Plan or Program, and 45 working days to comment on a Policy-level SEA.

Committee Review(s):

- NEMA *may* constitute a Technical Advisory Committee (TAC) to review and provide independent technical comments on a Plan or Program-level SEA. The Standards and Enforcement Review Committee (SERC) *may* be asked to review Policy-level SEAs. Committee reviews will be done within a period of 60 days. An Independent Expert Commission *will be setup* to review SEAs having trans-boundary impacts.

Validation, Preparation and Submission of Final SEA Report:

- The SEA experts incorporate stakeholder comments into the Draft SEA Report;
- To maintain validity of the SEA, the SEA team should bring the corrected version of the SEA within sixty (60) days.
- In coordination with NEMA, the Master Plan owner will hold a validation workshop to engage the public/ stakeholders in reviewing and validating the *corrected* SEA report.
- NEMA will coordinate the additional corrections arising from the validation workshop to finalize the SEA report.
- The Master Plan owner submits five (5) hard copies and one (1) electronic copy of the Final SEA Report to NEMA.

Decision Making for Plan or Program-level SEA

- NEMA will make the final decision for Plan and Program-level SEAs through issuing an approval with conditions. The decision will be communicated within 60 days.

- The Master Plan owner needs to consent in writing to the approval conditions before implementing the plan or program

STAGE 4: MONITORING AND EVALUATION

- The Master Plan owner is responsible for monitoring and evaluation of the Master Plan.
- NEMA shall oversee the M&E process by the Master Plan owner.
- SERC shall follow-up with NEMA on the M&E of the Policy.

1.9.2 Summary of the SEA process

The flow chart below summarises the processes undertaken during the Strategic Environmental Assessment (SEA) process.

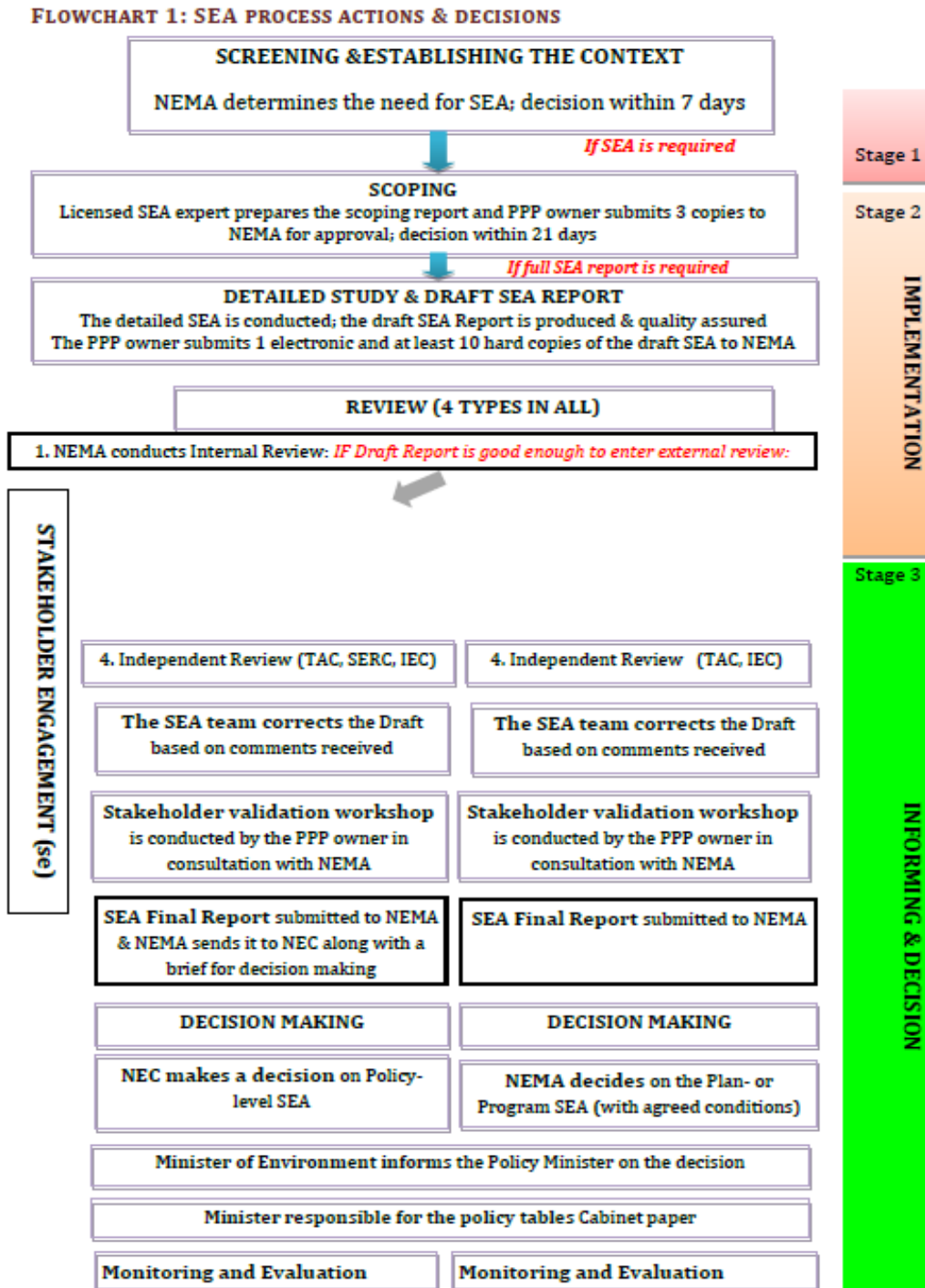


Figure 1.3 SEA Process

1.10 Work Plan and Deliverables for executing the SEA

1.10.1 SEA Time Schedule

The entire Strategic Environmental Assessment, starting from data collection to submission of the Final SEA Report to NEMA and approval, was undertaken as per EMCA Cap 387 and SEA Guidelines of 2012. Table 1:2 below presents a summary of the key activities that were followed. Table 1:3 summarizes the milestones and the key deliverables.

Table 1-2 SEA Time Schedule

Report Due/Activities	weeks				
	1-4	5-8	9-12	13-20	
Task 1: Mobilization period / SEA Screening and Scoping/ Development of data collection tools/TORs-Drafting of MasterPlan Brief for NEMA Approval					
Task 2: Detailed Description of the Proposed Master Plan					
Task3: Detailed Description of the Environment/ Baseline Surveys					
Task 4: Analysis of the Legislative and regulatory Considerations					
Task 5: Determination of the Potential Impacts of the Proposed Master Plan					
Task 6: Analysis of the Alternatives to the Proposed Master Plan					
Task7: Development of Environmental Management Plan to Mitigate Negative Impacts/Concerns					
Task 8: Development of Environmental Monitoring Plan					
Task9: Identification of Institutional Needs to Implement SEA Recommendations					
Task 10: Public Consultations and Public Participation					
Task 11: Final SEA Report Compilation, Review and Final Submission to Proponent/ Developer and NEMA					
Task 12: Processing and Approval of Final SEA Report					
Approvals = Within 20 weeks from the date of commencement					

1.10.2 Key deliverables for the SEA

Table 1-3 Key deliverables for the SEA

SN	Milestones/ deliverables	Proposed Tentative Dates
1.	Master Plan Brief, Submission and Approval by NEMA	04/07/2018
2.	Data Collection and Submission of SEA Scoping Report to NEMA	17/07/2018
3.	Stakeholders meeting	05/07/2019
4.	Submission of SEA Draft Report	16/09/2019
5.	SEA Validation Workshop	30/01/2020
6.	Drafting and submission of SEA Final Report	12/02/2020
7.	NEMA Approval Period	29/02/2020

1.10.3 Budget to implement the SEA

The proponent (Tatu City) committed to facilitate financial, administrative and technical resources to see the SEA process from scoping into implementation stage. The proponent also provided access to Master Plan details, various project information and obliged to facilitate consultative meetings among key SEA consultants, technical teams and stakeholders.

2 DESCRIPTION OF THE PROPOSED MASTER PLAN

2.1 Introduction

This chapter highlights the purpose, rationale and objectives, of Tatu City Extension (Mchana Estate) Master Plan. It gives a detailed analysis of alternative policy, options, and strategies identified. Areas and sectors affected by the Master Plan are also highlighted in the succeeding sections.

2.2 Purpose / Rationale of the Master plan

The main importance of Tatu City Extension (Mchana Estate) Master Plan is to develop a sustainable development that incorporates socio-economic and environment-friendly concepts/principles by hosting a community of integrated mixed-use development. The Master Plan proposes a comprehensive mix of land uses including; low, medium and high residential developments, light and heavy industrial components, commercial, educational and recreational developments, tourism and social facilities, infrastructure and transport networks, public utilities and high quality public open spaces with natural green zones and water bodies. The Master Plan is seeking to pursue a balance among economic, social, and environmental performance during plan implementation.

2.3 Objectives of the Master plan

The proposed Tatu City Extension (Mchana Estate) Master Plan aims to safeguard integration of all the facets of a sustainably developed entity by ensuring that the economic, social and environmental factors are its guiding principles in the design, construction and management. The specific objectives of the plan are to provide the much-needed facilities and services as highlighted below;

- i. To develop a housing development with low, medium and high-density units targeting both middle and high-income earners.
- ii. To establish industrial development that includes light and heavy industries.
- iii. To develop educational institutions including pre-primary, primary and secondary schools, middle level college, research Centre and university.
- iv. To provide a commercial centre and services with various and mixed-use developments.
- v. To provide various recreational and sports facilities and services.
- vi. To design infrastructure utilities and services with reliable power supply network that includes renewable sources.
- vii. To establish a transportation system with a comprehensive road network system that includes transit and local roads with cycle tracks and walkways
- viii. To designate natural green open spaces, wetlands & water bodies with public purpose utilities.

2.4 Areas and sectors affected by the Master plan

The proposed Tatu City Extension Master Plan is anticipated to interlink with other regional and local policies, plans and programmes. Some of the key interlinking regional plans, briefly discussed below include; Nairobi Integrated Urban Development Master Plan (2014-2030)-NIUPLAN, Kiambu County Integrated Development Plan 2010-2022, Tatu City Phase 1, Kenyatta University Master Plan, The Two Rivers Development and The Northlands Master Plan. In addition, the Master Plan will cover other sectors of the economy such as housing, education, hospitality, and natural resource conservation.

The proposed Tatu City Extension (Mchana Estate) is also located closer to the other planned cities in Kiambu County and the periphery of Nairobi City County as illustrated in figure 2.1, and table 2.1 below.

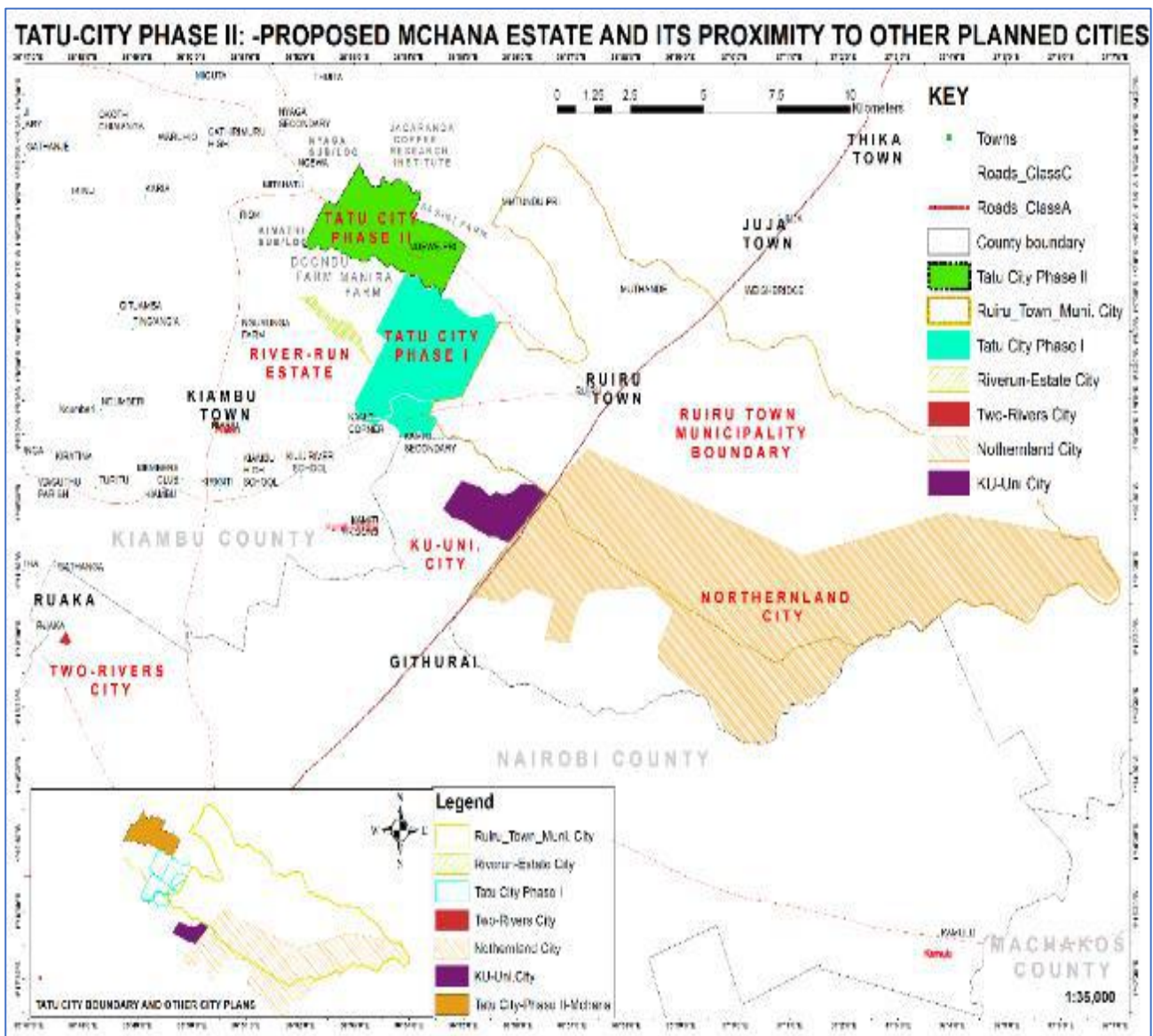


Figure 2.1 Illustration of the Master Plan boundary and proximity to other planned cities

Table 2-1 Aerial distances to proposed Tatu City Extension (Mchana Estate)

City / Town Name	Aerial Distance to Proposed Tatu City Extension (Mchana Estate)
Tatu City Phase 1	4 km
Riverun-Estate	3.5 km
Ruiru Town	7.4 km but Municipality boundary touches Tatu City Phase 1
KU-Unicity	8.5 km
Northern Land City	10.5 km
Kiambu Town	10.5 km
Juja Town	12.5 km
Two Rivers City	16 km
Thika Town	21.5 km
Nairobi Town	21.5 km

2.4.1 The Nairobi Integrated Urban Development Master Plan (2014 - 2030)-NIUPLAN

The Nairobi Master plan provides for a 16-year plan (2014 - 2030) with the objective of developing concepts for implementation of urban development projects for sustainable urban development and improvement of living conditions based on integrated urban development plan for Nairobi City. This is by

integrating all existing sectoral plans in the city and aligning them to Vision 2030. The plan provides a system of addressing urban challenges related to land use, urban economy, population, settlements, urban infrastructure, and environmental disasters etc. The project area covered by the NIUPLAN is approximately 700 km² (Covers the entire Nairobi City County). The projected population in the NIUPLAN is expected to rise from 3,138,372 according to the 2009 Population Census to 3,601,351 in 2013, 4,174,952 in 2018, 4,677,677 in 2023 and 5,212,500 in 2030. The Master Plan acknowledges the fact that due to rapid urbanization, Nairobi City County is expanding across its borders set to about 20km forming the greater Nairobi Region/Nairobi Metropolitan.

Below, succeeding sub-sections give a highlight of key infrastructural facilities/services under NIUPLAN which are envisioned to influence and link with proposed Tatu City (Mchana Estate) development.

2.4.1.1 Water

The existing water sources for the water supply system to Nairobi City are Sasumua Dam, Thika Dam, Ruiru Dam and Mwagu intake on the Chania River, Kikuyu Springs and groundwater. There are four water supply systems to Nairobi City as per the water source, namely the Sasumua system, Ruiru system, Mwagu system and Kikuyu system. Some of the facilities of the systems, such as the raw/treated water transmission pipelines of Sasumua Water Treatment Plant and Ngethu Water Treatment Plant, exist outside of Nairobi City. The distribution network for Nairobi City receives treated water from four reservoirs, namely Kabete, Kyuna, Kiambu and Gigiri reservoirs. The distribution area is segmented into 13 zones based on the reservoir supplying the water to the zone. About the distribution network, pipes are high densely installed in the western area of Nairobi City and low densely installed in the eastern area. The water demand in year 2030 is projected to be 719,000 m³/day as shown in the table below;

Table 2-2 Projected water demand for larger Nairobi

Year	2009	2013	2018	2025	2030
Demand (m³/day)	414,000	479,000	568,000	641,000	719,000

In order to meet the water demand in Nairobi, the following (Table 2:3) are the recommended sources of water by the NIUPLAN. Completion of all the proposed water projects will raise the water capacity to 654,000 m³/day in 2030.

Table 2-3 Recommended sources of water by NIUPLAN

Phase	Component	Planned capacity (m ³ /day)	Expected Completion Year
1	Well Field in Kunyu	34,560	2014
	Well Field in Uritu	30,240	2015
2	Northern Collector Tunnel Phase 1 to Thika Dam	120,960	2016
	Ngorongo Water Treatment Plant		2016
3	S. Mathioya Transfer	132,192	2020
	Maragua Dam		
	Ndunyu Chege Water Treatment Plant		
4	Northern Collector Tunnel Phase II to Thika Dam	120,096	2026
5	Ndarugu Dam		
	Raw Water PS		
	Ndarugu Water Treatment Plant		
	Treated Water PS		

Phase	Component	Planned capacity (m ³ /day)	Expected Completion Year
	Kasarani BPS	216,000	2029

2.4.1.2 Sewerage Systems

There are 24 existing sewage treatment plants (STPs) in Nairobi City, but most of them are localized STPs with small capacity of less than 2,000 m³/day. The major STPs are the Dandora STP (capacity 120,000 m³/day) and the Kariobangi STP (32,000 m³/day). The Plan notes that these STPs are not functioning well in terms of actual sewage treatment volume and water quality of treated outflow. Majority of existing sewers are the combined sewers, collecting both storm-water and wastewater, and are developed in the CBD and other recent development areas. The total length of existing trunk sewers is about 162 km, collecting wastewaters from the sewerage service areas totaling about 208 km², which accounts for approximately 40% of the total area covered by the water supply service. The NIUPLAN estimates the sewage generation at 575,200 m³/day in year 2030 as shown in Table 2:4 below.

Table 2-4 NIUPLAN sewage generation estimate

Year	2009	2013	2018	2023	2030
Sewerage Generation (m ³ /day)	331,200	383,200	454,400	512,800	575,200

The plan gives a target of increasing the total capacity of Sewage Treatment Works (STWs) from 131,000 m³/day in 2010 to 572,000 m³/day by utilizing the extension of the Dandora Estate STW (DESTW) and rehabilitation of the Kariobangi STW. The planned development of sewage treatment capacity by 2030 is enough to meet the required sewerage treatment capacity of 431,400 m³/day estimated by NIUPLAN.

2.4.1.3 Storm Water Drainage

In Nairobi City, storm water is collected through both natural and man-made drainage systems and discharged to the Nairobi River system comprising the Gitathuru, Rui Ruaka, Nairobi, and Ngong rivers, and then discharged through the main stream of the Nairobi River. The development and maintenance of these rivers should be regarded as a primary task for the management of storm water drainage in Nairobi City. Each of these rivers should be maintained with a hydraulic capacity sufficient for discharging storm water runoff concentrated from its catchment areas. Within the catchment area of the river, the storm water drainage systems draining the individual sub-catchment areas should be designed in conformity with the hydraulic capacity of the river. In the meantime, the riparian reserves need to be delineated and secured to maintain better river environment.

2.4.1.4 Road Network

The importance of the Northern Corridor as the city's trunk road as well as an international trunk road is emphasized, and traffic flow along the Northern Corridor is given more priority than other crossing roads. Therefore, the Northern Corridor becomes a kind of barrier for the local traffic flow in the west-east direction. As the densely populated area of Nairobi City mainly stretches to the west and east, the traffic demand in the west-east direction is larger than that in the north-south. Therefore, roads in west-east direction across the Northern Corridor are always congested.

The road length density is 0.98 km/km² over all of Nairobi City, which includes some low population density areas. The Japanese standard density of a trunk road in the urban area is 4.0 km/km², and only the center of Nairobi City is in this range. The road length density by population for the entire Nairobi City is 0.22 km/1000 people. Since Kenyan people walk a lot along the arterial roads and in the urban streets, walking occupies a large proportion among the travel modes. Therefore, non-motorized transport (NMT) facilities for safe, comfortable and easy movement are necessary especially in traffic congested areas. The

Master plan provides an integrated approach to the mobility and transport system, considering a more diverse availability of transport modes, including the piloting of a Non-Motorized Transport approach. The development of the Nairobi Railway City is another key strategic project, where national, metropolitan and local interests are to be integrated, aligned and harmonized for an effective and sustainable impact. By redeveloping the current railway area, the Railway City is to offer a new city district, planned and designed to meet the requirements of sustainable urban development. A Transport Oriented Development (TOD) approach provides the core for integrating mobility and land use planning, and where the new district be a natural extension of the central parts of Nairobi.

2.4.1.5 Electricity Supply

The main source of power in Nairobi is electricity supplied by Kenya Power with the NIUPLAN approximating that there will be 3,925 MW of demand in Nairobi City by 2030. The maximum demand of Nairobi City in 2015 was 1,192MW, and projected to be 1,862 in 2020 and 2,791 in 2025. The number of power supply customers in Nairobi has increased by more than 100,000 annually from the 2009/10 financial year. The recorded number of customers in Nairobi totaled 1,062,329 in April 2013. Nairobi County has an unreliable electricity supply system with frequent cases of blackouts with Kenya Power struggling to implement underground distribution systems with frequent cases of vandalism on the overhead distribution lines and transformers. Future strategies adopted by the NIUPLAN to increase supply of electricity include adoption of nuclear technology and utilization of renewable energy sources such as wind, solar and geothermal energy sources to meet the expected rise in power demand by 2030.

2.4.1.6 ICT Network

Fiber optic trunk communication network in Nairobi city and introduction of leased network among government offices are identified as priority projects for telecommunications sector by the NIUPLAN. Upgrading the optic fiber trunk network for the metro trunk communications and local access network is essential to solve telecommunications infrastructure issues. Enhancement of communications network contributes not only to the improvement in internet user convenience but also to the introduction of Intelligent Transport Systems (ITS) which provide innovative services to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.

2.4.1.7 Security

Safety and security are identified as a priority social concern by the NIUPLAN. Poor planning, design, and management of the city are some of the numerous factors that give rise to crime and violence in the city. The existing governance, legal, and institutional frameworks have also failed in providing the much desired safe and secure city. The lack of safety and increasing insecurity in Nairobi City has contributed largely to the loss of property and even sometimes the loss of possible investment opportunities. Consequently, the County is losing in its economic development agenda both in terms of losses in human and financial resources. The NIUPLAN proposes proper urban development with a strong institution that can mitigate the safety and security issues.

2.4.1.8 Firefighting facilities

Nairobi City has only three fire stations even though the physical planning handbook provides that for every 50,000-100,000 people, a fire station should be provided. The NIUPLAN states that Nairobi City needs 32 fire stations to serve its population. It provides different suggested sites for proposed fire stations considering proximity to roads, availability of land, population of surrounding area, and land use in the surrounding area.

2.4.1.9 Solid Waste Management

The Nairobi City County (NCC) has the responsibility of Solid Waste Management (SWM) in Nairobi city. Department of Environment (DOE) in NCC collects the solid waste by themselves or contract out with

private companies. On the other hand, private companies collect the solid waste through the contract with households or public or private enterprises. The collected waste is transported into Dandora landfill site or other dumping sites. Some of the collected waste is illegally dumped. The NIUPLAN establishes the need to develop a new sanitary landfill site in Ruai (80 ha of NCC land), safe closure of the existing landfill site in Dandora and alternative establishment of the material recovery facility (MRF) near the source of waste generation as being crucial for effective solid waste management in regard to the reduction of transportation cost and the cost of segregation. It also proposes establishment of proper legal and institutional frameworks to guide waste management.

2.4.2 Kiambu County Integrated Development Plan 2010-2022

The Kiambu CIDP had the main objective of creating and transforming systems, structures and institutions within the County based on five key pillars of security, employment, education, health and urban planning that will light the way towards the birth and rise of Kiambu County. The Kiambu CIDP acknowledges the fact that the proximity of the County to the city of Nairobi has seen transformation of large pieces of land into residential houses. The presence of good all weathered roads have given an opportunity to those working in Nairobi to reside within the County. This means that establishment of residential estates such as Tatu city being one of the major housing projects currently under implementation in the County provides for this advantage.

At the County level, the proposed Tatu City Extension Master Plan links well with the Kiambu CIDP. **Section 1.14 (industry and trade) sub-section 1.14.1 (industrial parks)** of the CIDP emphasizes on the importance of the Tatu City in spurring economic growth of Kiambu County. According to the CIDP, the County has a gazetted and an established industrial park; Tatu City in Ruiru Sub-County. The park is also a special economic zone for the County. According to the proposed Tatu City Extension Master Plan, substantial land has been set aside for industrial development. **Sub-section 1.14.3 of the CIDP** focuses on major industries in Kiambu County. The Plan highlights that Thika Sub-County has over 58 industries. Inclusion of the industrial park in the proposed Tatu City extension links very well with the Kiambu County industrial development agenda.

The proposed Tatu City Extension Master Plan focuses on other sectors of the economy such as housing, education, agriculture, hospitality, natural resources conservation amongst others. The sectors are well captured in Kiambu CIDP. For instance, Tatu City Extension Plan, has set aside substantial land for conservation (natural green spaces and water bodies). Similarly, Kiambu CIDP, has over 40,032.81ha of gazetted forests. The proposed Tatu City mixed-use development activities are consistent with Kiambu County development goals and are geared towards building on the Kiambu CIDP. The plan also lists Tatu City as one of its priority programs and projects in Ruiru Constituency which will provide a city with modern office facilities, residential houses and amenities, equipped with ICT. With obvious backing from the County Government through its CIDP, the proposed Tatu City will benefit not only its residents but the entire Kiambu County through creation of employment opportunities for County residents and increased revenue to the County.

2.4.3 Tatu City Phase 1

Tatu City Phase 1 is on 965.66 Hectares (2,385 Acres) of land comprised of mixed-use developments with a planned total resident population of 150,000 residents and thousands of day visitors. The success of the Tatu City Phase 1, located to the south of Mchana Estate has contributed greatly to establishment of Phase 2 -Tatu City Extension (Mchana Estate). Phase 1 of Tatu City mainly comprises of residential homes, office developments, retail/commercial zones with various infrastructure developments which include water supply, waste water management, solid waste, road network, power and communication infrastructure. The Master Plan aims at achieving a city that represents a new way of living and thinking for all Kenyans, creating a unique live, work and play environment that is free from traffic congestion and long-distance commuting.

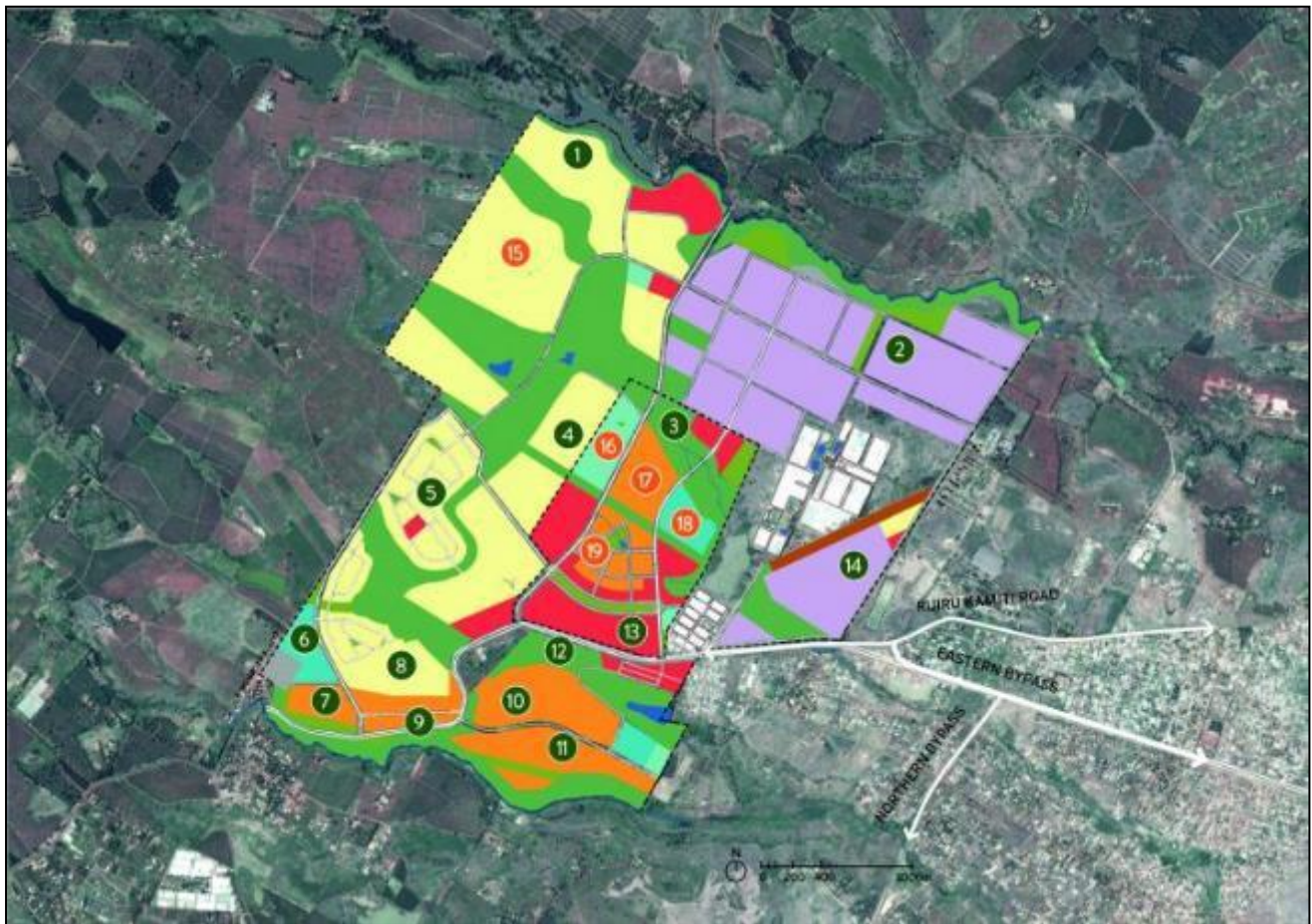


Figure 2.2 The general structural plan of the Tatu City Master Plan for Phase 1

2.4.4 Kenyatta University Master Plan

Kenyatta University is located approximately 3 km, south east of Tatu City. The University has established a comprehensive, modern campus that appeals to the increasing numbers of collegiate bound Kenyans. Tatu City extension (Mchana Estate) is expected to link with the Kenyatta University on several up-fronts including key amenities (wastewater treatment), and major roads (Northern Bypass and Thika Superhighway). The Master Plan provides the necessary framework for Kenyatta University to grow from 35,000 students to 70,000 students by 2030. The Kenyatta University Master Plan seeks to establish a comprehensive, modern campus on 350 hectares that appeals to the increasing numbers of collegiate bound Kenyans. The Master Plan reorganizes facilities in order to coordinate with the planned academic re-alignment. Key design elements include a 30,000 seat multi-purpose sports stadium which includes a comprehensive student recreation center. The design also includes over 10,000 beds of student housing. A transit loop, new Medical school, staff housing, and an incubator research park are also elements of the new plan. Other additional amenities in the plan include a new main quad, academic precincts and a green space network with shaded pedestrian connections.



Figure 2.3 An Architectural impression of the Kenyatta University Master plan

(Source: Google)

2.4.5 The Two Rivers Development Master plan

The Two Rivers development is located in Nairobi, Kenya on a site area of 100 acres. It is located in the western direction of Tatu City on the Northern Bypass. The development is situated in Nairobi's diplomatic Blue Zone at the heart of the affluent Gigiri, Muthaiga, Runda and Nyari neighborhoods and just minutes away from the United Nations complex and the American Embassy. Key links with Tatu City Extension (Mchana Estate) are envisioned on economic zones, and residential areas. The mixed-use development includes retail, residential, office, leisure and hospitality components. The total built up area is 850,000 m² with uses including Retail (62,000 m²/220 stores), Office (21,000 m²), Hotel (370 Keys), Residential (100 luxury apartments) and a parking silo (75,000m²/2,200 bays) & 3-level retail center parking (1,500 bays). In addition to the over 150 retail and food outlets, the site has over 30% of land set aside for parks and natural open spaces. A prominent feature of this development is the Two Rivers Mall that makes up 10% of the development. The retail section is made up of approximately 50% local and 50% international brands.



Figure 2.4 An Architectural impression of the Two Rivers Development Master plan

(Source; NEMA SEA Report for the Master Plan)

The ongoing 100 luxury apartments within the development will offer an impressive mix of medium and high density serviced and unfurnished apartments. They will be unique and timeless, offering a great value to investors and a high quality of life to residents comparable to global standards. The world class amenities in the apartments will include;

- Adequate basement parking for residents
- High-speed elevators/ lifts
- 24 hour security including CCTV
- Reliable, potable water supply
- Reliable power source and/or backup generators
- High-speed internet access
- Sustainable and well landscaped environment
- Washer/drier in the units
- Fully equipped kitchens with modern appliances
- Storage areas
- Domestic staff quarters

The development will create value by optimizing on the uniqueness of the site that has undulating terrain covered by a blend of indigenous trees and is cut across by two rivers. This not only provides key attraction for visitors and residents but also offers exceptional scenery for recreational space, entertainment, leisure and lifestyle facilities. The site will be developed in an environmentally sustainable manner that will seek to protect and preserve the flora and fauna and the riparian reserve. To achieve this noble objective, the Master Plan has allocated about 30% of the total area to preservation of green areas. The development will also make the most of the favorable climatic conditions resulting from the unique location of Nairobi within equatorial area to create destination that is naturally appealing in all seasons.

2.4.6 The Northlands Master Plan

Northlands Master Plan (NMP) is located less than 10 km eastwards of Tatu City set on an 11,576 acre-parcel of land located in Ruiru Sub-County, Kiambu County (Figure 2.5) comprising of various proposed land uses described below. The development is estimated to host 250,000 people,



Figure 2.5 Northlands Master Plan

- a) Residential uses (Approx. 3,570 acres) consisting:
 - Low density Residential (Northlands Meadows) : 3,134 acres
 - High density Residential (Northlands Boulevards): 306 acres
 - Medium density Residential (Northlands Heights): 130 acres
- b) Educational uses (86 acres);
- c) Commercial uses (390 acres) including:
 - Central Business District (CBD): 355 acres
 - Hotel/Mall: 33 acres
 - Club House: 2 acres
- d) Industrial uses (695 acres):
 - Logistics Park: 630 acres;
 - Brookside Dairies: 65 acres.
- e) Recreational uses (1,697 acres):
 - Recreational Parks and buffer zones: 1,431 acres;
 - Water features: 266 acres.
- f) Agricultural/wildlife conservation uses:
 - Ranching and wildlife conservation zone: 5,156 acres
- g) Other public uses

- Internal roads (Spine Roads): 232 acres
- Reserves for sewer trunks and high voltage power lines
- Space allocations for Hospitals; Petrol Station; Interchange; Substation; Police station; Fire station; Heliport.

2.4.7 Gulmarg-Sasini Master Plan

The Gulmarg-Sasini Estate is in Kiambu County. It is 20 kilometres from Nairobi Central Business District, approximately 11 kilometres from Ruiru Town and 5 kilometres from Kiambu Town. The estate sits on a 403.6 acres piece of land whose client's vision is to create an integrated mixed-use development consisting of residential housing units, retail, hotels, office developments, educational facilities and recreation areas.

When completed the development will have 1,910 residential units with a resident population of 9,550 people. In addition, the development will have a university with a student population of 5,415. The total resident and working population will be 30,000 people. The development will have 2 primary schools and 4 religious buildings. Others include office & commercial developments and a hospital facility. The vision developed has a natural green space system of parks and river fronts of 74.28 acres or 18.4% of the development site's 403.6 acres.



Figure 2.6 An Architectural impression of the Gulmarg-Sasini Master Plan

2.4.8 Other relevant Plans

Below is a highlight of other key relevant master plans with areas and sectors linking with the proposed Tatu City (Mchana Estate) Master Plan. A review and discussion of the plans is detailed in Chapter 4 of this report.

- Nairobi Metro 2030 (GoK, 2008)
- National Master Plan for the Conservation and Sustainable Management of Water Catchment Areas in Kenya, 2012 (GoK, 2012)
- National Water Master Plan 2030 (GoK, 2013)
- National Spatial plan 2017

2.5 Proposed Land Uses for Development in the Tatu City Phase II Master Plan

Below is a highlight of key relevant information on the proposed Tatu City (Mchana Estate) Master Plan.



Figure 2.7 Proposed Tatu City Extension (Mchana Estate) Master Plan identifying different land uses : Source (Tatu City, 2019)

Table 2-5 Land use budget for proposed Tatu City Extension (Mchana Estate) Master Plan

Land Use	Acreage (ha)	Percentage (%)
Residential Zone - Low / Medium	263.16	29.73
Residential Zone - High	111.67	12.61
Industrial Zone	163.97	18.52
Educational Zone	15.24	1.72
Natural Green Spaces	168.58	19.04
Public Purpose / Walking Trail	12.44	1.41
Commercial Zone	27.8	3.14
Recreational Zone	47.41	5.36
Transportation Zone	55.46	6.27
Public Utilities Zone	7.1	0.80
Water Bodies	12.39	1.40
TOTAL	885.22	100.00
Precinct	Acreage (Hectares) (Developable)	Percentage (%)
6A	70.32	12
6BA	38.91	7
6BB	65.24	11
7A	88.81	15
7BA	40.19	7
7BB	53.52	9
8	206.11	34
9	34.57	6
Total Size	597.67	100

The zones in each of the development phases include:

2.5.1 Housing Development

The housing development area will have low and medium units and high-density units targeting both middle and high-income earners. The development will offer individual $\frac{1}{2}$ acre and $\frac{1}{4}$ acre serviced plots and contemporary architectural designs with fully integrated amenities. The development will provide large living spaces, with easy reach amenities such as schools, healthcare, shops and lush green areas all within walking distance.

The high density residential will be located within a radius of 600 - 800 metres preferably within a walking distance from the public transport interchange with low density residential spreading outside. Going by this, the Northeastern part is the prime location for the high density residential while the western part of the site has been earmarked for the medium density residential. The Southwestern side of the proposed Tatu City Extension (Mchana Estate) is also primed for exclusively low-density residential development because of the attractive natural and environmental features.

The housing will be in form of single-family dwellings in individual plots. Multi dwelling units in form of duplexes, row houses, and town houses can be allowed as well. The estimated figures for the total resident population in Mchana are 66, 803 with an estimated daytime population of approximately 20,563.

2.5.2 Industrial Development

The East and Southeastern side of the site has been earmarked for light industrial development (163.97 ha) including warehouses/depots, distribution centres and logistics services. Other activities that typically will be permitted in the industrial zone include auxiliary uses such as offices and banks. The Southeastern

corner of Tatu City Extension (Mchana Estate) is the lowest point and relatively flat area of the site and will therefore be the preferred location for a sewerage/waste treatment plant, should one be required on the property. As residential development should not be allowed within proximity of sewerage treatment plants, the ideal land uses for the immediate surroundings are light industrial (non-noxious and non-polluting) and other infrastructure related facilities such as transport depots.

2.5.3 Educational Institutions

The education institutions (15.24 ha) include pre-primary, primary and secondary schools, middle level college, research centre and university. There is an existing public school (Ngewe Primary) in the proposed development area (Mchana Estate) and it will be retained in its present location during implementation of Tatu City Extension (Mchana Estate) Master Plan. Tatu City has increased the total acreage of Ngewe Primary School to approximately 8 hectares to cater for future expansion. There is a proposal for a kindergarten along the road towards Kimathi Sub-location as well as a school to be located along the main road to Githunguri from Ngewa Primary. The Kindergarten and the school will occupy 1.89ha and 4.73ha of land respectively.

2.5.4 Recreational and Sports Facilities and Services

The city will have a number of facilities providing various sports and recreational activities (47.41 ha). This includes nature trails, water sports, spa, gym, tennis, cycling zones, swimming, basketball, mini-soccer pitch, kids, play areas, and outdoor landscape events areas. In the proposed Tatu City Extension (Mchana Estate) Master Plan 2.24ha will be occupied by a social/ Community hall which be located next to the proposed school in an area between Ruiru river and road to Githunguri.

2.5.5 Natural Green Space

The design of the development plan for Tatu city development is to protect the natural environment and capitalize on the environmental assets. About 168.58 ha has been set for high quality public open spaces, for outdoor public events and beautifully landscaped gardens for leisure. The green open space includes parks, playgrounds and a network of open spaces.

The natural open space system is made up of rivers and other watercourses, wetlands and riparian zones, ecological buffers and corridors and dams. These elements are of high ecological value and must be protected from intrusive and irresponsible development.

Layout designs around the natural open space system are informed by the following four principles:

- Minimizing any impact on the natural open space system, in particular the number of times which roads have to cross the natural open space system;
- Keeping the natural open space system visible and public, i.e. not privatizing the entire perimeter of the wetlands areas;
- Bordering all sections of the natural open spaces with a street on at least one side to ensure continuous movement and surveillance along edges of the natural open space system; and
- Optimizing land values and development opportunities adjacent to the natural open space system by demarcating some exclusive pockets of land that front onto the natural open space system.

2.5.6 Wetlands & Water bodies

Natural features in Tatu City Extension (Mchana Estate) include dams, rivers, wetlands, and riverine forests which are the lifeline of the city and ecologically sensitive areas that provide immense opportunities. 12.39 ha will be maintained for riparian reserve, rivers, wetlands and dams.

2.5.7 Commercial Centre

The commercial zone (27.80 ha) will have mixed development complexes including shopping arcade, office parks, show rooms and retail malls. The commercial centre will be fitted with first-class integrated safety and high-tech security systems with state-of-the-art ICT networking with provision for ultra-fast internet service.

2.5.8 Infrastructure Utilities and Services

The city will have reliable power supply network from a dedicated substation, backup supply and alternative renewable sources. The existing power within Tatu City Extension (Mchana Estate) is what had been installed by Kenya Power to service existing structures. These power structures will be decommissioned to allow for installation of new power structures for construction and permanent works in the proposed development. Tatu City main substation, which is in Phase 1 is currently being developed and will have a capacity of 135MVA when fully developed. The substation will also serve Tatu City Extension (Mchana Estate). This will be achieved by having separate 66/11kV substation fed from phase 1 main substation. Additional three 45MVA transformers will also be installed in the proposed development. Tatu City Extension (Mchana Estate) will have adequate water supply from treatment of water from existing dams and rivers, sinking deep wells and additional boreholes and rainwater harvesting. The city will generate increased surface run-off and a comprehensive drainage system and waste water management system including recycling facilities is to be developed. Currently, Tatu City Limited is constructing all bulk infrastructure including water, power, roads, lighting, sewerage and recreational area in Tatu City Phase 1.

It is anticipated that the solid waste will be disposed at one of the landfills operated by the County Government of Kiambu, possibly, the landfill located in Thika Sub County that was constructed by the County Government in the year 2015 to curb solid waste management issue

2.5.9 Transportation System

Tatu City Extension will have a comprehensive road network system with public transport and pedestrian friendliness. The road transport system proposes a dual carriage way for the heavy transit of 4 traffic lanes, cycle track and walkways on either side and a single carriageway for light transit of 2 traffic lanes and a walkway on either side.

In Tatu City Extension (Mchana Estate) - Phase 2 the existing regional road networks have a spatial and functional structure that impacts on the organization of land use activities. The key road linking Tatu City phase 1 and 2 is Ngenda Road (D 399). The D 399 which links C63 and C65 will be utilized as a public transport corridor in Tatu City phase 1 and this will extend to phase 2 - Tatu City Extension (Mchana Estate) as well. D 399 (Ngenda Road) also provides more access opportunities to industrial use.

The C63, C65, and D399, which connects the phase 1 and phase 2 of the development, are the pivot around which the entire development concept revolves. This is based on the internationally accepted best practice of Transit Oriented Development (TODs) (also referred to as Transit Oriented Design). The concept of TODs seeks to support and enhance the use of public transport and public transport facilities and focuses on the integration of major public transport facilities with urban development.

A TOD area is characterized by the following:

- A centre with a rail or bus station linked to a public space such as a square, a market, or a boulevard;
- A mixed-use activity node around the public transport facility that includes shops, offices, schools, community services and high density residential;
- Relatively high-density residential development within a 10 min walking distance (approximately 600m) from the centre and progressively lower densities spreading outwards;
- Pedestrian movement and cycling; and
- A variety of housing types and prices in each neighborhood

Each of the public transport route within the development will be designated as the centre of a TOD, each comprising a mixed-use activity node (of varying size and influence sphere) and high-density residential development around the node.

2.5.10 Community Clusters

Community facilities make important contribution to sustainability and vitality of a neighborhood; therefore, provision has been made for several community clusters throughout Tatu City development.

They will play a critical role in the development of vibrant neighborhood by providing opportunities for the residents to interact socially thus creating a sense of place. They provide for health, cultural, social welfare, spiritual, educational, leisure, recreational, and health needs of the community. The purpose of these community clusters is to provide centrally located, accessible parcels of land that can be used for all social and community facilities such as education facilities, health services, libraries, sports centres, community centres.

The clustering of community facilities in and around points of highest accessibility is also important as it enables the sharing of facilities between various services (for example buildings and office machinery) and for convenience for residents. Those community services that are rendered primarily from buildings (such as clinics, libraries, post offices) will be located within the secondary urban nodes and integrated with other land uses such as offices, shops, banks, and restaurants.

2.6 Implementation plan and time scale for the Master Plan

Tatu City development is rolled out in phases. Mchana has 4 phases (Phase 6 - 9) as outlined in table 2:5 above. Once the developer embarks on Mchana Estate, the focus on site will be phase 6. The coffee on this phase will therefore be cleared to pave way for infrastructure development and built environment.

The proposed planning program for Tatu City Extension (Mchana Estate) Master Plan is outlined in table 2:6 below

Table 2-6 Proposed Planning Program for Tatu City Extension (Mchana Estate) Master Plan

<i>SN</i>	<i>Description</i>	<i>Target Start Date</i>	<i>Target Completion Date</i>	<i>Status</i>
STAGE 1: SURVEY/ PRELIMINARY APPROVALS				
1.1	Survey			
a)	Topographical Survey	Jan 2018	Dec 2018	Complete
b)	Land Survey & Boundary Verification	Jan 2018	Dec 2018	Complete
1.2	Masterplan Approvals			
a)	Master Plan approved by County	June, 2019	Oct, 2019	
b)	SEA /EIA Approvals	June, 2019	Nov, 2019	
STAGE 2: DESIGN & APPROVALS				
2.1	Engineering Designs			
a)	Roads and Infrastructure designs	Nov , 2019	Feb, 2020	
b)	Water and waste water design	Nov , 2019	Feb, 2020	
2.2	Precinct Layout Design			
a)	Tatu Industrial Park 2 Layout Design	Dec, 2019	Mar, 2020	
b)	High Density Residential Design	June, 2020	Dec, 2020	
c)	Medium Density Residential & Commercial Areas design	Jan, 2021	Dec, 2021	
STAGE 3: CONSTRUCTION				
3.1	Tatu Industrial Park 2 Construction	May, 2020	Dec, 2024	
a)	High Density Residential Construction	Jan, 2021	Dec, 2026	
b)	Bulk Infrastructure Construction	Jan, 2021	Dec, 2027	
c)	Medium Density Construction	Jan, 2023	Dec, 2028	
d)	Commercial Area Construction	Jan, 2024	Dec, 2030	
e)	Recreation and Other areas construction	Jan, 2025	Dec, 2030	

3 ENVIRONMENTAL ANALYSIS OF THE MASTER PLAN

3.1 Introduction

This Chapter discusses the baseline environmental assessment and detailed analysis of the areas which will be affected during execution of the proposed Tatu City Extension (Mchana Estate) Master Plan. This entails discussion on the pillars of sustainability including the physical, biological, socio-cultural and socio-economic components in the proposed Master Plan. The chapter begins by highlighting an outline of the methodology employed in the situational analysis, it gives the data sources used and methods of analysis. Physiographic conditions are described in succeeding section with detailed description of the current environmental situation followed by the biological and socio-economic issues.

3.2 Methodology for baseline analysis

The steps followed during the environmental baseline situation analysis were as follows:

- Environmental screening and scoping of the proposed Master Plan land uses
- Desktop studies
- Physical inspection of the proposed development area and surrounding Master Plan areas

The SEA screening process was conducted with an aim to narrow down to the most critical issues requiring attention during the SEA study. Environmental issues were categorized into physical, biological/ecological, socio-cultural and socio-economic components of the proposed Master Plan. It also included discussions with Tatu City Limited managers, physical planners and design engineers as well as interviews with residents and neighbours within the proposed Tatu City Extension (Mchana Estate).

3.2.1 Data sources

The key data sources for desktop study and analysis for the proposed Tatu City Extension (Mchana Estate) Master Plan on each of the pillars of sustainability are outlined in the table below:

Table 3-1 Data Sources on Pillars of Sustainability

Pillars of Sustainability	Concerns/desired aims	Data Sources
Natural Resources or Bio-physical environment	Loss of forest cover	<ul style="list-style-type: none"> ▪ Kenya Forest Service (KFS), Kiambu County ▪ Kieni Forest Station
	Loss of biodiversity (flora and fauna)	<ul style="list-style-type: none"> ▪ Kiambu County wildlife offices ▪ Lari Forest Station ▪ Kenya Forest Service (KFS), Kiambu County
	Land degradation	<ul style="list-style-type: none"> ▪ Ministry of Agriculture, Kiambu County ▪ Kiambu County Integrated Development Plan 2018-2022
	habitat loss and fragmentation	<ul style="list-style-type: none"> ▪ Department of Environment, Forestry and Natural Resources, Kiambu County ▪ Kenya Forest Service (KFS), Kiambu County
	Water Resources degradation	<ul style="list-style-type: none"> ▪ Kiambu County Water Services Providers ▪ WRA, Upper Athi Sub- Region - Kiambu Office ▪ Kiambu County Integrated Development Plan 2018-2022 ▪ Kiambu County, Department of Water
	Greenhouse gases emission / Climate Change	<ul style="list-style-type: none"> ▪ Kiambu County State of the Environment Report, 2015 ▪ National Environmental Management Authority, Kiambu County

Pillars of Sustainability	Concerns/desired aims	Data Sources
	Physical Environment (topography, landforms geology, soils climate and meteorology, air quality, hydrology, etc.)	<ul style="list-style-type: none"> ▪ GIS mapping ▪ National Survey of Kenya ▪ Kenya Meteorological Department ▪ KEBS ▪ KNBS Data - Kenya National Bureau of Statistics
Social cultural Issues	Rapid urbanization, Urban poverty, Informal settlements, Housing Scarcity, Crime, Migrations, Increased Community Health/ Disease Control, Water supply and sanitation, Solid-waste management, Traffic congestion, Cultural Change.	<ul style="list-style-type: none"> ▪ Kiambu County Integrated Development Plan (CIDP) ▪ KNBS Data - Kenya National Bureau of Statistics ▪ World Bank ▪ Existing feasibility studies ▪ Kenya ▪ Tatu City Phase 1 Master Plan and SEA Report, 2011 ▪ Reconnaissance visit findings
Economic Issues	Income disparity, Unemployment, Disruption and loss of businesses. labour market analysis, Government policy, Taxes; Agriculture, industries, manufacturing; Main economic activities and livelihood patterns	<ul style="list-style-type: none"> ▪ Kiambu County Integrated Development Plan (CIDP) ▪ World bank ▪ KEBS ▪ KNBS Data - Kenya National Bureau of Statistics ▪ National Survey of Kenya

3.2.2 Data Analysis

Data obtained was analyzed based on GIS, mapping and use of spatial based methods.

3.2.2.1 Application of GIS and Spatial analysis

Spatial techniques involving Global Information Systems (GIS) analysis in Arc Map were employed to develop map overlays useful in illustrating and analyzing the potential direct influence of the Master Plan activities against the pillars of sustainability. In order to achieve this, baseline data was collected from the National Survey of Kenya. The data was used to superimpose the different types of maps onto one another.

Given the expansive size of the Master Plan area, which is 885.22 Hectares and the complexity of Master Plan elements proposed, GIS and Remote Sensing were adopted to understand the spatial heterogeneity of both existing and proposed infrastructure, water bodies and land use zones. This was used to enhance determination of visual relations between environmental elements and also inform identification of impacts in relation to proximity distances and topographical undulations such as surface run off.

3.2.2.2 GIS data needs and related analysis

Some of the key data needs and related analysis for mapping included;

- Distances between infrastructures;
- Area coverage of various features;
- Population density-current and projected;
- Slope factor.

Table 3-2 GIS Data Requirements and Output

Data required	Output Maps Analysis
<ul style="list-style-type: none"> ▪ Agricultural space and flower farms ▪ Any data on land use, vegetation, forest, coffee farms coverage in Acres 	Land use map-Agriculture, forest, crops
<ul style="list-style-type: none"> ▪ Industrial Zones-Phase 1 and Phase 1I 	Zoning Map-Residential vs. Industrial
<ul style="list-style-type: none"> ▪ Proposed Housing-Low, Medium, High density ▪ Proposed Cultural sites, recreation and nature space ▪ Proposed Club House ▪ Workers Estate Coordinates ▪ Any data on neighbouring villages/settlement 	Settlement Map-Housing and recreation space
<ul style="list-style-type: none"> ▪ Proposed Hospital ▪ Existing Hospital 	Infrastructure map-Health
<ul style="list-style-type: none"> ▪ Existing schools, ECD, Primary, Secondary, ▪ Proposed schools - pre-primary, primary and secondary schools, middle level college, research Centre and university 	Infrastructure map-education
<ul style="list-style-type: none"> ▪ Existing roads-codes/names ▪ Proposed roads network ▪ Existing power line (2-3phase) ▪ Existing sewer line ▪ Proposed Sewer line ▪ Existing water pipeline and tanks ▪ Proposed water pipeline and tanks ▪ RUJUWASCO site and connectivity ▪ Existing dams and wetlands 	Infrastructure map-roads, water, power connection
<ul style="list-style-type: none"> ▪ Geology/Soil Characteristics ▪ Master plan and coordinates of facilities in Phase 1 	Geology/Soil Map

3.2.2.3 Mapping

The following maps have been studied into detail in the chapter;

- (i) Land use/land cover map-Agriculture (coffee plantation), forest cover and other crops;
- (ii) Geology/Soil map and suitability of proposed structures;
- (iii) Water resources;
- (iv) Key infrastructure and existing utilities -residential, industrial, water, sewer, power, roads, clubs, recreation areas;
- (v) Spatial Analysis of all facilities to determine their cumulative effects.

3.3 Physiographic features

3.3.1 Physical & Topographic Features

Kiambu County is divided into four broad topographical zones viz, Upper Highland, Lower Highland, Upper Midland and Lower Midland Zone.

- The Upper Highland Zone is found in Lari Constituency and it is an extension of the Aberdare ranges that lies at an altitude of 1,800 - 2,550 meters above sea level. It is dominated by highly dissected ranges and it is very wet, steep and important as a water catchment area.
- The lower highland zone is mostly found in Limuru and some parts of Gatundu North, Gatundu South, Githunguri and Kabete constituencies. The area is characterized by hills, plateaus, and high-elevation plains. The area lies between 1,500-1,800 meters above sea level and is generally a tea

and dairy zone though some activities like maize, horticultural crops and sheep farming are also practiced.

- The upper midland zone lies between 1,300-1,500 meters above sea level and it covers mostly parts of Juja and other constituencies except for Lari. The landscape comprises of volcanic middle level uplands.
- The lower midland zone partly covers Thika Town (Gatuanyaga), Limuru and Kikuyu constituencies. The area lies between 1,200-1,360 meters above sea level. The soils in the midland zone are dissected and are easily eroded. Other physical features include steep slopes and valleys, which are unsuitable for cultivation. Some parts are also covered by forests.

Tatu City Extension (Mchana Estate) lies between 1500 – 1700 meters above sea level with an undulating, landscape that generally slopes from North West to South East. It slopes gradually towards the rivers and valleys as shown in figure 3:1.

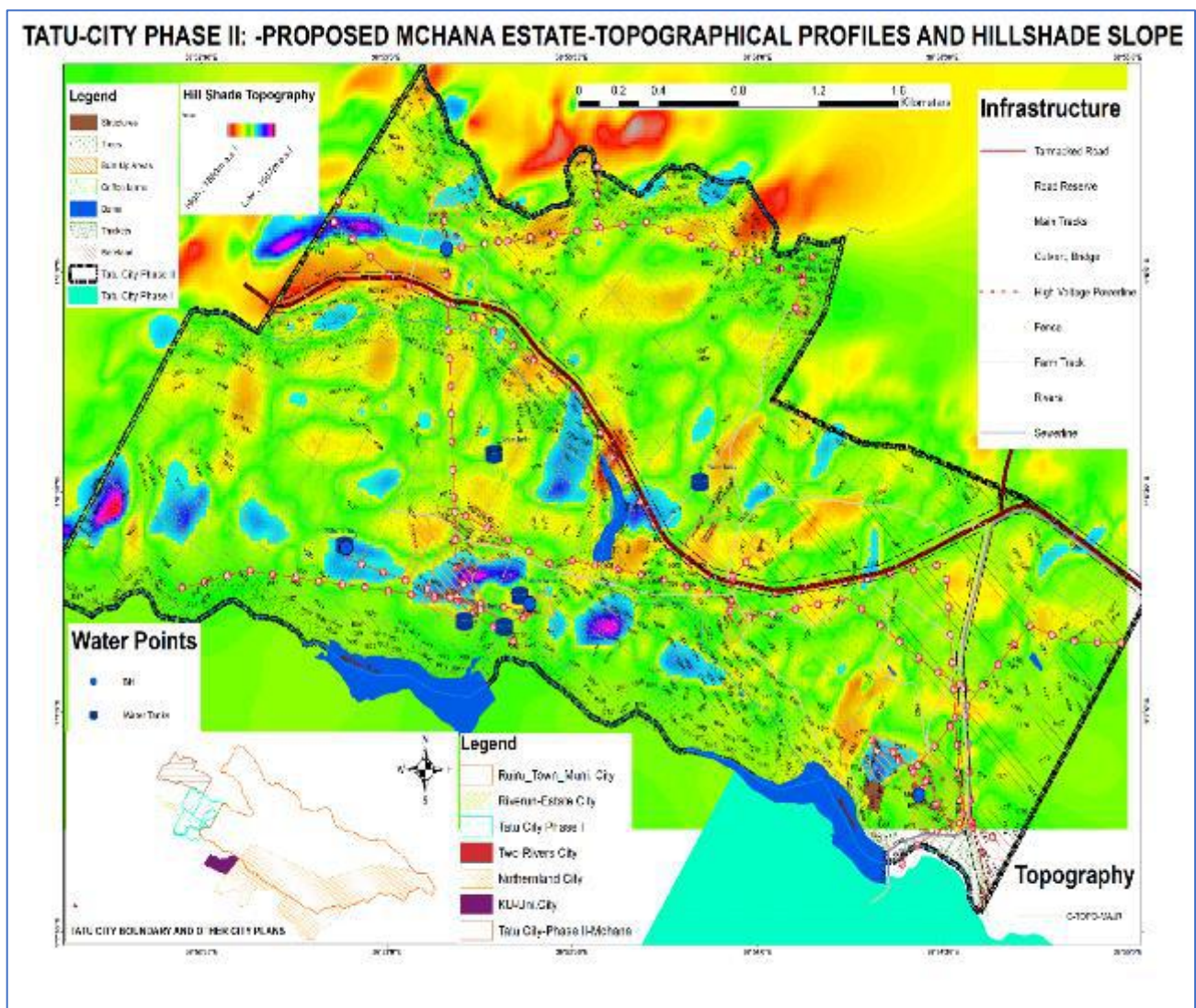


Figure 3.1 Topo-Cadastral survey for Tatu City Extension (Mchana Estate)

3.3.1.1 Geology and Soils

Kiambu County is covered by three broad categories of soils which are: high level upland soils, plateau soils and volcanic footbridges soils. These soils are of varying fertility levels with soils from high-level uplands,

which are from volcanic rocks, being very fertile. Their fertility is conducive for livestock keeping and growth of various cash crops and food crops such as tea, coffee, horticultural products, pyrethrum, vegetables, maize, beans, peas and potatoes. These soils are found in the highlands, mostly in Gatundu South, Gatundu North, Githunguri, Kiambu, Kiambaa, Lari, Kikuyu, Kabete and Limuru Constituencies.

Most parts of the County are covered by soils from volcanic footbridges. These are well drained with moderate fertility. They are red to dark brown friable clays. However, parts of Thika Town, Ruiru, Juja and Lari constituencies are covered by shallow soils, which are poorly drained, and these areas are characterized by low rainfall, which severely limits agricultural development. The proposed Master Plan area has well drained, very deep kaolinitic clayey soils, Igneous bed rock, with rolling slope relative factor 8%, CLAY: KA, dominated with ridges.

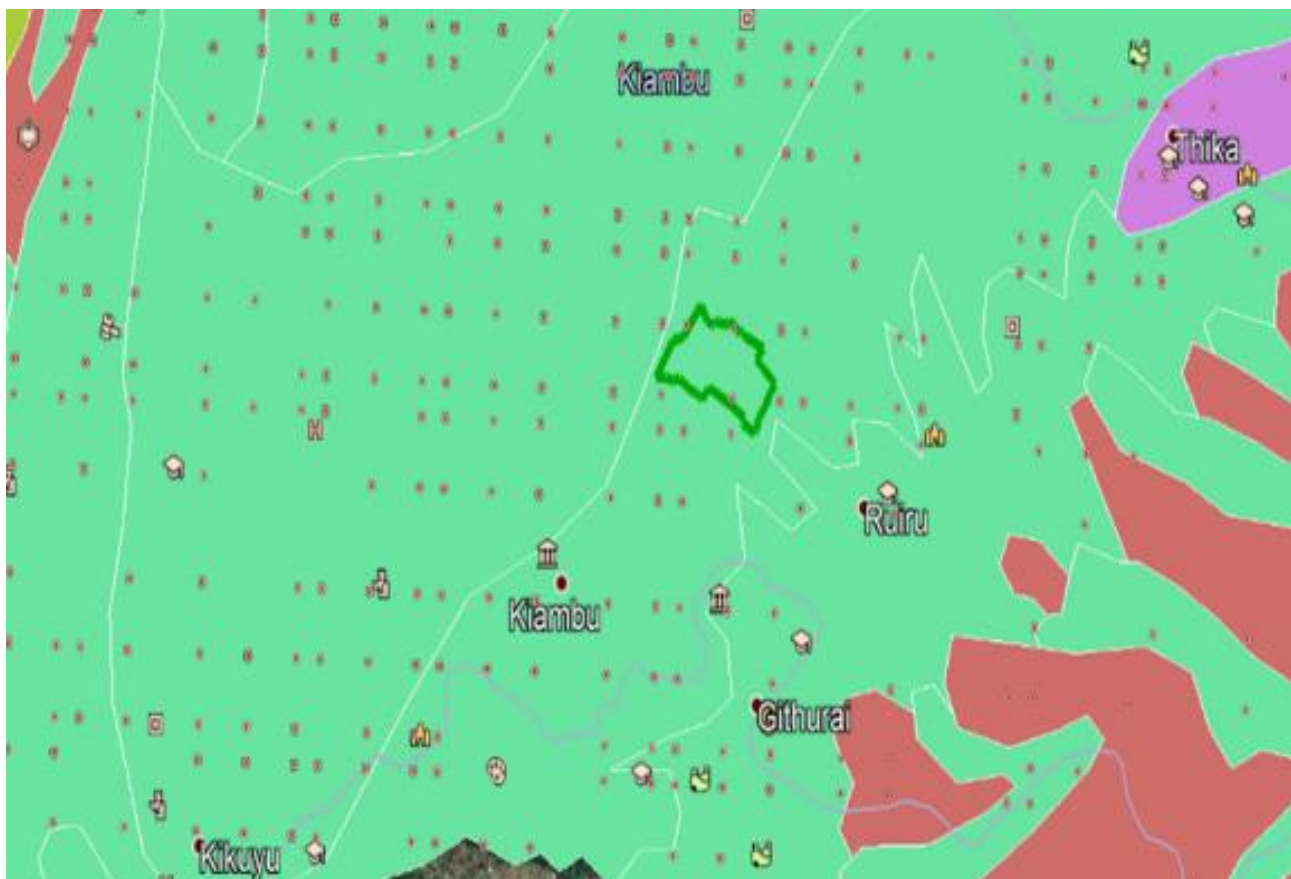


Figure 3.2 Soils in Tatu City Extension (Mchana Estate)

Soil reference No: KE122/1-30, Whose PHAQ: 5.6, PHKC: 5.1, CECS: 0.0.

There is potential flooding towards the area proposed for high-density housing. Once vegetation is cleared, it may lead to increased surface run off and therefore, a proper drainage network needs to be developed during implementation of the Master Plan, as well as use of block pavement 'çabro' on the paved ground to allow infiltrations. Around one-third of the land is set aside for natural green spaces and water bodies.

3.3.2 Ecological Conditions

Water in the County is from two principal sources: surface and sub-surface. About 90 percent of the County's water resource comprises of both surface water resources and ground water potential. The County is divided into several sub-catchments' areas. The first one is Nairobi River Sub-catchment which occupies the southern part of the County with the major rivers being Nairobi, Gitaru, Gitahuru, Karura, Ruirwaka, and Gatharaini. The second one is Kamiti and Ruiru Rivers Sub-catchment which is located to the north of the Nairobi River sub-catchment. It has eight permanent rivers which include Riara, Kiu,

Kamiti, Mukuyu, Ruiru, Bathi, Gatamaiyu and Komothai. The third one is the Aberdare plateau that contributes to the availability of two sub-catchments areas comprising of Thiririka and Ndarugu Rivers. The main streams found in the two areas include Mugutha, Theta, Thiririka, Ruabora, Ndarugu and Komu. They flow from Nairobi, Kamiti, Ruiru, Thiririka, and Ndarugu sub-catchments to form Athi River sub-catchment. The fourth is the Chania River and its tributaries comprising of Thika and Kariminu Rivers which rise from the slopes of Mt. Kinangop in the Aberdares Range. Last one is Ewaso Kedong sub-catchment which runs in the north-south direction and occupies the western part of the County. It has several streams that normally form swamps.

Following the ecological analysis, the site was divided into three sensitivity categories, namely:

- High Ecological Sensitivity – Riparian Areas and Moist Grassland
- Medium Ecological Sensitivity – Grassland
- Low Ecological Sensitivity – Transformed Areas

The high ecologically sensitive riparian areas and moist grasslands (i.e. wetlands) also require ecological buffer zones around the delineated wetland area. A wetland buffer zone is an area of vegetation which begins from the boundary of a wetland's temporary zone (wetland edge) and extends outward. Protection of vegetated buffers may reduce the severity of water fluctuations and flooding, assist in stabilizing riverbanks, absorb pollutants before they enter the watercourse, and provide ecologically important habitat. In the context of the current study area, a buffer zone of 50 meters is recommended. With regard to the medium ecologically sensitive areas (grasslands), the development should aim to remove as little as possible of these grasslands as well as the large indigenous trees that it supports, or incorporate ecological corridors to aid the persistence of biodiversity on the study site and surrounds.

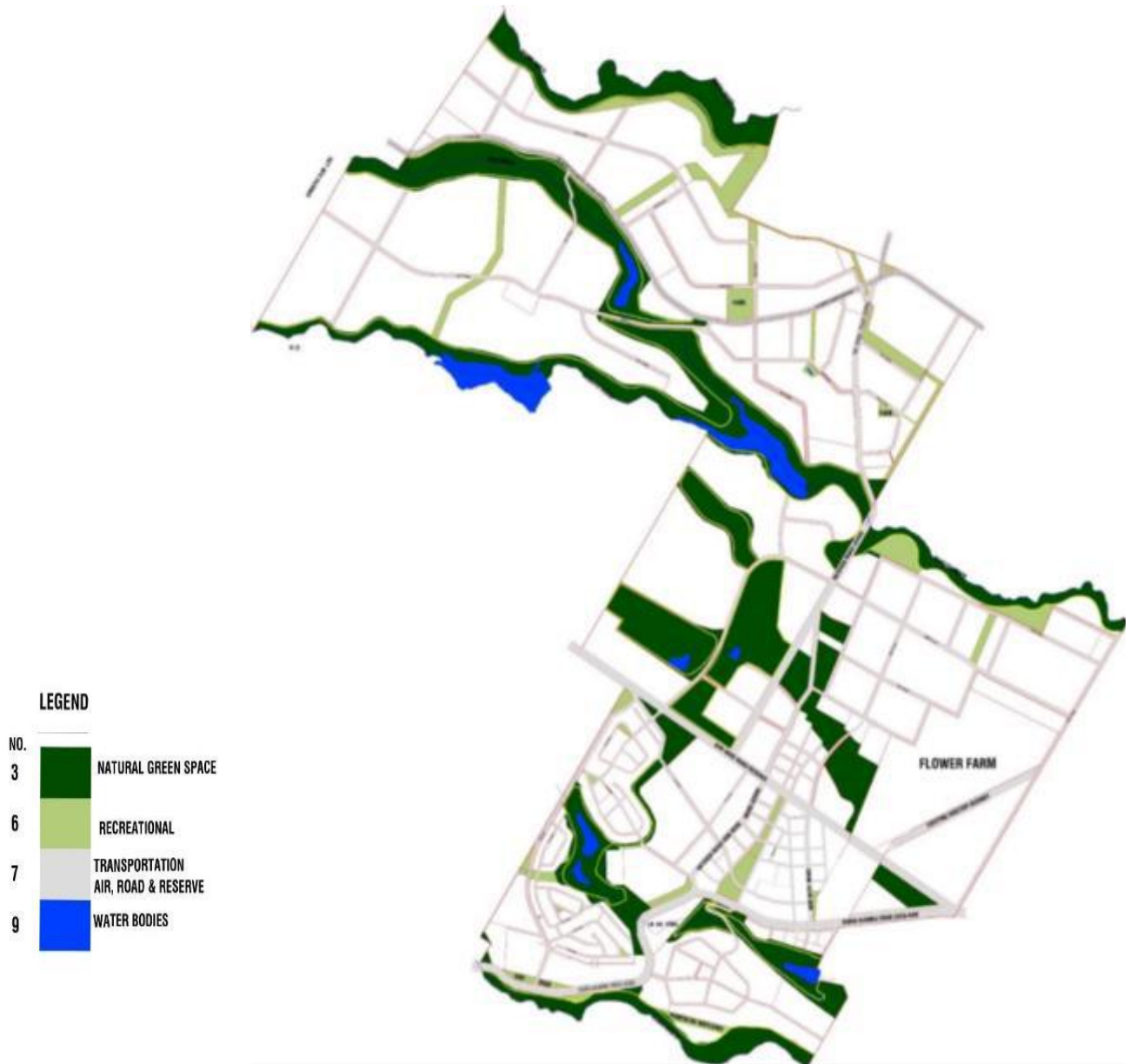


Figure 3.3 Ecological sensitive areas (Natural Green Space and Water bodies) in Tatu City

3.3.3 Climatic Conditions

The County experiences bi-modal type of rainfall. The long rains fall between mid - March to May followed by a cold season usually with drizzles and frost during June to August and the short rains between mid-October to November. The annual rainfall varies with altitude, with higher areas receiving as high as 2,000 mm and lower areas of Thika Town constituency receiving as low as 600 mm. The average rainfall received by the County is 1,200 mm.

The mean temperature in the County is 26 °C with temperatures ranging from 7 °C in the upper highlands areas of Limuru and some parts of Gatundu North, Gatundu South, Githunguri and Kabete constituencies, to 34 °C in the lower midland zone found partly in Thika Town constituency (Gatunyaga), Kikuyu, Limuru and Kabete constituencies (Ndeiya and Karai). July and August are the months during which the lowest temperatures are experienced, whereas January to March are the hottest months. The County's average relative humidity ranges from 54 percent in the dry months and 300 percent in the wet months of March up to August.

The climate in Kiambu is warm and temperate. There is a great deal of rainfall in Kiambu, even in the driest month. This climate is considered to be Cfb according to the Köppen-Geiger climate classification. The

temperature here averages 18.8 °C. In a year, the average rainfall is 962 mm. The climate is mild, and generally warm and temperate, and is classified as Cwb by the Köppen-Geiger system. Rainfall in the area averages 797 mm, and is lowest in July, with an average of 13 mm. In April, the precipitation reaches its peak, with an average of 170 mm. the difference in precipitation between the driest and wettest months is 157 mm (Figure 3:3). The temperatures here average 19.5 °C. March is the hottest month of the year at an average temperature of 21.0 °C, while July is the coldest month of the year at 17.2 °C on average. The variation in annual temperature is around 3.8 °C. (Figure 3:4).

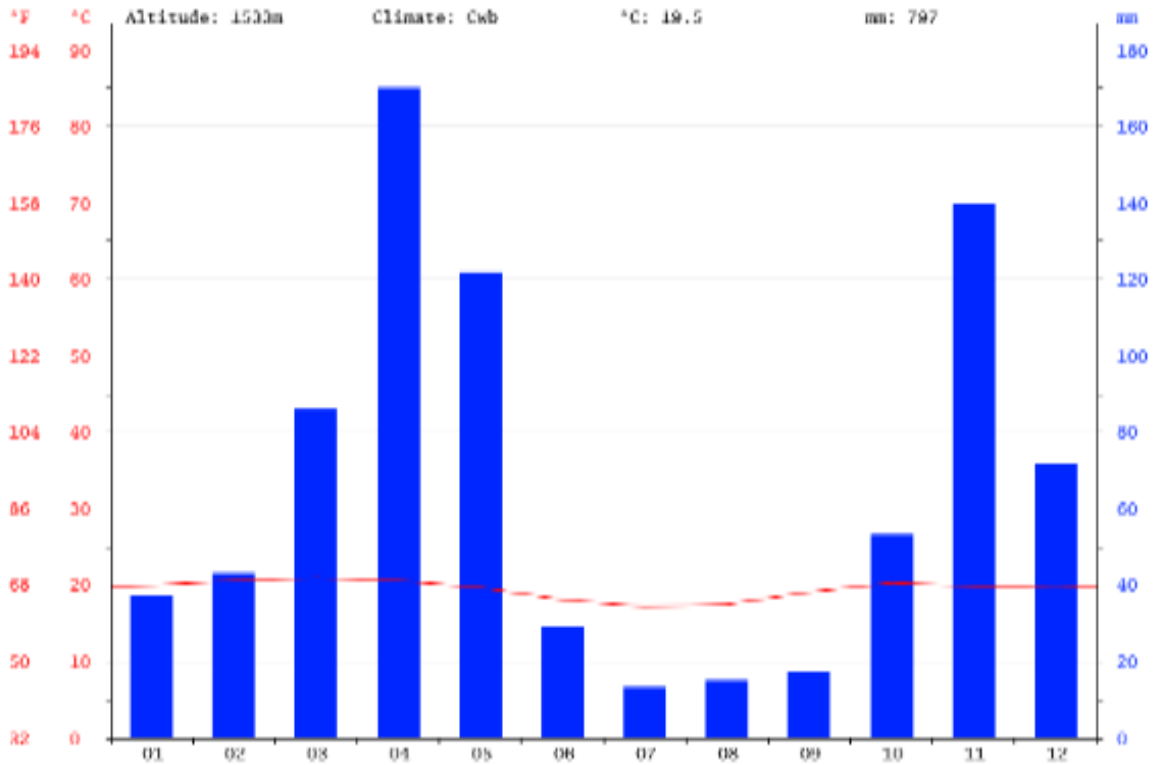


Figure 3.4 Rainfall graph for Ruiru by Month

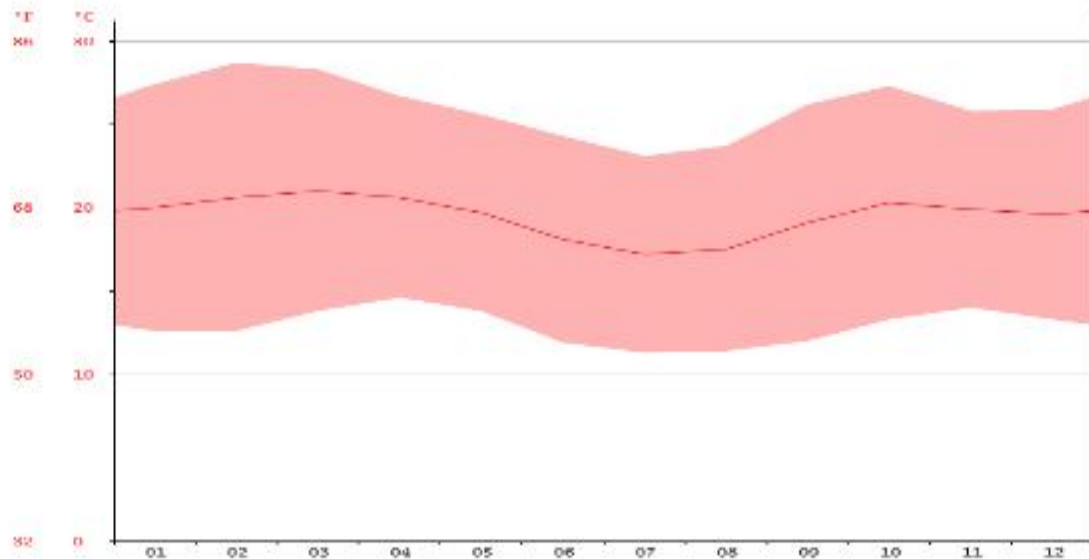


Figure 3.5 Average temperatures in Ruiru by Month

Between the driest and wettest months, the difference in precipitation is 157 mm. The variation in annual temperature is around 3.8 °C (Table 3:3)

Table 3-3 Ruiru weather by Month- Weather Conditions

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Avg. Temperature (°C)	20	20.6	21	20.6	19.7	18.1	17.2	17.5	19.1	20.3	19.9	19.6
Min. Temperature (°C)	12.6	12.6	13.8	14.6	13.8	11.9	11.3	11.4	12	13.3	14	13.3
Max. Temperature (°C)	27.4	28.7	28.3	26.7	25.6	24.3	23.1	23.7	26.2	27.3	25.8	25.9
Avg. Temperature (°F)	68.0	69.1	69.8	69.1	67.5	64.6	63.0	63.5	66.4	68.5	67.8	67.3
Min. Temperature (°F)	54.7	54.7	56.8	58.3	56.8	53.4	52.3	52.5	53.6	55.9	57.2	55.9
Max. Temperature (°F)	81.3	83.7	82.9	80.1	78.1	75.7	73.6	74.7	79.2	81.1	78.4	78.6
Precipitation / Rainfall (mm)	37	43	86	170	122	29	13	15	17	53	140	72

Source: <https://en.climate-data.org/location/717954/>

3.3.4 Water Resources

3.3.4.1 Water Sources

Kiambu County has 16 permanent rivers originating from Aberdare Ranges which is the main tower of the County. The major rivers that meet the water demand are: Ndarugu, Thiririka, Ruiru, Kamiti and Kiu, all of which eventually drain into Athi Rivers and five major wetlands namely: Kikuyu, Lari, Theta, Kiganjo and Gacii wetlands.

The eastern part of the County that includes Thika, Gatundu, Ruiru and Juja are well endowed with surface water from Chania, Thika, Karimenu, Ruabora, Ndarugu, Thiririka, Theta, Mukuyu and Ruiru rivers. The western part of the County that includes Limuru, Kimabu, Kikuyu, Karuri, Lari and Githunguri areas has limited surface sources, hence rely on underground water sources mainly boreholes. However, some areas of groundwater resources have high fluoride levels which cause negative effects to both people and residue effects in crops.

There are four perennial rivers, namely the Ruiru River, Gaia River, Mukuyu River, and Kamiti River, which run along the Northern and Southern boundaries of Tatu City, Wetlands (seasonally moist grasslands) occur in the low-lying areas between the currently cultivated parcels of land. The wetland type identified within the study area comprises mainly of valley bottom wetlands without channels. In some areas, channels were present although these were often associated with artificial drains. The wetlands are of high ecological importance and deemed as areas of high ecological sensitivity. It is worth noting that these areas have not been interfered with; they have been preserved as green spaces.

The Mukuyu and Mchana Rivers are the two key rivers existing within the proposed Tatu City Extension (Mchana Estate) Master Plan. While Mukuyu River runs along the boundaries of Tatu City and the proposed Master Plan area, Mchana River passes through the proposed Master Plan - Tatu City Extension (Mchana Estate).

The two (2) rivers (Mukuyu and Mchana Rivers) are heavily covered by indigenous vegetation making them invisible despite the high-water flows. For instance, at point (01007.668', 036054.670', 1564 m a.s.l), Mukuyu River appears as a narrow stream (Plate 3:1) due to heavy vegetation cover.



Plate 3-1 Mukuyu River covered with indigenous vegetation

Mukuyu River plays a critical role in recharging of Comte dam (Plate 3:2) located at point (01°07.481', 036°54.408', 1580 m a.s.l) while Mchana River recharges Mchana earth dam (Plate 3:3) located at point (01°06.756', 036°53.253', 1616 m a.s.l). It is projected that surface run-off from the 1,180 acres to be developed will generate water to recharge the dams in the development.



Plate 3-2 A section of the Comte earth dam at the proposed Tatu City Extension (Mchana Estate)



Plate 3-3 Mchana earth dam at the proposed Master Plan area



Plate 3-4 A Section of Galana/Ruiru River in the neighbourhood of the Master Plan area

However, it will be important to note that storm water from urban environments is usually contaminated and unless adequate precautionary measures are put in place, it may affect the quality of water in the streams and dams to the detriment of aquatic life and local livelihoods dependent on the water bodies. It will also be prudent to evaluate whether the existing earth dams will be able to withstand the huge volumes of surface run-off to be generated upon development. It is significant to note once developed, the land will form an 'island' of impervious surfaces thus increasing surface run-off drastically.

The rivers and dams in turn support local livelihood not only in the proposed land for the Master Plan but also its environs through provision of water for domestic consumption, livestock and irrigated agriculture. A diversity of wildlife depends on the water points for survival. Any activity that may degrade the water quality will have far reaching impacts on wildlife and local livelihoods in the proposed Master Plan area and its environs.

3.3.4.2 Water Supply Schemes

There are eight (8) main licensed water management institutions in Kiambu County namely: Limuru Water and Sewerage Company, Kikuyu Water Company, Kiambu Water and Sewerage Company, Karuri Water and Sanitation Company, Githunguri Water and Sanitation Company, Ruiru Juja Water and Sewerage Company Limited, Gatundu Water and Sanitation Company, and Thika Water and Sewerage Company Limited.

The proposed Tatu City Extension (Mchana Estate) will be supplied with water from the Ruiru River via the Ruiru - Juja Water and Sewerage Company (RUJUWASCO) located at Tatu City Phase 1 and borders the Master Plan area to the south east as illustrated in Plate 3:5.



Plate 3-5 RUJUWASCO Offices and plant located at Tatu City Phase 1

The city will require approximately 14,725 m³ of water per day for the daily activities and operations in the different zones within the Master Plan. Water volumes required for the low, medium and high residential developments, industrial, commercial, educational and recreational developments, tourism and social facilities are outlined in table 3:4

Table 3-4 Water demand and wastewater volumes

Category of Consumer	Water Demand (m ³ /day)	Sewage Factor	Waste Water Generation (m ³ /day)
Low Density Residential	78	75%	59
Medium Density Residential	706	80%	565
High Density Residential	10,944	85%	9,302
Industrial Area, ha	2,400	85%	2,040
Educational Facilities, No.	128	85%	108
Aviation School, ha	39	85%	34
Commercial, ha	324	85%	275
Public Purpose, ha	96	85%	82
Police Station, Fire Station	10		9
TOTAL	14,725		12,474

The distribution of water within the city will be based on the demand from different developmental zones with the high residential development having the highest water demand of 10,944 m³/day and an estimated waste water generation 9,302 m³/day. Proposed water sources for Tatu City are boreholes, Kamiti River, existing earth dams and proposed Kariminu Dam II, wells and supply from Ruiru - Juja Water and Sewerage Company (RUJUWASCO) of 7500 m³/day.

During the field visit, it was noted that a water treatment and storage plant exists in Tatu phase 1 with a storage capacity available is 5,000,000 litres as shown in Plate 3:6 It has been proposed that phase 2 development relies on the water supply form RUJUWASCO with supplementation from the boreholes as well. Given that the entire water demand will not be required at the onset, the development should depend on the water company which will achieve a supply of 47,000m /day by 2022, which is before phase 2 attains its full potential. It is expected that the borehole water will be treated by dilution with the County supply water.



Plate 3-6 Water treatment and Storage plant

3.4 Biological Analysis

3.4.1 Forests/Vegetation types

The land proposed for Tatu City Extension (Mchana Estate) Master Plan is characterized by a diversity of forests and vegetation types. Natural forests/vegetation types characterize the riparian zones of the key rivers, streams and earth dams. Forest plantations occur in isolated patches amidst the predominant coffee plantations. Classical agroforestry systems exist in the coffee plantations. Some of the land zones are characterized by bushlands heavily occupied by the invasive *Lantana camara*. Patches of small to medium wetlands/marshy lands predominantly occupied by grasses are in existence.

As shown in figure 3.5 below, land under forests and bushlands is 235 acres while that under coffee plantations is 1,089.71 acres. The proposed area to be developed is approximately 1,180 acres with approximately 144.71 acres being left under coffee/forests/bushlands.

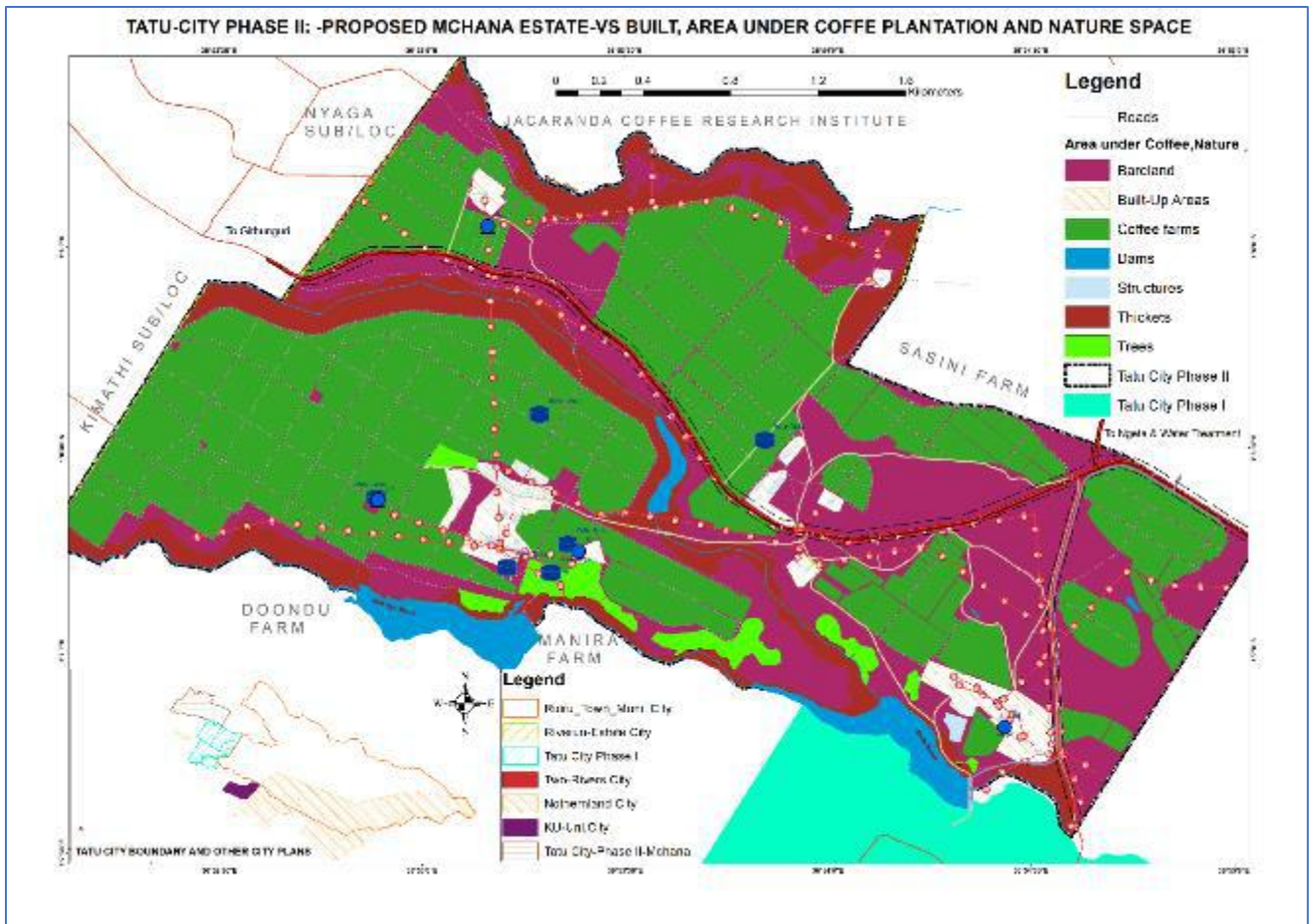


Figure 3.6 Area proposed for development compared to that under coffee, forests and bushlands

The remaining area under natural vegetation will greatly impact on the rivers in the proposed Master Plan area due to catchment disturbances. The vegetation cover along the rivers play critical environmental and ecological roles such as strengthening of stream banks, reduction of stream banks erosion, reduction of sediment removal from the stream banks, reduction of water pollution, provision of sediment traps, provision of habitat for riverine faunal biodiversity, reduction of river channel modifications such as widening/deepening, modification of riverine habitat, reduction of turbidity amongst others (Newell et al., 1999, Langer, 2003 and Roda, 2008). Below is a description of forests/vegetation types in the proposed Master Plan area.

3.4.1.1 Natural forest plantations

The main forest types in the County are natural/indigenous and plantation forests. The County has six gazetted forests with the major ones being Kieni and Kinale forests occupying an area of 426.62 km².

Natural forests/vegetation at the proposed Master Plan area is mainly restricted in riparian zones of streams, rivers and earth dams. The Mukuyu and Mchana rivers are well covered by indigenous vegetation as shown in plate 3:1. The riverine vegetation is characterized by both low and high canopy forests. For instance, along Mchana River at point (01006.864', 036053.650', 1593 m a.s.l), high canopy forest type (Plate 3:7) characterize the riparian corridor.



Plate 3-7 High canopy forest cover along Mchana River

Key indigenous and riverine species encountered in the proposed Master Plan area include: *Diospyros abyssinica*, *Polycias kikuyuensis*, *Vangueria apiculata*, *Vangueria infausta*, *Vangueria madagascariensis*, *Ficus sur*, *Ficus sycomorus*, *Lantana camara*, *Olea europaea*, *Rhus natalensis*, *Rhus tenuinervis*, *Rhus vulgaris*, *Strombosia scheffleri*, *Prunus africana*, *Dombeya kirkii*, *Dombeya rotundifolia*, *Teclea simplicifolia*, *Teclea nobilis*, *Syzygium guineense*, *Erythrina abyssinica*, *Cordia africana*, *Caesalpinia volkensii*, *Kigelia africana* amongst others. In some sections of the indigenous forests, enrichment planting has been done to increase vegetation cover. Key species used in enrichment planting include *Jacaranda mimosifolia*, *Casuarina equisetifolia*, *Olea africana*, *Dendrocalamus giganteus* (Plate 3:8) amongst others.



Plate 3-8 Giant bamboo enriching the riparian corridor of Mchana River & Comte dam

It will be very important for the proponent to exercise maximum caution during planning to avoid land use changes that might result into disturbances to the natural forest/vegetation. The forests serve as the key catchment for the rivers. Isolated forest plantations exist at the area proposed for Tatu City Extension (Mchana Estate) Master Plan. The different types of forest plantations that characterize the area are typically small and scattered amidst the predominant coffee plantations. They are described below.

a) *Eucalyptus grandis* plantations

Most of the forest plantations at the proposed Master Plan area are characterized by *Eucalyptus grandis* (Plate 3:9). The plantations are characterized by mature trees. Typically, forest plantations are mainly grown for economic gains such as provision of timber, poles, posts and fuel wood. Due to its fast growth and high calorific value, *Eucalyptus grandis* is mostly preferred for provisions of fuel wood. The high value wood from the species is mainly used in tea and coffee processing.



Plate 3-9 Sections of *Eucalyptus grandis* plantation at the proposed Master Plan area

Selective logging of mature eucalyptus trees (Plate 3:10) was noted at point (01006.864', 036053.650', 1593 m a.s.l) along Mchana River and at the neighbourhood of Mchana Coffee Factory. The selective logging may not have a long-term impact on the plantations since eucalyptus have excellent coppicing ability after they are cut. Though the plantations are small, they contribute greatly to increased tree cover and diversity at the project area as well as acting as carbon sinks. As such, during the implementation of the Tatu City Extension Master Plan, it will be prudent to avoid and/or avoid complete clear-fell of the plantations.



Plate 3-10 A log of felled *Eucalyptus grandis*

b) *Grevillea robusta* plantations

Grevillea robusta does well in coffee growing zones. Small plantations of the species characterize the proposed Master Plan area. Typically, *Grevillea robusta* is grown for provision of timber, fuel wood amongst others. In coffee farms, it is grown as a nurse crop purposely to provide shade and act as a wind breaker. During implementation of the proposed Master Plan, it will be prudent to retain the plantations unless it is mandatory to clear-fell them. It is also important to note that *Grevillea robusta* is an important tree species for hedge and roadside tree planting in urban environments.

c) *Cupressus lusitanica* (cypress) plantations

Isolated *Cupressus lusitanica* plantations (Plate 3:11) exist at the Master Plan area for Tatu City Extension (Mchana Estate). The species is predominantly grown for timber production noted at point (01°06.884', 036°54.042', 1603 m a.s.l). The observed plantations are basically small and young. It will be prudent to allow the young plantations to reach maturity age (merchantable age) if clear fell will be mandatory during implementation of the Master Plan. This will help in recouping some of the capital investment used during plantation establishment.



Plate 3-11 *Cupressus lusitanica* (Cypress) plantation at the proposed Master Plan area

3.4.1.2 Urban forestry

The farm houses, school, coffee factory, workers' camp sites are characterized by tree planting typical of urban forestry. Urban forestry in form of roadside tree planting is also common at the proposed Master Plan area. Classical roadside tree planting (Plate 3:12) was evident as you enter Mchana coffee factory at point (01°06.869', 036°53.679', 1597 m a.s.l). Urban forestry provides economic values (increased real-estate values, recreational values, savings due to carbon dioxide sequestration and air pollutant removal among others), social values (positive psychological effects, aesthetic quality, emotional and spiritual benefits among others) and ecological values (increased biodiversity, air pollution removal, carbon capture, regulation of the hydrological cycle, regulation of the micro-climatic environment, harbouring wildlife among others). Unless it is mandatory, it is important to avoid clearance of trees and other ornamental plants under urban forestry during project implementation. It is also important to note that the Master Plan for the proposed Tatu City Extension (Mchana Estate) has provided for landscaped areas.



Plate 3-12 Classical urban forestry at the entrance of Mchana coffee factory

The proposed mixed-use development will likely disturb the natural forest ecosystem along the rivers and the dams. Such disturbances can result to amplified negative impacts to both the natural and social environment not only in the project area but also the neighbourhood. Typically, natural ecosystems are usually very sensitive to anthropogenic disturbances (Mackey and Currie, 2001; Svensson, R. et al., 2009). Similarly, Sapkota et al. (2010) documents species diversity reduction in response to increase in disturbances. Since the natural forest ecosystem plays a critical ecological and social role, it will be prudent for the developer to enhance the stability of the ecosystem for enhanced service provisions. Taking into cognizance that the Master Plan has set aside areas under water resource to be retained under natural conditions, the proponent should work towards increasing the vegetation cover and diversity through enrichment planting using suitably adapted tree species. Creation of buffer zones around such catchment areas will go a long way in cushioning the areas from spill-over effects of the proposed mixed-use development.

3.4.1.3 Bush and shrub lands

Some of the areas proposed for Tatu City Extension (Mchana Estate) Master Plan are under bushes and shrubs. Bushes and shrubs in many cases are indicators of ecosystem disturbances or ecosystems at the early stages of succession. Majorly, the bushes and shrubs are composed of pioneer species and in many cases, weedy/invasive species. At the Master Plan area, such bushes were common in open areas or where the indigenous forests were transiting into open grasslands. In such transition zones, they formed an ecological ecotone that bound the forested region and the open grasslands. This ensures that ecosystem boundaries do not form abrupt edges, but ecotones and mosaic habitats bind them. At the proposed Master Plan area, one shrub species; *Lantana camara* predominated.

Lantana camara is a weedy/invasive species known to cause major ecological disturbances in natural ecosystems. The species is an aggressive gap colonizer, prolific and heavy seeder with the ability of out-

competing native species. The proposed Master Plan area is characterized by open grasslands/flood plains/marshy lands characterized by periodic flooding. These open grasslands are a major target for invasion and colonization by *Lantana camara*. For instance, at point (01°06.792', 036°53.403', 1619 m a.s.l), at the outskirts of Mchana coffee factory, *Lantana camara* (Plate 3:13) is invading an open marshy land.



Plate 3-13 *Lantana camara* invading a marshy land at the Master Plan area

At the Master Plan area, *Lantana camara* was found to form heavy and impenetrable thickets in open spaces. Such thickets make the affected sites inaccessible and completely eradicate other species from growing underneath including grasses. In the long run, the land becomes unproductive. *Lantana camara* poses a major challenge in roads. Where a road has been opened, *Lantana camara* starts invading the edges of the road. If the road is earthen, the species will completely invade it unless periodic roadside bush clearance is done. For instance, at the proposed Master Plan area at point (01°06.675', 036°54.135', 1608 m a.s.l), *Lantana camara* has invaded a road reserve (Plate 3:14) making passage of traffic a challenge. The proposed Master Plan development is expected to open up many roads and other open spaces. It will be prudent to monitor invasion of such roads and open spaces and take corrective measures against early colonization. This will reduce the cost of road and open spaces maintenance due to invasion by *Lantana camara*.



Plate 3-14 A road reserve invaded by *Lantana camara* at the proposed Master Plan area

3.4.1.4 Open plains/grasslands/marshy lands

At the proposed Master Plan area, several open plains exist amidst the coffee plantations. These open plains form typical wetlands due to their marshy nature. For instance, at point (01°06.846', 036°54.316', 1596 m a.s.l), an expansive marshy land (Plate 3:15) exists adjacent to a coffee plantation. The main vegetation in the wetland is assorted grass species that can withstand prolonged waterlogging. However, invasive species such as *Lantana camara* were found to colonize the edges of the marshy lands. Such edges are subject to periodic dryness thus offering opportunity for waterlogged intolerant species to invade.



Plate 3-15 Marshy land at the proposed development area

Eucalyptus species are known to be heavy consumers of water and in some instances, they are used to reclaim water logged areas. In some of the marshy lands (01°06.693', 036°54.012', 1602 m a.s.l) at the proposed Master Plan, *Eucalyptus grandis* (Plate 3:16) has been planted to reclaim the land. However,

survival of the Eucalyptus is very low probably due to the species inability to withstand prolonged periods of water logging.



Plate 3-16 Isolated stems of *Eucalyptus grandis* in a marshy land at the Master Plan area.

Marshy/wetlands play critical ecological and economic roles. They act as habitats for aquatic animals, breeding and feeding sites for birds, take up storm/flood waters, remove pollutants, and recharge underground aquifers, streams, rivers amongst others. Against this background, it is important that the existing marshy lands in the proposed Master Plan area are maintained in their natural state. All efforts should be geared towards integrating the wetlands into the proposed Master Plan land use zones.



Plate 3-17 Marshy land in the proposed Master Plan area

3.4.2 Wildlife

Several pockets of wildlife habitats exist within the proposed Master Plan area. Depending on type of habitat, different wild game exists. At the proposed Master Plan area, three types of wildlife habitats exist. Water bodies such as Mukuyu and Mchana Rivers, Comte and Mchana dams form a key wildlife habitat mostly for aquatic animals. Secondly, the riparian corridors of the water bodies mainly composed of natural forests/vegetation forms another key wildlife habitat at the proposed Master Plan area. Thirdly, the many pockets of grasslands/marshy lands scattered in the proposed area forms another habitat for wildlife. The forest plantations that characterize some sections of the proposed Master Plan do not form suitable wildlife habitat. Typically, forest plantations are subject to human interventions thus discouraging wildlife habitation. Secondly, forest plantations are mostly monocultures that do not provide a diversity of food and breeding niches for wild game.

As a result of ongoing agricultural activities at the proposed Master Plan area, most of the wildlife habitats are small and isolated. Ecologically, only small game can survive in such small habitats since the available resources for feeding, sheltering and reproduction are limited. Once the proposed development is complete, approximately 144.71 acres will be left under coffee/forests/bushlands. This implies that the existing wildlife habitat will be decimated further to the detriment of the wildlife in habitation. Wild game is known to prefer natural ecosystems and any disruption that may result to departure from the natural state such as habitat fragmentation, loss of nesting sites and other wildlife habitat through bush clearing, disruption of watercourses, establishment of non-native invasive plant species, creation of barriers to wildlife movement and visual and auditory disturbance forces wild game to move out of their habitat, die of heat stroke or die due to lack of their most preferred diet. The proposed Master Plan mixed-use land uses are expected to subject the existing wildlife habitats to further disturbances/modifications. Incidences of habitat pollution, especially the water bodies and marshy lands, are likely to occur thus altering the existing natural conditions. Surface run-off from the proposed Master Plan development will be used to recharge

the earth dams. Surface run-off from urban environs is usually contaminated and this may compromise the quality of water to the detriment of aquatic life in habitation. Since the existing wildlife habitats are small and previously disturbed by habitat fragmentation, it will be prudent during Master Plan implementation to put measures aimed at increasing the habitat sizes as well as maintain their natural status. In many cases, mimicking what happens in natural ecosystems can make even human modified ecosystems suitable for wildlife habitation.

3.4.2.1 Types and diversity of wildlife

According to the Kiambu CIDP (2018-2022), most of the wildlife in Kiambu County is concentrated in Lari Sub-County especially Kinale forest. The existing wildlife habitats at the proposed Master Plan area are small and isolated. Typically, such habitats can only house small game. Ecologically, large game requires large and continuous habitats capable of supporting their huge resource requirements in terms of food, shelter and breeding sites. The water bodies (rivers and dams) in the proposed Master Plan area house aquatic animals such as fish, and hippopotamus amongst others. Mukuyu River is relatively big compared to Mchana River. Similarly, Comte earth dam along Mukuyu River is big compared to Mchana earth dam along Mchana River. The big water bodies at the proposed project area have high potential of housing crocodiles and hippopotamus.

It is, however, important to note that the drainage pattern (Figure 3:6) of the proposed project area and its environs is interconnected by a network of streams and rivers thus giving the aquatic wildlife a chance to freely roam the drainage pattern.

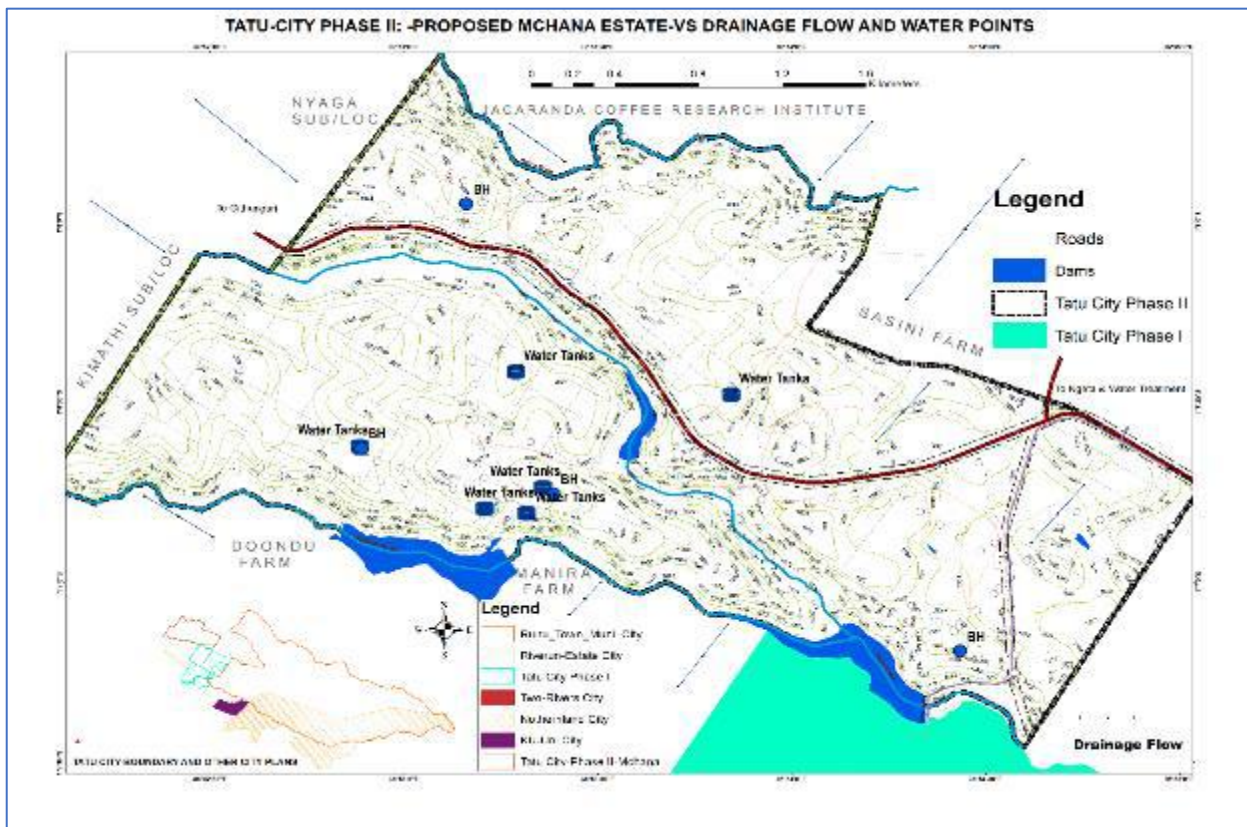


Figure 3.7 Drainage flow at the proposed Master Plan area

Galana/Ruiru River is the largest in the neighbourhood of the proposed Tatu City Extension (Mchana Estate) and drains most parts of Ruiru. Due to its size, Galana/Ruiru River is expected to house a large number of aquatic wildlife and probably serve as the main wildlife dispersal point to the other streams and rivers in the Master Plan area. Cases of human-wildlife conflicts, especially involving crocodiles and hippopotamus, have been reported in the past. Control and management of the human-wildlife conflicts will require a thorough understanding of the drainage pattern of the Master Plan area and the environs. As

such, the sources/dispersal points which are the main rivers such as Galana, should be given a lot of focus as the sinks which are mainly the dams and rivers/streams at the proposed Master Plan area. Due to their nocturnal feeding habits, hippos are known to stray from water bodies into neighbouring farms thereby intensifying human-wildlife conflicts through crop destruction and possible injuries to humans. Crops in farmlands provide fallback resource to the hippos especially during times of scarcity.

The natural forests in riparian corridors of water bodies house a number of small games such as monkeys, rabbits, dikdiks, and snakes amongst others. At the proposed Master Plan area, monkeys prefer the natural forests along the riparian corridors due to the presence of tree species diversity and availability of water. The tree diversity provides a wide range of feeding, sheltering and breeding niches for the monkeys. Several species of *Moraceae* family key among them *Prunus africana* where noted among the indigenous tree species at the proposed Master Plan area. The species, especially the fruits, form the top diet (Fashing 1999, Fashing et al., 2003 and Fashing, 2004) for *Colobus guereza* (colobus monkeys). However, in absence of their top diet, monkeys go for fall-back resources which are mainly food crops in farms. They are also known to stray into cypress plantation (*Cupressus lusitanica*) and cause serious debarking in search of food (Mutiso et al., 2008). Such straying into farms and plantations increases human-wildlife conflicts. Since the area under natural forest cover is expected to reduce, food resource for wildlife will also reduce thus increasing incidences of human-wildlife conflicts.

The open wetlands/grasslands in the proposed Master Plan area house a number of aquatic wildlife including several bird species. The open wetlands/grasslands provide a suitable habitat for assorted bird species by providing feeding, breeding and sheltering sites. Ecologically, birds prefer open plains to closed canopy forests due to a number of reasons. One, open plains are characterized by grasses whose seeds form a big part of the birds' diet while the grasses are important for making nests. Secondly, during breeding seasons, male birds prefer open plains with isolated trees on which they can perch and perform dancing and singing rituals to attract females for mating. Frogs, toads, small reptiles and assorted insects prefer wetlands as their habitat. Since the wetlands/grasslands are small and isolated, it will be important to avoid any disturbances that may interfere with wildlife inhabitation.

The proposed development area houses comprises several hippopotamus, which occupy the perennial rivers and earth dams which run along the northern and southern boundaries of the Master Plan area and make use of the seasonally moist grasslands and riparian areas (including wetlands) for foraging purposes and as ecological corridors for movement. During the baseline field survey and detailed SEA study no amphibian species were identified. However, the amphibians can be spotted during the wet season. Many bird species exist in the study area including secretary bird, crowned cranes, pelicans, marabou storks, and eagles. Tatu City in coordination with relevant agencies such as the Kenya Wildlife Service are in the process of relocating the animals since the existing wildlife habitats are small and previously disturbed by habitat fragmentation. This will also ensure the safety of the people living within the proposed development as well as the survival of the animals.

3.5 Socio-Economic Setting

3.5.1 Population Size and Composition

According to the 2009 Population and Housing Census, Kiambu County had a population of 1,697,887 while Ruiru Constituency had a population of 201,986 with a density of 1,122 people per square kilometre. Further, the population of Kiambu County was projected to be 1,766,058 with 873,200 males and 892,857 females by 2012 and expected to reach 2,032,464 people by the end of 2017. This is influenced by the County's high population growth rate, which is at 2.81 per cent and the influx of people working in nearby counties who prefer to stay in Kiambu and its environs where there is less congestion and well developed infrastructure. In terms of gender, the sex ratio of male to female is approximately 1:1.02.

3.5.2 Land Use and Local economy

The combination of good soils, suitable climate, well developed infrastructure and the proximity to the most important capital city in the region have all served to make Kiambu the most lucrative farming County

in the country. Farms range from less than 0.3 ha to large plantations of well over 1,000 ha. Over 90% of the total rural land mass is suitable for farming.

Agricultural activity has a major new competitor in the form of real estate as housing, trading centers and shopping malls offer more reliable dividends to investment than farming. Horticulture, the growth industry of the last two decades appears capable of out-earning tea and coffee – the traditional cash crops of this region. Other agricultural activities include dairy farming and growing of pyrethrum and subsistence crops such as maize, beans and locally consumed vegetables.

3.5.2.1 Agro-Forestry

3.5.2.1.1 Farm Forestry

Farm forestry characterize substantial portion of the proposed Master Plan areas. On-farm tree planting is important in provision of shade, wind break, fodder, fruits, construction materials, soil erosion control, bee foraging, medicinal value, fuel wood, nitrogen fixation among others (Cheboiwo & Langat, 2006). Two agroforestry systems namely shade systems and agri-silviculture were observed in the proposed Master Plan area as described below.

3.5.2.1.2 Shade systems

This is a classical agroforestry system common in coffee plantations. With shade applications, coffee is purposely raised under *Grevillea robusta* canopies and within the resulting shady environment. For most uses, the understory crops are shade tolerant or the overstory trees have fairly open canopies. This practice reduces weeding costs and increases the quality and taste of the coffee. At the proposed Master Plan area, cases of the shade systems (Plate3:18) were common in the coffee plantations as noted at point (01°06.849', 036°54.649', 1587 m a.s.l). Apart from increasing coffee production, the shade systems increase land productivity mainly from the multiple uses of the *Grevillea* trees. The systems also improve the aesthetic value of the plantations. Since the systems offer a wide range of economic and ecological values, it will be prudent to avoid complete elimination of the systems unless it is mandatory.



Plate 3-18 Shade systems (intercrop of *grevillea* and coffee) at the proposed development area

3.5.2.1.3 Agri-silviculture system

This is an agroforestry system that encompasses growing of trees and agricultural food crops. The system increases land productivity while benefiting from the multiple uses of the trees. At the Master Plan area,

this practice was common in small farms at the coffee workers' camp sites. For instance, at Mchana coffee factory (01°06.869', 036°53.679', 1597 m a.s.l) many small farmlands (Plate 3:19) are under agri-silviculture system. Notably, several agri-silvicultural practices were evident at the Master Plan area and the neighbourhood farms such as trees mixed with bananas (*Musa acuminata*), trees and maize, trees and arrow roots amongst others.



Plate 3-19 Agri-silviculture at the Master Plan area.

3.5.2.2 Crop, Livestock and Value addition

The County has a total arable land of 1,878.4 km² of which a total of 21,447 ha is under food crops and a total of 35,367.41 ha is under cash crops.

The main food crops grown in the County include maize, beans, Irish potatoes bananas and vegetables. Coffee and tea form the major industrial (cash) crops grown in the County especially in the upper and lower highlands. There are 21 coffee and 3 pyrethrum co-operative societies which assist in marketing of coffee and pyrethrum.

3.5.2.2.1 Coffee Plantation

The development area and neighbouring land is vastly covered with coffee plantation (Plate 3:20), natural/indigenous tree species, bamboo trees and grassland vegetation Food crops such as bananas, maize and beans can be spotted grown relatively in small scale.



Plate 3-20 Coffee plantation within the master plan zone

On the 885.22 ha of land proposed for Tatu City Extension (Mchana Estate), land cover under coffee plantations is estimated to be 1,090 acres and land under bush and other forest vegetation covers at 235 acres.

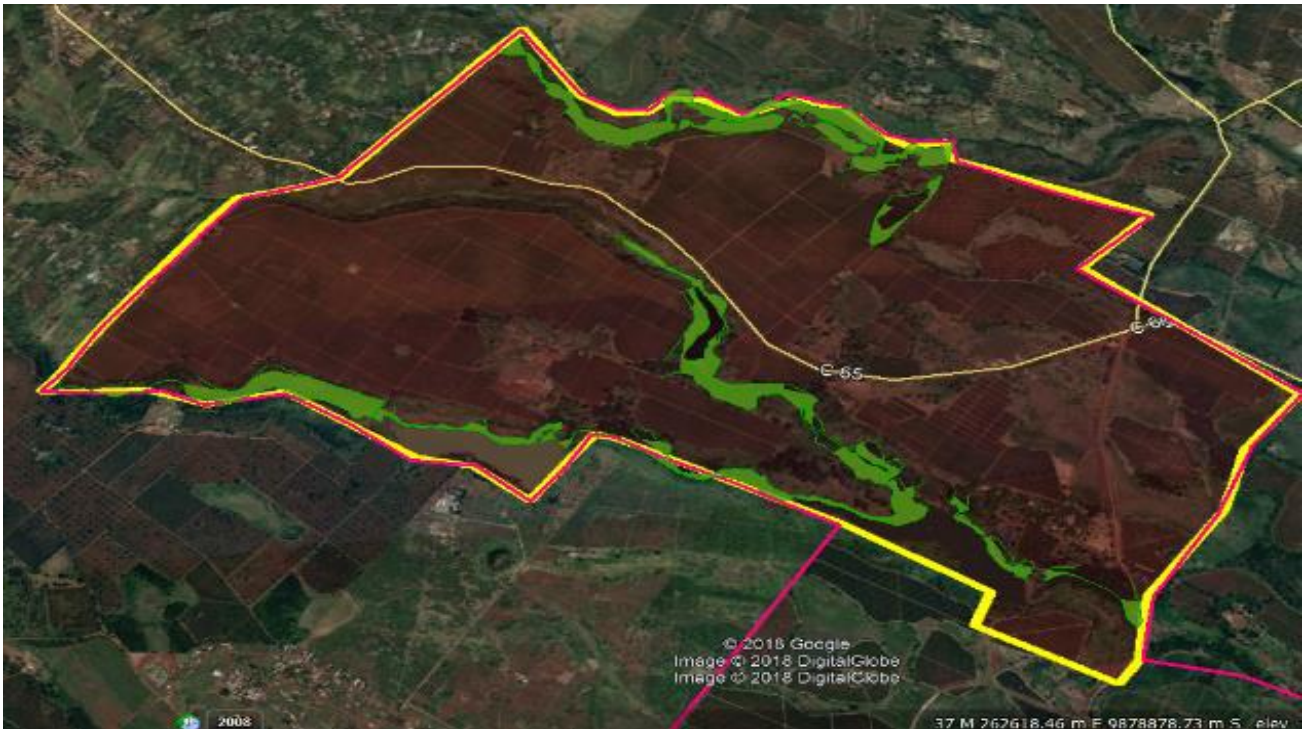


Figure 3.8 The plain green land in back boxes represent land cover under coffee plantations

3.5.2.2.2 Livestock

Dairy industry is the leading enterprise with nearly 70% of the farm families keeping an average of 2-3 cows under the zero grazing systems. Milk is the major livestock product in Kiambu County and currently leading in Kenya. Production has increased from 264,773,621 litres in 2013 to 308,818,919 litres.



Plate 3-21 Livestock (cattle) grazing in the Master Plan area

3.5.2.2.3 Apiculture (beekeeping)

Known the importance of honey to human health, adoption of bee keeping in the County has gradually increased leading to an increase in the kilograms of honey produced as well as the farmers' income. Beekeeping is scattered in the County and most farmers use Langstroth hives, top bar hive and Log hives. The production of honey has risen from 102,397 kg of honey produced in 2014 to 114,000 kg in 2017. The value of honey in Kenyan Shilling has also increased from Kshs 51.2 Million in 2014 to 56 Million Shillings in 2017.



Plate 3-22 A beehive in a natural forest at the proposed Master Plan area

3.5.3 Mean land holding size

The size of arable land in the County is 1,878.4 km² while that of the non-arable land is 649.7 km². Water masses (dams, ponds and rivers) cover 15.5 km² of the County. The average small-scale land holding size is 0.36 ha while the large-scale land-holding size is 69.5 ha.

The small-scale land holdings are mostly found in upper parts of Gatundu North, Gatundu South, Kiambaa, Limuru and Kikuyu constituencies while the large-scale land holdings are usually found in the lower parts of the County especially in Juja constituency and the upper highlands in Limuru and Lari constituencies.

3.5.4 Infrastructure and Access

3.5.4.1 Road and Rail Network

According to Kiambu County Integrated Development Plan (CIDP) 2018 - 2022, the County has a total of 5533 km of roads network; 249 km of road are yet to be opened. The roads under bitumen standards are 865.4 km, 1,051 km on gravel, 3,167 km on earth surface. The County is served by Thika Super Highway from Githurai-Ruiru-Juja-Thika on average of 50 kms and A104 Uthiru-Kikuyu-Kamandura- Kinungi on average of 65 which 25.1 km of it is on rehabilitation expansion programme. It is also served by a railway line which is 131km and has Railway stations in Kahawa, Ruiru, Juja, Thika, Kikuyu and Limuru. There are exist bus parks in all sub counties; 9 paved and 4 unpaved.

It is expected that Tatu City will attract most of its traffic from 3 areas, namely Nairobi, Ruiru and Kiambu. The existing routes affecting the development of Tatu City are:

- The Ruiru-Kiambu road: This road runs through the development and is a Class C (C63) surfaced road with gravel shoulders. The road falls under the jurisdiction of the Kenya National Highway Authority (KENHA) and accommodates through-traffic from Ruiru to Nairobi or Kiambu. It also gives access to the local communities and coffee plantations.
- An existing North-South link road: This road runs through Tatu City (Mchana Estate) and is a Class D (D399) existing gravel road linking the C63 with the C65 to the north of the Master Plan area. This road is in a very poor condition, has numerous rivers and low-lying area crossings constructed by concrete culverts (pipe- or box-culverts), and is mainly used by local traffic and the coffee plantation transport. This road falls under the jurisdiction of the Kenya Rural Roads Authority (KERRA). The road needs to be upgraded to enhance connectivity between phase 1 and 2 of Tatu City.
- The Ruiru-Githunguri Road: This road runs through the phase 2 and it is a class C (C65). Currently the road is under construction and is expected to improve connectivity between Ruiru and Githunguri.

The Northern and Eastern Bypasses, which increases the accessibility of the Master Plan area from a regional/metropolitan perspective, are very critical for development of Tatu City. The Eastern Bypass terminates on the South-eastern boundary of the phase 1, at the point where the existing Ruiru- Kiambu road (C63) enters the Master Plan area.

The Northern Bypass terminates in the Eastern Bypass, and it is located approximately 1.2 km to the East of Master Plan area. The Northern Bypass, the Eastern Bypass, together with Thika Road (A2) is a major access/link between the development and Nairobi. The existing Ruiru-Kiambu road is the extension of the Eastern Bypass at the Eastern entrance to Tatu City. This link road is the major entrance road into the phase 1 of the development. There is also an existing 60m wide road reserve/easement that runs through the Master Plan area, and which was originally intended to be the alignment of the C63 and D399.



Plate 3-23 Road construction works along Ruiru – Githunguri Road (C65)

3.5.4.2 Information, Communication Technology

Kiambu County has 98 percent mobile network coverage owing to its location and proximity to the city as per Kiambu CIDP 2018 -2022. Landline coverage has been on the decline due to adoption of new technology and ease of using mobile phones. There is a total of 19 post offices and 14 sub post offices which are fairly distributed in the County. These post offices are; Ruiru, two at Thika, Juja, Githunguri, Karuri, Kiambu, Kikuyu, Limuru and Matathia-Lari post office. There are quite a number of cyber cafes offering internet access hence easy access of communication. This has been possible due to the introduction of fibre optic cables in the County. Many residents listen to local FM and radio stations mainly Kameme, Inooro and Coro FM for primary information in addition to other national stations. The citizens are able to watch a variety of TV stations operating in the country. There is one Huduma centre located at Thika where citizens access government services.

3.5.4.3 Financial Institutions

There is a total of 18 commercial banks with branches well distributed within the County. In addition, there are 31 microfinance institutions, 4 village banks, 12 insurance companies and 520 SACCOs. The institutions are well distributed within the County and hence they are easily accessible. This is an indication of vibrant economic activities that are able to sustain the financial sector making it one of the fastest growing sectors in the County over the last five years.

3.5.4.4 Education Institutions

The County is well endowed with education institutions which are well distributed within the County. It has 948 Primary Schools, 365 Secondary Schools, 7 Universities and 4 University Campuses, 26 Colleges, 31 Operational Youth Polytechnics and 2 Technical Vocational Education Training Institutions (TVET). They are well distributed within the County and hence children do not have to travel long distances.

The proposed Tatu City Extension (Mchana Estate) has one public school, Ngewe Primary school located within the Master Plan area (plate 3:24). Adjacent to the school is a playing field for the pupils, illustrated in Plate 3:25. During implementation of the Master Plan, Ngewe Primary School will be retained in its present location and the size of land for the school has been increased to approximately 8 Hectares to cater for future expansion.



Plate 3-24 Ngewe Primary School within the proposed Master Plan area



Plate 3-25 Ngewe school pupils at the playing field

3.5.4.5 Energy Access

Kiambu County has 98 percent coverage of electricity with effective coverage on the last mile programme. There has been an increase in the connectivity of rural households to electricity due to the rural electrification programme. The total households connected to electricity form 70 percent, and this number is expected to rise to 100 percent in the year 2022. Solar energy has less than 5 percent coverage, while biogas use is at 25 percent especially by farmers in Githunguri, kikuyu, Limuru and other sub-counties where dairy farming is practiced. Kenya Power and Lighting Company has played a key role in street lighting, installation of flood masts; 12 in Thika, 11 in Kiambu, 5 in Kikuyu, 11 in Limuru, 11 in Ruiru, 11 in Juja and 9 in Kiambaa. These flood masts are of 30 m in height.

The city will have reliable power supply network from a dedicated substation, backup supply and alternative renewable sources. The existing power within Tatu City Extension (Mchana Estate) is what had been installed by Kenya Power to service existing structures. These power structures will be decommissioned to allow for installation of new power structures for construction and permanent works in the proposed development. Tatu City main substation, which is located in phase 1 is currently being developed and will have a capacity of 135MVA when fully developed. The substation will also serve Tatu City Extension (Mchana Estate). This will be achieved by having separate 66/11kV substation fed from phase 1 main substation. Additional three 45MVA transformers will also be installed in the proposed development.

3.5.4.6 Markets and Urban Centres

The County has a total of 2,517 trading centres with 6,634 registered retail traders and 750 registered wholesale traders. There are also a number of urban centres with the largest being Thika Town which is one of the largest industrial towns in the country. Other urban centres include Kiambu and Karuri in Kiambaa constituency, Kikuyu in Kabete constituency, Limuru in Limuru Constituency, Gatundu in Gatundu South Constituency and Ruiru in Juja Constituency.

The proposed Tatu City Extension (Mchana Estate) is bordered by Ngewa Centre (Plate 3:26) which has health centres, housing units, restaurants, re-creational facilities among others.



Plate 3-26 Ngewa (Kwa Maiko) Centre

Other centres near the Master Planning area include: Ruiru Town (GPS Cordinates -1.148426, 36.95806); BTL center near Tatu Sales office (GPS Cordinates -1.153415, 36.908529); and Lioki (Kwa Githiri) Shopping Center GPS Coordinates -1.106549, 36.848385).

3.5.4.7 Housing

According to 2009 Kenya Population and Housing Census, 48.3 percent of all homes in the County are stone-walled, 4.9 percent are brick/block while 4.8 percent are mud/wood. There are 74.6 percent of the houses that have cemented floors and 87.5 percent with corrugated iron sheets. Only 0.1 percent has used other forms of roofing materials.

During the SEA study, it was noted that the proposed Master Plan area has existing housing structures including Kofinaf offices, two (2) Mchana houses, Kofinaf driers located to the North East and approximately 40 staff houses built of stone with iron roofing where the staff working within Mchana Estate and surrounding coffee farms reside.



Plate 3-27 Stone walled houses in the Proposed Tatu City (Mchana Estate) Master Plan area

4 RELEVANT POLICY, PLAN, LEGISLATIVE AND REGULATORY FRAMEWORK

4.1 Introduction

There is a growing concern in Kenya and at a global level that many forms of development activities cause damage to the environment and the community. It is part of the Kenyan laws that all Policies, Plans and Programmes (PPPs) for implementation shall be subject to Strategic Environmental Assessment (SEA). SEA acts as a useful tool for prevention of negative environmental and social effects of developmental activities. It is now accepted that developments must be economically viable, socially acceptable and environmentally sound. The proposed Tatu City Extension (Mchana Estate) was subjected to a comprehensive analysis based on the environmental obligations' framework developed for the SEA.

This chapter highlights the Constitution of Kenya, 2010, and describes key government vision and agenda. A review of relevant National Environmental Policies, National Strategic Plans, Legislations and pertinent regulations and Multilateral Environmental Agreements (MEAs) is studied and reviewed in detail in succeeding chapters.

4.2 The Constitution of Kenya, 2010

The Constitution is the supreme law of the land. It lays the foundation on which the wellbeing of Kenya is founded. The constitution's provisions are specific to ensuring sustainable and productive management of land resources; transparent and cost-effective administration of land; and sound conservation and protection of ecologically sensitive areas.

Article 42: Every person has the right to a clean and healthy environment which includes: -

- a) To have the environment protected for the benefit of present and future generations through legislation and other measures, particularly that contemplated in article 69.
- b) To have obligation relating to the environment fulfilled under article 70.

Section 69 states that: The state shall;

- a) Encourage public participation in the management, protection and conservation of the environment.
- b) Establish systems of environmental impact assessment, environmental audit and monitoring of the environment.
- c) Eliminate processes and activities that are likely to endanger the environment.

Every person has a duty to cooperate with state organs and other persons to protect and conserve the environment and ensure ecologically sustainable development and those of actual resources. The Master Plan has made provisions to ensure a clean and healthy environment through the environmental and social management plan. It is also anticipated that Tatu City Extension (Mchana Estate) will be guided by the spirit of the Kenyan constitution considering environmental protection and conservation.

4.3 Key Policies relevant to the SEA

4.3.1 Sessional Paper No. 10 of 2014 on the National Environment Policy

The Republic of Kenya has a policy, legal and administrative framework for environmental management. The broad objectives of the national environmental policy in Kenya are: -

- a) To ensure optimal use of natural resources while improving environmental quality.
- b) To conserve natural resources such that the resources meet the needs of the present without jeopardizing future generations in enjoying the same.
- c) To develop awareness that inculcates environmental stewardship among the citizenship of the country.
- d) To integrate environmental conservation and socio-economic aspects in the development process.
- e) To ensure that national environmental goals contribute to international obligations on environmental management and social integrity.

To achieve this, it is a policy direction that appropriate reviews and evaluations of proposed Tatu Extension (Mchana Estate) Master Plan and operations are checked to ensure compliance with the environmental policy.

4.3.2 Sessional Paper No. 9 of 2012 on the National Industrialization Policy Framework for Kenya 2012 - 2030.

The main objective of the national industrialization policy is to enable the industrial sector to attain and sustain annual sector growth rate of 15% and make Kenya the most competitive and preferred location for industrial investment in Africa leading to high employment levels and wealth creation. Specific objective number 6 of the policy focuses on developing at least 2 Special Economic Zones and 5 SME Industrial Parks. This specific objective anchors well with the proposed Tatu City Extension Master Plan objective on industrial development. Under the Master Plan, substantial land has been set aside for special economic zones, SME and industrial parks. As such, the proposed Tatu City Extension contributes greatly to the government efforts on industrialization.

4.3.3 National Wetlands Conservation and Management Policy, 2013

The draft Wetlands Conservation and Management aims at integrating both local and expert knowledge while upholding the principle of public participation as entrenched in the Constitution. The policy therefore seeks to secure and ensure the benefits of wetlands for posterity. It also aims at providing a framework for mitigating and tackling the diverse challenges that affect wetlands conservation and wise use in Kenya. Also, the policy fulfils Kenya's obligations under the Ramsar Convention and the East Africa Community (EAC) among other instruments. The proposed Master Plan is therefore expected to jointly support the implementation of the policy to sustain healthy wetland ecosystems within the proposed development area for community livelihoods and biodiversity conservation.

4.3.4 National Wildlife Conservation and Management Policy, 2017

The wildlife policy is aimed at promoting protection and conservation of wildlife in Kenya, both in protected and non-protected areas. The policy is implemented by the Kenya Wildlife Service (KWS). The proposed Master Plan will need to be consistent with this policy. Where wild animals will be disturbed during the Master Plan implementation phase appropriate mitigation measures must be implemented to minimize disturbance to wildlife.

4.3.5 National Energy and Petroleum Policy, 2015

This policy was formulated to beef up the Sessional Paper No. 4 on Energy. The overall objective of the policy is to ensure affordable, competitive, sustainable and reliable supply of energy to meet national and County development needs at the lowest cost, while protecting and conserving the environment. On solar energy, the policy recommends that there should be regular review of standards for solar energy technologies and equipment, provision of a framework for connection of electricity generated from solar energy to national and isolated grids, through direct sale or net metering and Research Development and Dissemination (RD&D) should be undertaken on solar technologies. The proposed Master Plan is therefore expected to incorporate the various aspects of the energy policy including renewable energy and energy efficiency and conservation measures.

4.3.6 Forestry Policy, 2014

This policy of the government is intended to ensure forests in the country are protected from wanton destruction. The goal of the policy is to increase the area under forest to 10% of the total land area in the country. The proposed Master Plan will therefore be required to be consistent with the Kenya's forest policy. Where clearance of forests or sections of forests is envisaged, it would be important to put in place appropriate mitigation measures such as those specified in the preliminary environmental management and monitoring plan of this SEA report.

4.3.7 National Environmental Sanitation and Hygiene Policy, 2007

The National Environmental Sanitation and Hygiene Policy is devoted to environmental sanitation and hygiene in Kenya as a major contribution to the dignity, health, welfare, social well-being and prosperity of all Kenyan residents. The policy recognizes that healthy and hygienic behaviour and practices begin with the individual. Proposed Tatu City Extension Master Plan is in line with the implementation of the policy to enhance sanitation, hygiene, food safety, improved housing, use of safe drinking water, waste management, and vector control at the household level. As a basic human right, all Kenyans should be able to live with dignity in a hygienic and sanitary environment. The proposed Master Plan should ensure that all sectors understand what constitutes a healthy human environment, and that they adopt attitudes and practices that create and sustain such an environment.

4.3.8 National Urban Development Policy

The National Urban Development Policy Provides a framework for sustainable urban development in the country. The various sectors addressed in the policy include; urban economy; urban finance; urban governance and management; national and County urban planning; land, environment and climate change; social infrastructure and services; physical infrastructure and services; urban housing; urban safety and disaster risk management; and marginalized and vulnerable groups. The policy is guided by the Constitution of Kenya 2010, clauses 184 and 176 (2) which provides for regulation of urban areas and cities, clause 200(2), which outlines the governance of the capital city, other cities and urban areas and Vision 2030, which calls for a nationwide urban planning and development campaign. The policy aims at strengthening urban governance and management, development planning, urban investment and the delivery of social and physical infrastructure in urban areas throughout the country. The proposed development being a city will be required to adhere to the frameworks stipulated in the policy in order to ensure proper governance and management of the city by provision of high-quality infrastructure and services to its residents, proper and planned urban development and investments and also sustainable use of land.

4.3.9 The National Housing Policy 2004

The sessional paper no. 3 of 2004 on national housing policy outlines the government of Kenya's commitment in provision of affordable housing. The main goal of the policy is to facilitate the provision of adequate shelter and a healthy living environment at an affordable cost to all socio-economic groups in Kenya in order to foster sustainable human settlements. This will minimize the number of citizens living in shelters that are below the habitable living conditions. It will also curtail the mushrooming of slums and informal settlements especially in the major towns. Chapter two of the housing policy outlines one of the objectives of the policy as to promote inclusive participation of the private sector, public sector, community-based organisations, Non-Governmental Organisations, co-operatives, communities and other development partners in planning, development and management of housing programmes. The proposed Tatu City extension Master Plan provides adequate land for high end residential premises. This provision links very well with the goals and objectives of the national housing policy 2004. Further, in the national housing policy, the government of Kenya commits to facilitate investments in the housing sector. Based on the provisions of the national housing policy 2004, the proposed Tatu City extension Master Plan builds on the government's agenda on housing.

4.3.10 Sessional Paper No. 9 of 2012 on the National Industrialization Policy Framework for Kenya 2012-2030

The Vision of this policy aims to make Kenya the leading industrialized nation in Africa with a robust, diversified and globally competitive manufacturing sector. The Mission is: "To promote and sustain a vibrant, globally competitive and diversified industrial sector for generation of wealth and employment through the creation of an enabling environment". The implementation of this Sessional Paper is premised on the guiding principles namely: (i) Productivity and competitiveness; (ii) Market development; (iii) High value addition and diversification; (iv) Regional dispersion; (v) Technology and innovation; (vi) Fair trade practices; (vii) Growth and graduation of Micro, Small and Medium Industries; (viii) Employment creation; (ix) Environmental sustainability; (x) Compliance with the current Constitution; and (xi) Education and

human resource development. All these principles are in line with the envisioned development and will form key tenets in the Tatu City Extension Master plan.

4.3.11 The Sessional Paper No. 1 of 2017 on National Land Use Policy (NLUP)

The overall goal of the national land use policy is to provide legal, administrative, institutional and technological framework for optimal utilization and productivity of land related resources in a sustainable and desirable manner at national, County and community levels. The Policy is premised on the philosophy of economic productivity, social responsibility, environmental sustainability and cultural conservation. Key principles informing it include efficiency, access to land use information, equity, elimination of discrimination and public benefit sharing. Amongst the key principles envisioned by the policy include:

- Land use planning, resource allocation and resource management for sustainable development to promote public good and general welfare;
- Environmental management and sustainable production in the utilization of land resources;
- Coordination and integration of institutional linkages in planning at sectoral and cross-sectoral levels to foster collaboration and decision making among different land users;
- Equitable utilization of land resources to meet governance, social-economic and cultural obligations of the people of Kenya.

The Policy provides a framework for adequately addressing the challenges related to the use of land and land-based resources. Implementation of the policy will help in the conservation of water catchment areas, mitigating climate change effects in order to have a reliable and steady rainfall for sustained water supply for human settlement, manufacturing and agriculture. The policy provides a guide for preparation of physical development plans at the County level and provide for renewal and re-development of urban areas. The Proposed Master Plan will be subjected to the provisions of this land use policy in order to ensure proper utilization of the available land.

4.3.12 National Policy for Disaster Management in Kenya

The policy lays emphasis on preparedness on the part of the Government, communities and other stakeholders in Disaster Risk Reduction activities. In this regard, the policy aims at the establishment and strengthening of Disaster Management institutions, partnerships, networking and main streaming Disaster Risk Reduction in the development process so as to strengthen the resilience of vulnerable groups to cope with potential disasters. The proposed Master Plan is therefore required to be in line with the provisions of disaster management. Adequate and informed planning will be required to ensure disaster preparedness is implemented during planning. Key aspects of the policy that the Master Plan should consider are the two major categories of disasters; 1) Natural: Bush fires, epidemics on human beings and animals, pests on crops, forests and livestock; geologic and climatic disasters (e.g. droughts, floods, landslides, cyclones, storm surges, coastal erosions, earthquakes, invasive plants. 2) Human-made: Terrorism, Industrial accidents, fires, transport accidents, civil, resource-based and political conflicts, collapsed infrastructure, food poisoning, invasive plants, drug and substance abuse, human trafficking, industrial sabotage, environmental degradation and other emerging disasters.

4.3.13 The National Water Policy of Kenya 1999

The National Policy on Water 1999 aims to achieve sustainable development and management of the water sector by providing a framework in which the desired targets/goals are set, outlining the necessary measures to guide the entire range of actions and to synchronize all water-related activities and sectors. The policy set the following specific policy objectives covering the four basic areas of water resources management, water supply and sewerage development, institutional arrangement and financing of water sector: The proposed Master Plan should therefore ensure its objectives are aligned with the key water policy objectives stipulated below;

- a) Preserve, conserve and protect all available water resources and allocate it in a sustainable, rational and economical way;
- b) Supply of water of good quality and in enough quantities to meet the various water needs including poverty alleviation, while ensuring safe disposal of wastewater and environmental protection;

- c) Establish an efficient and effective institutional framework to achieve a systematic development and management of water sector; and
- d) Develop a sound and sustainable financing system for effective water resources management, water supply and sanitation development.

4.3.14 National Water Policy, 2012

The National Water Policy, 2012 has been developed in line with the mandate, vision and mission of the Ministry responsible for water affairs in Kenya. This Policy is compliant with the Constitution of Kenya 2010 and the Vision 2030 besides considering the targets of Sustainable Development Goals (SDGs). The Policy is built on the premises of Integrated Water Resources Management (IWRM). The Policy aims at guiding the development of strategies for water management and utilization by water sector stakeholders. This policy recognizes the great expectation of population regarding access to freshwater supplies and use for domestic, livestock, agriculture and other production purposes. It is therefore expected that the proposed Tatu City (Mchana Estate) will ensure adequate protection of water resources during the master plan execution.

4.3.15 Environment and Development (Sessional Paper No. 6 of 1999)

The Kenya's policy paper on the Environment and Development was formulated in 1999. The policy defined approaches that will be pursued by the Government in mainstreaming environment into development. The policy harmonized environmental and developmental objectives with the broad goal of achieving sustainable development. The policy paper also provided guidelines and strategies for government action regarding environment and development. In regard to wildlife, the policy reemphasized government's commitment towards involving local communities and other stakeholders in wildlife conservation and management, as well as developing mechanisms that allow them to benefit from the natural resources occurring in their areas. The policy also advocated for the establishment of zones that allow for the multiple use and management of wildlife. This policy is relevant to the proposed Master Plan in view of the potential impacts on the environment and involvement of the public in planning.

4.3.16 Kenya National Policy on Gender and Development (NPGD), 2000

The purpose of the Gender Policy is to institutionalize The Kenya National Policy on Gender and Development (NPGD), within Gender, Children and Social Development. It articulates the policy approach of gender mainstreaming and empowerment of women at the ministry level. The policy seeks a society where women, men, children and persons with disabilities enjoy equal rights, opportunities and a high quality of life. This report has in depth addressed matters to do with gender and development and in the concession period the Master Plan should be guided by respective principles under this policy.

4.3.17 HIV/AIDS Policy of 2009

The policy identifies HIV/AIDS as a global crisis that constitutes one of the most formidable challenges to development and social progress. The Pandemic heavily affects the Kenyan economy through loss of skilled and experienced manpower due to deaths, loss of man hours due to prolonged illnesses, absenteeism, reduced performance, increased stress, stigma, discrimination and loss of institutional memories, among others. Due to the large of number of workers who will be involved in the implementation of the Master Plan and the associated social issues expected in the proposed city, HIV/AIDS policy aspects will be considered.

4.3.18 Kenya National Youth Policy (2016)

The Youth policy provides for Youth inclusion in the different sectors to identify specific Youth issues and how to address and include them. Article 260 of Kenya's Constitution defines a Youth as a person aged between eighteen (18) years and thirty-four (34) years. It is envisaged that the Master Plan execution will identify the needs and concerns of youth and include their views during specific project implementation.

4.4 National Strategies

4.4.1 The Kenya Vision 2030

Nationally, the proposed Tatu City Extension (Mchana Estate) Master Plan links well with Vision 2030 blueprint. The proposed development builds on Chapter 4 (economic vision and strategy: adding value to our products and services) and Chapter 5 (the social strategy: investing in the people of Kenya) of the vision 2030 blueprint. Chapter 4 of the blueprint focuses on tourism, agriculture, wholesale and retail trade, financial services amongst others, while chapter 5 focuses on education, health, water, environment, housing and urbanization amongst other sectors. The projects envisioned in the proposed Tatu City extension adequately addresses the economic and social pillars of the vision 2030. For instance, in the proposed Tatu City extension Master Plan, adequate land has been set aside for construction of hospitals, schools, hospitality facilities, residential and commercial premises, and natural green space and water bodies. As such, implementation of the Tatu city extension Master Plan will contribute immensely towards the achievement of key flagship vision 2030 projects captured under the economic and social pillars of the blueprint.

The Economic Pillar of Vision 2030 seeks to improve the prosperity of all regions of the country and all Kenyans and as such the development blueprint recognizes projects such as the Proposed Master Plan to be a prerequisite in attaining the Kenya's Vision 2030.

Moreover, Environment's cleanliness and security is ensured via protection and conservation and conservation of sensitive areas such as wetlands and wildlife corridors and migratory routes which can be done by conducting specific project's Environmental and Social Impact Assessments and developing of comprehensive mapping of land use patterns in Kenya.

4.4.2 The Government of Kenya's Big Four Agenda

The National government came up with the Big Four agenda with four pillars; manufacturing, universal healthcare, affordable housing, and food security. This is fully supported by President Uhuru Kenyatta in a bid to cement his legacy. The government allocated Sh44.6 billion for universal health coverage, Sh6.5 billion for provision of affordable and decent housing for all Kenyans, Sh20.25 billion to enhance food and nutrition security to all Kenyans by 2022, and Sh2.4 billion to support value addition and raise the manufacturing sector's share to gross domestic product to 15 per cent by 2022. To make the Big Four Agenda a success, the government plans to create partnerships with the private sector and development partners with the final goal of accelerating economic growth of the country through achievement of the four pillars.

The proposed Tatu City extension Master Plan offers a direct linkage to the Big Four Agenda as it provides adequate land for high end residential premises. This provision links very well with the goals and objectives of the Big Four Agenda for provision of affordable housing by investing in the housing sector. In enhancing the manufacturing sector, the government is proposing to promote industries like leather, textile and agro-processing. Similarly, Tatu City extension Master Plan, lays out substantial land for development of special economic zones, SME and industrial parks. As such, the proposed Tatu City extension contributes greatly to the government's Big Four Agenda on manufacturing.

4.4.3 The Kenya National Climate Change Response Strategy of 2010

This strategy provides measures that the Government of Kenya is taking to address issues related to the impact of climate change on various sectors of the economy. The proposed Master Plan will need to take on board the effects of changing climate in the country and apply climate change mitigation measures.

4.4.4 The National Biodiversity Strategy of 2000

The National Biodiversity Strategy and Action Plan (NBSAP) was formulated to enable Kenya address national and international commitments defined in Article 6 of the Convention on Biological Diversity (CBD). The strategy is a national framework of action for ensuring that the present rate of biodiversity loss is reversed, and present levels of biological resources are maintained at sustainable levels for posterity. The general objectives of the strategy are to conserve Kenya's biodiversity; to sustainably use its components; to fairly and equitably share the benefits arising from the utilization of biological resources

among the stakeholders; and to enhance technical and scientific cooperation nationally and internationally, including the exchange of information in support of biological conservation. The proposed Master Plan will need to comply with the requirements of this strategy since the land uses may interfere with biodiversity in some sections along the wetlands.

The Proposed Tatu City extension Master Plan has made provisions to ensure a clean and healthy environment through the environmental and social management plan. This will ensure protection of the biodiversity. It is also anticipated that Tatu City Extension (Mchana Estate) will be guided by the Kenya National Biodiversity Strategy and Action Plan, considering environmental protection and conservation. The proposed development has the potential of impacting on biodiversity including wetlands, forests resources and other natural environment. It is crucial to take appropriate measures to minimize interference and maximize conservation and proper utilization of biodiversity within the development area.

4.4.5 The National Water Master Plan 2030

The National Water Master Plan (NWMP) 2030 was launched on 26th March 2014. It is a product of an intensive study of Kenya's water resources and meteorological conditions to facilitate planning for development and management of the same. The objectives of the Project were: To assess and evaluate availability, reliability, quality, and vulnerability of the country's water resources up to around 2050 taking into consideration climate change; To renew the National Water Master Plan towards the year 2030 taking into consideration climate change; To formulate an action plan for activities of WRA up to 2022 to strengthen their capability; To strengthen the capacity of water resources management through transfer of technology.

NWMP 2030 has been prepared for six catchment areas which are management units of WRA. These include; Athi Catchment Area (ACA) – Machakos; Ewaso Ng'iro North Catchment Area (ENNCA) – Nanyuki; Lake Victoria North Catchment Area (LVNCA) – Kakamega; Lake Victoria South Catchment Area (LVSCA); Rift Valley Catchment Area (RVCA) – Nakuru and Tana Catchment Area (TCA) – Embu. The NWMP 2030 consist of the following nine component plans: a) Water Supply Development Plan; b) Sanitation Development Plan; c) Irrigation Development Plan; d) Hydropower Development Plan; e) Water Resources Development Plan; f) Water Resources Management Plan; g) Flood and Drought Disaster Management Plan and h) Environmental Management Plan.

The proposed Tatu City Extension (Mchana Estate) Master Plan fits within the Athi Catchment hence will require to be in line with the development plans and overall NWMP. The Master Plan aims at ensuring protection of water resources within the Master Plan area and management of water including proper rain water harvesting and creating buffer zones for protection of water bodies. Tatu City Limited should input all strategies necessary to ensure adequate provision of water to the city residents.

4.4.6 The Kenya National Spatial Plan (2015-2045)

The National Spatial Plan is a long-term plan that covers a period of 30 years and provides a spatial structure that defines how the national space is going to be utilized for the realization of optimal and sustainable use of our land. The Plan provides a spatial framework upon which the various sectoral plans and policies will be anchored and is a basis for preparation of all other lower level plans. The Plan covers the entire Kenyan territory and the Exclusive Economic Zone (EEZ). The Plan addresses the disconnect between economic and spatial planning that has led to uncoordinated and unguided development by establishing a broad physical planning framework that provides physical planning policies to support economic and sectoral planning. The National Spatial Plan is therefore, designed to provide a national spatial planning framework for integration of social, economic and environmental policies. The proposed Tatu city Extension Master Plan should be able to adhere to the goals of the national spatial plan in order to promote planned and sustainable development. The development should achieve a balance between economic and spatial planning by bridging the gap.

4.4.7 Agricultural Sector Development Strategy 2010-2020

Agricultural Sector Development Strategy 2010-2020 is the overall national policy document that guides all agricultural stakeholders and ministries in Kenya. It outlines the characteristics, challenges,

opportunities, vision, mission, strategic thrusts and the various interventions that the ministries will undertake to propel the agricultural sector to the future. The policy document advocates for improved management of the environment and natural resources, improved environmental conservation and improved pollution and waste management. The proposed Tatu City Extension (Mchana Estate) Master Plan should ensure sustainable management of riparian reserves, wildlife and establishment of green belts in the development. The Master Plan has designated areas for agricultural zones in order to promote agricultural practices.

4.4.8 National Master Plan for the Conservation and Sustainable Management of Water Catchment Areas in Kenya, 2012

The Master Plan was formulated to create a framework that will support the rehabilitation, protection and conservation of important water catchment areas in Kenya to ensure sustainable use of water resources. This includes the two dams within the proposed Tatu City Master plan.

The proponent of the proposed Tatu City Extension (Mchana Estate) Master Plan should ensure water catchment areas within the development area are conserved and protected during and after implementation of the Master Plan, and this will be done in collaboration with relevant stakeholders such as WRA and ATHI Water.

4.4.9 The Big Four Tourism Plan 2030

The Big Four Tourism Plan 2030 was created by the Ministry of tourism to review its marketing strategy in a bid to upscale the tourism sector and reclaim Kenya's position as a leader in the sector. The blueprint provides strategies that aim at ensuring that the country's tourism sector unlocks its maximum potential. The plan calls for innovative approaches in the management of the tourism sector in Kenya to achieve Vision 2030, while outlining the tools and guidelines to achieve this. It is anchored on four pillars that include product strategy, marketing strategy, investment promotion and infrastructure strategy.

To achieve this, the plan aims at capitalizing on Kenya's rich biodiversity by protecting indigenous animals, plants, habitats and ecosystems, and maintaining its purity for future generations while at the same time minimizing challenges that face wildlife and habitats such as climate change, population growth, pollution, poaching and human wildlife conflict. The Plan acts as a transformational framework for the tourism sector in Kenya offering modern approaches to tourism with vibrant, innovative and inclusive propositions that seek to provide unforgettable experiences to visitors, as well as ensure that tourism resources in the country benefit Kenyan communities.

The proposed Tatu city extension Master Plan consists of a comprehensive mix of land uses including residential, commercial, retail, tourism, social facilities and recreation which will be privately managed. This means that it will be able to attract both domestic and international tourists who will be eager to enjoy the facilities and biodiversity of the proposed development. The proposed Tatu City extension Master Plan also focuses on natural resources conservation as it has set aside substantial land for conservation (natural green spaces and water bodies) similarly, The Big Four Tourism Plan 2030 advocates for protection of Kenya's biodiversity including indigenous animals, plants, habitats and ecosystems and maintaining its purity for future generations. The proposed Tatu City mixed-use development activities are consistent with The Big Four Tourism Plan 2030 and are geared towards promoting tourism in the Country.

4.4.10 Nairobi Metro 2030

The Nairobi Metro created by the Ministry of Nairobi Metropolitan Development in 2008 outlines a strategy for the entire Nairobi Metropolitan Region by promoting development through rapid economic growth, employment and balanced wealth creation, poverty alleviation, meaningful youth engagement, and a vigorous pursuit of regional equity. The Nairobi Metro 2030 growth strategy aims to transform the Nairobi metropolitan region into a world class African region that offers sustainable wealth creation and a high quality of life for its residents, by the year 2030. In the Proposed Nairobi Metropolitan growth structure, the region includes Nairobi, Machakos, Kiambu and Kajiado Counties. One of the metropolitan within the Nairobi Metropolitan Region is Ruiru town which borders the proposed Tatu City. On completion of the development, Tatu City sets to promote development of not only within Ruiru town but also in the entire

Nairobi metropolitan region as it is expected to create employment, generate wealth through investments and business activities.

4.4.11 Nairobi Master Plan for Sewer, Sanitation and Drainage, Third Nairobi Water Supply

The Nairobi Sewerage Master Plan states that due to the ever-increasing population within the entire Nairobi Metropolitan Region, infrastructure development does not match the population growth rate that is currently estimated at 7.8% per annum in the urban regions of NMR. The Master Plan acknowledges that peri-urban boundaries of Nairobi are constantly growing at a projected population of 350,000 people in 1989 to 1.4 million people in 2020, this poses a major challenge to the County Government and the National Government due to the unavailability of a sewerage system in the area.

The Master Plan indicates that, to meet the envisaged development for Nairobi and its environs, there will be need to provide sewerage services through construction of own local sewerage treatment systems or by employing privately owned, on site treatment systems. The Master Plan proposes development of Ruiru II Sewerage Treatment Works for the growing population of Ruiru town estimated to grow to 237,413 persons from 174,877 persons according to the 2009 census.

Development of the Proposed Tatu city in Ruiru Municipality will further lead to increased population in the area hence the need for a well-developed modern sewer and drainage system to effectively cater for the expected population.

4.5 Legal Framework / Laws and Key relevant Regulations

There are several legal provisions on environmental protection, which touch on and regulate the development of infrastructure like Tatu City (Mchana Estate). A brief review of the various legislations relevant to the development is given hereunder. The following pieces of legislations are applicable to the proposed Tatu City (Mchana Estate).

4.5.1 Environmental Management and Coordination Act (EMCA Cap 387)

EMCA Cap 387 apply to all policies, plans and programs as specified in part IV, part V and the Second Schedule of the Act. According to Part VI of the Act, section 42 (1), the lead agencies in consultation with the Authority are mandated to subject all proposals for public policy, plans and programmes to a Strategic Environmental Assessment to determine which ones are the most environmentally friendly and cost effective when implemented individually or in combination. The SEA must consider the effect of implementation of alternative policy action on the use of natural resources, protection and conservation of biodiversity, human settlement and cultural issues, socio-economic factors, the protection, conservation of natural physical surroundings of scenic beauty as well as protection and conservation of built environment of historic or cultural significance. The principles of SEA must also be incorporated in any sector or national policy development. The Tatu City Extension (Mchana Estate) Master Plan has been subjected to a SEA as per the requirement of these regulations. Below is a highlight of key regulations under EMCA, Cap 387;

4.5.1.1 Environmental Management and Coordination (Environmental Impact Assessment and Audit) Regulations, 2003

These regulations stipulate the steps to be followed when undertaking an Environmental Impact Assessment, and Environmental Audit. The proposed Master Plan land uses will have impacts on several environmental compartments and several considerations will have to be made when assessing them as prescribed in the Second Schedule of the regulations. All developments / projects within the proposed Master Plan that falls under the Second Schedule of the EMCA Cap 387, will require to undergo an Environment Impact Assessment/Audit which will be carried out in accordance with these regulations. The regulations stipulate the ways in which environment impact assessment and audits should be conducted. The project falls under the second schedule of EMCA, Cap 387 that requires an Environmental Impact Assessment Study be undertaken to provide baseline information upon which subsequent environmental control audit shall be based.

4.5.1.2 Environmental Management and Coordination (Water Quality) Regulations, 2006

Water Quality Regulations apply to water used for domestic, industrial, agricultural, and recreational purposes; water used for fisheries and wildlife purposes, and water used for any other purposes. Different standards apply to different modes of usage. These regulations provide for the protection of lakes, rivers, streams, springs, wells and other water sources. The effective enforcement of the water quality regulations will lead to a marked reduction of water-borne diseases and hence a reduction in the health budget.

The regulations also provide guidelines and standards for the discharge of poisons, toxins, noxious, radioactive waste or other pollutants into the aquatic environment in line with the Third Schedule of the regulations. The regulations have standards for discharge of effluent into the sewer and aquatic environment. While it is the responsibility of the sewerage service providers to regulate discharges into sewer lines based on the given specifications, NEMA regulates discharge of all effluent into the aquatic environment. Everyone is required to refrain from any actions, which directly or indirectly cause water pollution, whether or not the water resource was polluted before the enactment of the Environmental Management and Coordination Act (EMCA Cap 387). The Tatu City Extension (Mchana Estate) Master Plan will incorporate these regulations to protect human health and the environment.

4.5.1.3 Environmental Management and Coordination (Waste Management) Regulations, 2006

These regulations stipulate how the different types of waste streams should be stored, transported, and disposed of. The type of waste streams described herein include solid waste, industrial waste, hazardous waste, pesticides and toxic substances, biomedical waste and radioactive substances. The regulations also stipulate the conditions for licensing any person dealing with the transport or waste disposal. The Tatu City Extension (Mchana Estate) Master Plan will also incorporate the waste management regulations to offer proper guidelines in waste management.

4.5.1.4 Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009

These regulations prohibit any person from making or causing any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment. It also stipulates the factors to be considered when determining the amount of noise produced from various sources. The regulations further provide the permissible noise levels within different neighborhoods at different times. In determining whether noise is loud, unreasonable, unnecessary or unusual, the following factors may be considered:

- Time of the day;
- Proximity to residential area;
- Whether the noise is recurrent, intermittent or constant;
- The level and intensity of the noise;
- Whether the noise has been enhanced in level or range by any type of electronic or mechanical means; and,
- Whether the noise is subject to be controlled without unreasonable effort or expense to the person making the noise.

The Tatu City Extension (Mchana Estate) Master Plan will be guided by these regulations to ensure that all land use changes and developments envisioned in the Master Plan execution comply with the provisions of the regulations.

4.5.1.5 Environmental Management and Coordination (Air Quality) Regulations, 2014

These regulations provide for the prevention, control and abatement of air pollution to ensure clean and healthy ambient air. It applies to all internal combustion engines, all premises, places, processes, operations, or works to which the provisions of the Act and Regulations made thereunder apply, and any other appliance or activity that the Cabinet Secretary may by order in the Gazette, specify. They stipulate

the measures to prevent air pollution from both stationary and mobile phases. They also provide for the permissible occupational exposure limits. The Master Plan will incorporate these provisions to ensure ambient air quality is attained at the development and operation stage

4.5.1.6 The Environmental Management and Coordination (Wetlands, Riverbanks, Lakeshores, and Seashores Management) Regulations, 2009

The objective of these regulations is to ensure that the wetlands and wetland resources, Riverbanks, lakeshores and seashores are used and managed in a sustainable manner. The regulations provide conditions for an area to be declared as a protected wetland and its subsequent use after the declaration. They also provide for special measures that should be undertaken to protect the Riverbanks, lakeshores and seashores from degradation. These regulations will be incorporated in the Tatu City Extension (Mchana Estate) Master Plan to ensure that the areas such as Riverbanks are protected.

4.5.1.7 Environmental Management and Coordination (Conservation of Biodiversity) Regulations, 2006

These regulations prohibit any person from engaging in any activity that may have an adverse impact on any ecosystem, lead to the introduction of any exotic species or lead to unsustainable use of natural resources without an Environmental Impact Assessment License issued by the Authority under the Act. It stipulates the measures to be undertaken in a bid to conserve any threatened species, and provides for the protection of environmentally significant areas. These regulations will be incorporated in the Tatu City (Mchana Estate) Master Plan to ensure that any species of importance within the development area will be protected.

4.5.2 Occupational Safety and Health Act (OSHA 2007)

Occupational Safety and Health Act applies to all workplaces where any person is at work, whether temporarily or permanently. The purpose of the Act is to secure the safety, health and welfare of persons at work and protect persons other than persons at work against risks to safety and health arising out of the activities of persons at work. Section 19 of the Act provides that an occupier of any premises likely to emit poisonous, harmful, injurious or offensive substances, into the atmosphere shall use the best practicable means to prevent such emissions into the atmosphere and render harmless and inoffensive the substances which may be emitted. During the execution of the Master Plan, there will be the need to ensure that all employees and people around the area are protected against any risks that could arise from the operations, hence the provisions of this Act will be incorporated.

4.5.3 Climate Change Act, 2016

This Act provides for a regulatory framework for enhanced response to climate change; to provide for mechanism and measures to achieve low carbon climate development, and for connected purposes. This Act is applicable for the development, management, implementation and regulation of mechanisms to enhance climate change resilience and low carbon development for the sustainable development of Kenya and envisioned Tatu City (Mchana Estate) Phase 1I development. The Act's main objectives related to the various development zones for the proposed Master Plan are;

- a) Mainstream climate change responses into development planning, decision making and implementation;
- b) Build resilience and enhance adaptive capacity to the impacts of climate change;
- c) Formulate programmes and plans to enhance the resilience and adaptive capacity of human and ecological systems to the impacts of climate change;
- d) Mainstream and reinforce climate change disaster risk reduction into strategies and actions of public and private entities;
- e) Mainstream intergenerational and gender equity in all aspects of climate change responses;
- f) Provide incentives and obligations for private sector contribution in achieving low carbon climate resilient development;

- g) Promote low carbon technologies, improve efficiency and reduce emissions intensity by facilitating approaches and uptake of technologies that support low carbon, and climate resilient development;
- h) Facilitate capacity development for public participation in climate change responses through awareness creation, consultation, representation and access to information;
- i) Mobilize and transparently manage public and other financial resources for climate change response;
- j) Mainstream the principle of sustainable development into the planning for and decision making on climate change response.

4.5.4 Wildlife Management and Conservation Act 2013

The Wildlife and Conservation Act deals with the conservation and management of wildlife in Kenya. The Act provides that wildlife should be conserved so as to yield optimum returns in terms of cultural, aesthetic, scientific and economic benefits. The Act requires that full account be taken of the inter-relationship between wildlife conservation and land use. The Act controls activities within the national parks, which may lead to the disturbance of wild animals. Unauthorized entry, residence, burning, damage to objects of scientific interest, introduction of plants and animals and damage to structure are prohibited under this law. The development envisioned in the Master Plan will interact with wildlife areas hence Tatu City Limited will need to ensure the provisions of this act are implemented.

4.5.5 The Forest Conservation and Management Act, 2016

This law was enacted by Parliament to give effect to Article 69 of the Constitution with regard to forest resources; to provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socioeconomic development of the country and for connected purposes. Parts of the proposed Master Plan land uses will interact with forests albeit artificial. The Act requires all woodlands to be managed on a sustainable basis for the purposes inter alia of conservation of water, soil and biodiversity, riparian and shoreline protection, sustainable production of wood and non-wood products. Community participation as provided for in the Act should be encouraged. The most appropriate would be the initiation of participatory forest management so that the local community and organization can have a significant input with Kenya Forest Service (KFS) office playing a coordination role.

4.5.6 Water Act, 2016

This Act provides the legal framework for the regulation, management and development of water resources and water, and sewerage services in line with the Constitution. The Act gives provisions regarding ownership of water, institutional framework, national water resources, management strategy, and requirement for permits, state schemes and community projects. The Tatu City Extension (Mchana Estate) Master Plan will incorporate the provisions of the Act as it will include the development of infrastructure for water supply within the proposed city.

4.5.7 Energy Act 2019

The energy Act aims to consolidate the laws relating to energy, to provide for National and County Government functions in relation to energy, to provide for the establishment, powers and functions of the energy sector entities; promotion of renewable energy; exploration, recovery and commercial utilization of geothermal energy; regulation of midstream and downstream petroleum and coal activities; regulation, production, supply and use of electricity and other energy forms; and for connected purposes. The Act establishes the Energy and Petroleum Regulatory Authority to ensure generation, importation, exportation, transmission, distribution, supply and use of electrical energy except for licensing of nuclear facilities.

4.5.8 Environment and Land Court Act, 2011

This Act was established to give effect to Article 162(2) (b) of the Constitution; to establish a superior court to hear and determine disputes relating to the environment and the use and occupation of, and title to, land, and to make provision for its jurisdiction functions and powers, and for connected purposes. The principle

objective of this Act is to enable the court to facilitate the just and expeditious resolution of land disputes. This Act will be taken into consideration in the Tatu City Extension (Mchana Estate) Master Plan to facilitate the resolution of any land disputes that may arise during its execution.

4.5.9 County Governments Act, 2012

This is an Act of parliament to give effect to Chapter Eleven of the Kenyan Constitution; to provide for County government's powers, functions and responsibilities to deliver services and for connected purposes. The Act lays emphasis on the need for a consultative and participatory approach where the principles of planning and development facilitation in a County serve as a basis for engagement between the County government and the citizens and other stakeholders. The County government of Kiambu County will play an important role during the execution of the Tatu City Extension (Mchana Estate) Master Plan.

4.5.10 Agriculture, Fisheries and Food Authority Act, 2013

The Act provides legislation for the control over soil conservation and development. The Cabinet Secretary may provide guidelines for several matters for the purpose of the conservation of the soil, or the prevention of the adverse effects of soil erosion on any land. These may include: prohibiting, regulating or controlling the undertaking of any agricultural activity including the firing, clearing or destruction of vegetation so as to protect the land against degradation, the protection of water catchment areas or otherwise, for the preservation of the soil and its fertility. The provisions of this Act will be considered in the Tatu City Extension (Mchana Estate) Master Plan to ensure that measures will be put in place to conserve the existing vegetation, and where necessary measures to replace the vegetation that may be affected during the execution.

4.5.11 Housing Act Cap 117

The Act established a National Housing Corporation (NHC) to perform the duties conferred on it by this Act. The primary mandate of NHC is to play a principal role in the implementation of the Government's Housing Policies and Programmes. The proposed Master Plan for TATU City Extension has a housing development sector which is in line with the national housing policy.

4.5.12 Education Act.

An Act of Parliament to provide for the regulation and progressive development of education in Kenya. The proposed Master Plan has set aside land use areas for development of educational institutions which should abide to the provisions of this act.

4.5.13 Sports Act 2013

An Act of Parliament to harness sports for development, encourage and promote drug-free sports and recreation; to provide for the establishment of sports institutions, facilities, administration and management of sports in the country, and for connected purposes. Proposed Tatu City (Mchana Estate) Master Plan has provisions for development of sports facilities which should be done in line with the Act and in consultation of relevant bodies established by the Sports Act.

4.5.14 Building Code 2000

This Act stipulates the procedures that should be followed before a development is carried out. It provides for application and payment for licenses and permits for construction. It also stipulates that the Authority should submit physical development plans to the relevant local authorities before a development is carried out. It provides the requirements for certificates of occupation of premises. The proposed Tatu City (Mchana Estate) Master Plan will be guided by this Act during its execution and operation.

4.5.15 Employment Act, 2007

The Act is enacted to consolidate the law relating to trade unions and trade disputes, to provide for the registration, regulation, management and democratization of trade unions and employers organizations and federations. The purpose of the Act is to promote sound labour relations through freedom of association, the encouragement of effective collective bargaining and promotion of orderly and expeditious dispute for the protection and promotion of settlements conducive to social justice and economic

development for connected purposes. This Act is important since it provides for an employer – employee relationship that is important for the execution of the Tatu City Extension (Mchana Estate) Master Plan.

4.5.16 Food Drugs and Chemicals Substances Act (Cap 254)

This is an Act of Parliament to make provision for the prevention of adulteration of food, drugs and chemical substances. Any person who contravenes the provisions of this Act commits an offence. The Act provides for the establishment of a Public Health (Standards) Board. The Act also provides for the cancellation of licenses of any person or institution that contravenes the provisions of this Act during the sale of food, drugs and chemical substances. The Tatu City Extension (Mchana Estate) Master Plan will be guided by this Act to ensure that its provisions are adhered to during execution.

4.5.17 Land Act, 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. Part VIII of this Act provides procedures for compulsory acquisition of interests in land. Section 111 (1) States that if land is acquired compulsorily under this Act, just compensation shall be paid promptly in full to all persons whose interests in the land have been determined. The Act also provides for settlement programmes. Any dispute arising out of any matter provided for under this Act may be referred to the Land and Environment Court for determination. Tatu City Limited will acquire land/ensure due diligence for the proposed development envisioned by the masterplan in accordance with this Act.

4.5.18 The Land Registration Act, 2012

This is an Act of Parliament that revises, consolidates and rationalizes the registration of titles to land, to give effect to the principles and objects of devolved government in land registration, and for connected purposes. The Act requires that there is proper marking and maintenance of boundaries. An interested person who has made an application to the Registrar for his/her boundaries to be ascertained, the Registrar shall give notice to the owners and occupiers of the land adjoining the boundaries in question of the intention to ascertain and fix the boundaries. With regard to the maintenance of boundaries, the Act requires every proprietor of land to maintain in good order the fences, hedges, stones, pillars, beacons, walls and other features that demarcate the boundaries, pursuant to the requirements of any written law.

4.5.19 National Land Commission Act, 2012 (No. 5 of 2012)

The National Land Commission of Kenya is an independent government commission whose establishment was provided for by the Constitution of Kenya to, amongst other duties, manage public land on behalf of the national and County governments, initiate investigations into present or historical land injustices, recommend appropriate redress, monitor and have oversight responsibilities over land use planning throughout the country. It was officially established under The National Land Commission Act, 2012. The duties of the commission are among others to monitor the registration of all rights and interests in land and ensure that public land and land under the management of designated state agencies are sustainably managed for their intended purpose and for future generations. The Commission is also required in consultation and cooperation with the national and County governments, to establish County land management boards for the purposes of managing public land. The Master Plan will ensure that the provisions of this Act are adhered to in order to eliminate any land related disputes.

4.5.20 Penal Code Act (Cap.63)

This Act stipulates the various activities and conduct that are considered to be unlawful or criminal in nature, and the penalties as provided for by the Act. According to section 191, any person who voluntarily corrupts or fouls the water of any public spring or reservoir, so as to render it less fit for the purpose for which it is ordinarily used, is guilty of a misdemeanor. Section 192 also stipulates that any person who voluntarily vitiates the atmosphere in any place, so as to make it noxious to the health of persons in general dwelling or carrying on business in the neighbourhood or passing along a public way, is guilty of a misdemeanor. The Master Plan will take into consideration the provisions of this Act to prevent deliberate water and air pollution during execution.

4.5.21 Physical and Land use Planning Act, 2019;

This Physical and Land Use Planning Act, 2019 make provision for the planning, use, regulation and development of land and for connected purposes. Article 5 of the Act under Principles and norms of physical and land use planning notes that every person engaged in physical and land use planning development activities shall be in a manner that integrates economic, social and environmental needs of present and future generations. The 3rd Schedule of the Act Article 1 gives considerations for Easements and Wayleaves of base transmission stations. Article 4 notes major developments should be subjected to environmental and social impact assessment. Tatu City should ensure compliance with the provisions of the act and land use planning. Public participation has been conducted to ensure the involvement of stakeholders in the planning process.

4.5.22 Public Health Act (Cap. 242)

This Act provides a guide on how to establish a Central Board of Health and how to appoint its members. It stipulates measures that should be put in place so as to prevent the spread of infectious diseases such as malaria and smallpox among others within the country. It also provides for protection of foodstuffs and water from contamination. It stipulates measures to prevent the entry of infectious diseases through the ports and inland borders. The Tatu City Extension (Mchana Estate) Master Plan will incorporate the Act to guide its execution as regards to public health.

4.5.23 Special Economic Zones Act, 2015

Kenya aims to transform Kenya into a newly industrialized 'middle-income country providing a high-quality life to all its citizens by the year 2030'. The Establishment of Special Economic Zones is Key to the achievement of this vision. This is an Act of Parliament to provide for the establishment of special economic zones; the promotion and facilitation of global and local investors; the development and management of enabling environment for such investments, and for connected purposes. The government declared Tatu City, through a Kenya Gazette Notice, a Special Planning Area (SPA), which means the master-planned city will be under state control rather than County authority. The Special Economic Zones (SEZ) Authority is the regulator of all SEZs. It is responsible for designing, approving, establishing, developing, operating, promoting and regulating an SEZ. It also issues licences and implements Government policies and programmes. Further, the Authority oversees the investment criteria and investment thresholds for the businesses in the zone and maintains records of the enterprises and residents operating in each zone.

This act will assist Tatu City Limited to fast track Tatu City's materialization by allowing for fast planning and cutting construction approval bureaucracies for homeowners within the project while also paving way for the development of Tatu City's Local Physical Development Plan whose key aim is to ensure coordinated and progressive development of the area in order to ensure health, safety, convenience, and the general welfare of its inhabitants.

Tatu City is now required to liaise with the Special Economic Zones Authority to establish and operationalize a 'one-stop' shop within the city to facilitate processing and issuance of development construction permits and certificates of occupancy as envisaged under the provisions of section 11 of the Special Economic Zones Act, No. 16 of 2015. This will provide a framework for the physical development and management of the area and guide the development control processes within Tatu City.

4.5.24 Standards Act Cap. 496

This Act is meant to promote the standardization of the specification of commodities, and to provide for the standardization of commodities and codes of practice. It also provides for the establishment of a Kenya Bureau of Standards, definition of its functions and provides for its management and control. The Code of practice is interpreted in the Act as a set of rules relating to the methods to be applied or the procedure to be adopted in connection with the construction, installation, testing, sampling, operation or use of any article, apparatus, instrument, device or process. The Act will be incorporated in the Master Plan to ensure that all the commodities that will be purchased and used during the execution will adhere to the provisions of this Act.

4.5.25 Work Injury Compensation Benefit Act (WIBA) 2007

This is an Act of Parliament to provide for compensation to employees for work related injuries and diseases contracted in the course of their employment and for connected purposes. The Act applies to all employees, including employees employed by the Government, other than the armed forces, in the same way and to the same extent as if the Government were a private employer. It is the duty of all employers to obtain and maintain an insurance policy from an approved insurer in respect of any liability the employer may incur as provided for by the Act. The Act also stipulates that an employee who suffers an accident that leads to disablement or death is subject to the provisions of this Act and is entitled to compensation. The Master Plan execution will incorporate this Act to ensure that all the employees who will be engaged during the execution are covered as provided for in the Act.

4.5.26 Public Roads and Roads of Access Act Cap 399

The Public Roads and Roads of Access Act Cap.399 Act states that a public road is any road which the public has a right to use immediately before the commencement of this Act, or all proclaimed or reserved roads and thoroughfares being or existing on any land sold or leased or otherwise held under the East Africa Land Regulations, 1897, the Crown Lands Ordinance, 1902, or the Government Lands Act at any time before the commencement of this Act and all roads and thoroughfares hereafter reserved for public use. The infrastructural developments in the proposed Master Plan will need to take note of the provisions of this Act.

4.5.27 The Kenya Roads Act, 2007

This is an Act of Parliament that provided for the establishment of Kenya Road Agencies i.e. Kenya National Roads Authority (KeNHA), the Kenya Urban Roads Authority (KURA) and the Kenya Rural Roads Authority (KeRRA) and provided powers and functions of the authorities.

KeNHA is mandated to manage, develop, rehabilitate and maintain all national roads. Other function vested to this authority relevant to the proposed project are: controlling national roads and road reserves and access to roadside developments; implementing road policies in relation to national roads; ensuring adherence to the rules and guidelines on axle load control prescribed under the Traffic Act (Cap. 403) and under any regulations under this Act; ensuring that the quality of road works is in accordance with such standards; in collaboration with the Ministry responsible for Transport and the Police Department, overseeing the management of traffic and road safety on national roads; collecting and collating all such data related to the use of national roads as may be necessary for efficient forward planning under this Act; monitoring and evaluating the use of national roads; planning the development and maintenance of national roads and liaising and coordinating with other road authorities in planning and on operations in respect of roads.

4.5.28 Traffic Act Cap 403

This is an Act of Parliament consolidating the laws that govern the use of traffic on the roads. It stipulates the procedures for vehicle registration, licensing, training of drivers and conduct of drivers when using the road. It also stipulates the offences committed on the road and the penalties to be imposed in relation to these offences. The proposed Master Plan execution stage will have a lot of traffic hence the Act provisions will be quite relevant.

4.5.29 Urban Areas and Cities Act No 13 of 2011

This Act of Parliament gives effect to Article 184 of the Constitution; to provide for the classification, governance and management of urban areas and cities; to provide for the criteria of establishing urban areas, to provide for the principle of governance and participation of residents and for connected purposes. The Tatu City (Mchana Estate) Master Plan will incorporate provisions of the Act to ensure that the proposed city is established as per the legislations

4.5.30 National Gender and Equality Act, 2011

National Gender Equality Commission is a constitutional Commission established by an Act of Parliament in August 2011, as a successor commission to the Kenya National Human Rights and Equality Commission pursuant to Article 59 of the Constitution. NGEC derives its mandate from Articles 27, 43, and Chapter Fifteen of the Constitution; and section 8 of NGEC Act (Cap. 15) of 2011, with the objectives of promoting gender equality and freedom from discrimination.

Gender mainstreaming in developments ensures that the concerns of women and men form an integral dimension of the design, implementation, operation and the monitoring and evaluation ensures that women and men benefit equally, and that inequality is not perpetuated.

4.5.31 The Sexual Offences Act, 2006 and its amendment 2012

Observing a standard work ethic is recommended to ensure persons from both genders are not subjected to sexual offences. Ample working environment should prevail in all workplaces in the envisioned development by the Master Plan to be enhanced through implementation of a Sexual Misconduct Policy.

4.5.32 Persons with Disability Act, Chapter 133

This act protects the rights of people with disabilities ensuring they are not marginalized and that they enjoy all the necessities of life without discrimination. The act guarantees that (1) No person shall deny a person with a disability access to opportunities for suitable employment, (2) A qualified employee with a disability shall be subject to the same terms and conditions of employment and the same compensation, privileges, benefits, fringe benefits, incentives or allowances as qualified able-bodied employees, (3) An employee with a disability shall be entitled to exemption from tax on all income accruing from his employment.

A person with disability is entitled to exemptions which apply with respect to exemptions and deductions as described in Schedule 42 subsection (2) of the Act, among other provisions within this Act that should be complied with all parties involved.

4.5.33 Tobacco Control Act, 2007

The Act of Parliament aims to control the production, manufacture, sale, labelling, advertising, promotion and sponsorship of tobacco products, to provide for the Tobacco Control Board, to regulate smoking in specified areas and for connected purposes. The developments envisioned by the proposed Tatu City Mchana Estate Master Plan are expected to educate the public on the dangers of tobacco use while protecting non-smokers from 2nd hand smoke.

4.5.34 Alcoholic Drinks Control Act, 2010.

The Alcoholic Drinks Control Act is an act of Parliament to regulate the production, sale, and consumption of alcoholic drinks, to repeal the Chang'aa Prohibition Act, the Liquor Licensing Act and for connected purposes. The developments envisioned by the proposed Tatu City (Mchana Estate) Master Plan are therefore expected to be in the forefront to ensure that the public is informed and sensitized on the dangers of alcohol use (economic, social & health) impacts.

4.6 Multilateral Environmental Agreements / Treaties

There are number of Multilateral Environmental Agreements (MEAs) that are relevant to the proposed Master Plan reviewed in detail.

- i. African Convention on the Conservation of Nature and Natural Resources
- ii. Earth Summit on Sustainable Development Agenda 21
- iii. International Labour Organization
- iv. Rio Declaration on Environment and Development
- v. The 1992 United Nations Framework Convention on Climate Change (UNFCCC)
- vi. The Paris Agreement
- vii. The Ramsar Convention for the conservation and sustainable utilization of wetlands

- viii. The World Commission on Environment and Development (The Brundtland Commission of 1987)
- ix. United Nations Convention on Biological Diversity (UNCBD)
- x. United Nations Convention to Combat Desertification (UNCCD)
- xi. Vienna Convention on the Protection of the Ozone Layer

4.6.1 African Convention on the Conservation of Nature and Natural Resources (Africa Union, 1968)

The African Convention on the Conservation of Nature and Natural Resources, Article II – Fundamental Principle states the Setting aside areas for the propagation, protection, conservation and management of vegetation and wild animals as well as for the protection of sites, land-spaces or geological formations of particular scientific or aesthetic value, for the benefit and enjoyment of the general public.

4.6.2 Earth Summit on Sustainable Development, Agenda 21

The Agenda 21 entails a comprehensive plan of action to be undertaken globally, nationally and locally by organizations affiliated to the United Nations, governments, and other groups in every area in which humans' impact on the environment. Kenya continues to implement Agenda 21 plan of action by incorporating its principles in national policies, plans, programmes and strategies. The provisions have also been incorporated in the Master Plan to promote sustainable development, which comprises of the three underlying tenets of economic, social and ecology, which will be articulated in the Environmental and Social Management and monitoring Plan.

4.6.3 Ramsar Convention on Wetlands

The Ramsar Convention on Wetlands is primarily concerned with the conservation and management of wetlands. Parties to the convention are required to promote prudent use of wetlands within their territories and to take measures for the conservation of the same. One way to conserve the wetlands (as proposed under this convention) is establishing nature reserves whether they are included in the Ramsar list or not.

The wetlands include swamps, marshes, bogs, soaks, shallow lakes, ox-bow lakes, River meanders and flood plains, as well as Riverbanks, lakeshores where wetland plants grow. They also include marine and intertidal wetlands such as deltas, estuaries, mudflats, mangroves, salt marshes, sea grass beds, shallow coral reefs and creeks. The Tatu City Extension (Mchana Estate) Master Plan is expected to observe and adhere strictly to the Ramsar Convention's principles of prudent use of wetlands especially in controlling developments along the Riverine areas.

4.6.4 United Nations Convention on Biological Diversity (UNCBD)

The purpose of this convention is to ensure the conservation and sustainable use of biodiversity. Kenya signed the convention on 5th June 1992 and ratified the same on 26th July 1992. The National Environment Management Authority (NEMA) is the national focal point to this Convention. The provisions of this convention have been integrated in many laws of Kenya such as Wetlands, Riverbanks, Lake Shore and Sea Shore Management Regulations, 2009 (Legal Notice No. 19). The industrial park proposes the establishment of industrial investments that are agro-based whose operations have direct implications on the natural plant biodiversity through the utilization of raw materials and industrial processing.

4.6.5 United Nations Framework Convention on Climate Change (UNFCCC)

The primary purpose of the convention is to establish methods to minimize global warming and in particular emission of greenhouse gases. The United Nations Framework Convention on Climate Change (UNFCCC) was adopted on 9th May 1992 and came into force on 21st March 1994. Kenya ratified the Convention on 30th August 1994 thereby committing to join the international community in combating the problem of climate change. The National Environmental Management Authority is the agency acting as the national focal point for this protocol. The objective of the Convention is; "Stabilization of the greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (UNFCCC).

4.6.6 Kyoto Protocol to the United Nations Framework Convention on Climate Change

The Kyoto Protocol requires signatories to the United Nations Framework Convention on Climate Change to reduce their greenhouse emissions levels to 5% below 1990 levels by the year 2012. The Protocol came into force on 16th February 2005, after it received the pre-requisite signatures. However, major countries like United States, China, India, and Australia are not signatories to the Protocol. NEMA is the national focal point for this Protocol.

4.6.7 Vienna Convention for the Protection of the Ozone Layer

Intergovernmental negotiations for an international agreement to phase out ozone depleting substances concluded in March 1985 with the adoption of the Vienna Convention for the Protection of the Ozone Layer. This Convention encourages intergovernmental cooperation on research, systematic observation of the ozone layer, monitoring of CFC production, and the exchange of information.

The convention's declaration demands a voluntary attempt at monitoring development processes, their resultant emissions and the impacts on the ozone layer for purposes of knowledge and information sharing in order to combat the same. The Master Plan proposes industrial development, and therefore the SEA report has determined and put in place measures to minimize the emissions that affect the ozone layer through technological monitoring of gaseous emissions and their toxicity levels for purposes of minimizing the same.

4.6.8 Rio Declaration and Agenda 21

The Rio Declaration and Agenda 2, the action plan for the 21st century are two non-legally binding instruments adopted by the 1992 United Nations Conference on the Environment and Development (UNCED). While the Rio Declaration contains general principles and objectives, Agenda 21 contains detailed guidance on their practical implementation. Principle 4 of the Rio Declaration provides that to achieve sustainable development environmental protection shall constitute an integral part of the development process and cannot be considered in isolation from it. Principle 25 accentuates this by stating that peace, development and environmental protection are interdependent and indivisible.

4.6.9 The World Commission on Environment and Development (The Brundtland Commission of 1987)

The Commission in its 1987 report dubbed "Our Common Future" focused on the environmental aspects of development, in particular the emphasis on sustainable development that produces no lasting damage to the biosphere and to particular ecosystems. In addition to environmental sustainability is economic and social sustainability. Economic sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resources. While social sustainable development is development that maintains the cohesion of a society and its ability to help its members work together to achieve common goals, while at the same time meeting individual needs for health and well-being, adequate nutrition, and shelter, cultural expression and political involvement. The key aspect of sustainability is the interdependence of generations. The concept of EIA is embodied in many multilateral environmental agreements. Principle 17 of the Rio Declaration provides that environmental impact assessment as a national instrument shall be undertaken for proposed activities that are likely to have a significant impact on the environment and are subject to a decision of a competent national authority.

4.6.10 Convention on the Elimination of all forms of Discrimination against Women

The Convention on the Elimination of all forms of Discrimination against Women (CEDAW) places explicit obligations on states to protect women and girls from sexual exploitation and abuse. Universal Declaration of Human Rights (Article 7), the UN Charter (Articles 1, 13, 55, and 76) and the International Covenant on Civil and Political Rights (Article 24) reaffirm the freedoms and rights of all children, including internally displaced children.

4.6.11 International Labour Organization

The International Labour Organization (ILO) is built on the constitutional principle that universal and lasting peace can be established only if it is based upon social justice. The ILO has generated such hallmarks of industrial society as the eight-hour working day, maternity protection, child-labour laws, and a range of policies which promote workplace safety and peaceful industrial relations.

The key ILO Conventions applicable to the proposed developments envisioned by the Master Plan include:

- Equal Remuneration Convention (1951) (No. 100) - Calls for equal pay and benefits for men and women for work of equal value.
- Discrimination (Employment and Occupation) Convention (1958) (No. 111) - Calls for a national policy to eliminate discrimination in access to employment, training, and working conditions, on grounds of race, colour, sex, religion, political opinion, national extraction or social origin, and to promote equality of opportunity and treatment.
- Minimum Age Convention (1973) (No. 138) - Aims at the abolition of child labour, stipulating that the minimum age for admission to employment shall not be less than the age of completion of compulsory schooling.
- Worst Forms of Child Labour Convention (1999) (No. 182) - Calls for immediate and effective measures to secure the prohibition and elimination of the worst forms of child labour which include slavery and similar practices, forced recruitment for use in armed conflict, use in prostitution and pornography, any illicit activity, as well as work which is likely to harm the health, safety, and morals of children.

4.6.12 Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs) are a new, universal set of goals, targets and indicators that UN member states will be expected to use to frame their agendas and political policies over the next 15 years. The SDGs include 17 Sustainable Development Goals and 169 targets. The 17 sustainable development goals (SDGs) include:

- | | |
|---------------------------------------------------|---------------------------------------------------|
| ▪ GOAL 1: No Poverty | ▪ GOAL 10: Reduced Inequality |
| ▪ GOAL 2: Zero Hunger | ▪ GOAL 11: Sustainable Cities and Communities |
| ▪ GOAL 3: Good Health and Well-being | ▪ GOAL 12: Responsible Consumption and Production |
| ▪ GOAL 4: Quality Education | ▪ GOAL 13: Climate Action |
| ▪ GOAL 5: Gender Equality | ▪ GOAL 14: Life Below Water |
| ▪ GOAL 6: Clean Water and Sanitation | ▪ GOAL 15: Life on Land |
| ▪ GOAL 7: Affordable and Clean Energy | ▪ GOAL 16: Peace and Justice Strong Institutions |
| ▪ GOAL 8: Decent Work and Economic Growth | ▪ GOAL 17: Partnerships to achieve the Goal |
| ▪ GOAL 9: Industry, Innovation and Infrastructure | |

The Sustainable Development Goals (SDGs) seek to build on the Millennium Development Goals that expired in 2015. Most notably SDGs are integrated, indivisible and balance the three dimensions of sustainable development: the economic, social and environmental. This Master Plan is expected to cut-across the three dimensions of sustainable development hence making SDGs a key reference point. The SDGs are also linked to several Kenyan legal frameworks such as Water Act, Forestry Act, and EMCA Cap 387.

4.7 Institutional Framework

The SEA process extends the aims and principles of Environmental Impact Assessment (EIA) upstream in the decision-making process. Section 57A of EMCA (Cap 387) and Environmental (Impact Assessment and Audit) Regulations, 2003 recognizes SEAs as a measure of environmental impact assessment at strategic

level such as policy, plans and programmes. EMCA (CAP 387) Section 57A requires all Policies, Plans and Programmes for implementation to be subjected to Strategic Environmental Assessment. The Regulations section 42 and 43 address Strategic Environment Assessment; section 42(1) requires Lead Agencies in consultation with NEMA to subject all policy, plans and programmes for implementation to a Strategic Environment Assessments. Regulation 42(3) commits the government and all Lead agencies to incorporate principles of SEA in the development of sector or national policy.

4.7.1 Key National Institutions and Departments

At present there are over twenty (20) institutions and departments under the umbrella of different ministries albeit others being semi-autonomous; which deal with environmental issues in Kenya. Some of the key institutions which are relevant to the proposed Tatu City (Mchana Estate) include;

- i. National Environmental Management Authority (NEMA),
- ii. Kenya Forestry Service (KFS),
- iii. Kenya Wildlife Services (KWS),
- iv. Water Resources Authority (WRA)

4.7.1.1 Ministry of Water and Sanitation

Strategic functions of the Ministry of Water and Sanitation include;

- Accelerating the implementation of water sector reforms;
- Improving the sustainable management of water resources;
- Improving the provision of water and sewerage services;
- Improving utilization of land through irrigation and land reclamation;
- Strengthening institutions in the Ministry and the water sector;
- Mobilizing resources and promoting efficiency in their utilization; Improving the management and access to water resources information.

4.7.1.1.1 National Water Conservation and Pipeline Corporation

The National Water Conservation and Pipeline Corporation (NWPC) was established under the State Corporation's Act Chapter 446 of the Laws of Kenya as an autonomous agency. NWPC overall goal is to enhance social and economic wellbeing of all Kenyans through improved access; availability and reliability of water supply. The long-term objectives are to seek to bridge the gap between the demand and supply of water which is in line with Kenyan Constitution and Vision 2030. The main objectives of the corporation is to develop state schemes and spearhead dam construction for water supplies, flood control and other multi-purpose uses; land drainage and construction of dykes; Carry out groundwater recharge using flood water; Develop, retain existing and expand bulk water supply to Water Service Boards and other Water Service Providers.

4.7.1.1.2 Water Resources Authority (WRA)

Water Resources Authority (WRA) is a state corporation established under Section 11 of the Water Act, 2016. Pursuant to Section 6 of the Act, the Authority is an Agent of the National Government responsible for regulating the management and use of water resources. The Water Act, 2016 makes extensive provisions on the Authority's role in regulating the use and management of water resources. WRA was operationalized on 21st of April 2017, vide Gazette Notice No. 59. However, the Authority has been in existence for 12 years following its establishment under the Water Act, 2002 as Water Resources Management Authority (WRMA). WRA will provide the necessary borehole and water extraction permits from local streams.

4.7.1.2 Ministry of Environment and Natural Resources

The Ministry was established and mandated to undertake protection, conservation and development of environment and natural resources to ensure sustainable development. Semi-Autonomous Government Agencies under the Ministry of Environment and Natural Resources include:

- i. National Environment Management Authority (NEMA)
- ii. Kenya Water Towers Agency (KWTA)
- iii. Kenya Wildlife Service (KWS)
- iv. Kenya Forest Service (KFS)
- v. Kenya Forest Research Institute (KEFRI)

National Environmental Management Authority (NEMA): NEMA is a semi-autonomous agency under the Ministry of Environment, established to exercise general supervision and co-ordinate over all matters relating to the environment and to be the principal instrument of the government in the implementation of all policies relating to the environment. The Director General appointed by the president heads NEMA. Any project that falls under the second schedule of EMCA, Cap 387 shall seek an Integrated Environmental Impact Assessment Licence from NEMA.

Kenya Wildlife Service (KWS): KWS is a state corporation that was established by an Act of Parliament (Cap 376), now repealed by WCMA (2013), with the mandate to conserve and manage wildlife in Kenya, and to enforce related laws and regulations. KWS undertakes conservation and management of wildlife resources across all protected areas systems in collaboration with stakeholders. KWS goal is to work with others to conserve, protect and sustainably manage wildlife resources.

4.7.1.3 Ministry of Labour and social development

The mandate of the ministry is “formulation, review and implementation of employment, national human resource planning and development, national Labour productivity, Facilitating and Tracking Employment creation, Co-ordination of National employment, Internship and Volunteers for public service, Community Development, Protection and advocacy of needs of Persons with Disabilities, and Workplace Inspection and Workman’s Compensation. The Labour Department is the Ministry’s focal point agency responsible for implementation of the three major Labour Laws; namely: The Employment Act, 2007; The Labour Institutions Act, 2007; and The Labour Relations Act, 2007.

The Directorate of Occupational Safety and Health Services (DOSHS) is one of departments within the Ministry of Labour and social protection, whose primary objective is to ensure safety, health and welfare of all workers in all workplaces. Unsafe and unhealthy work environment causes accidents, diseases, disasters and environmental pollution that occasion huge economic and social burdens to individuals and enterprises thereby stifling economic and social growth.

4.7.2 Institutions under EMCA Cap 387

There are other institutional arrangements provided for within the EMCA Cap 387 and relevant to the developments envisioned in the Master Plan. The roles are reviewed and discussed into details below:

4.7.2.1 National Environmental Tribunal

The National Environment Tribunal (NET) created under Section 125 of EMCA Cap 387 has the following functions:

- To hear and determine appeals from NEMA’s decisions and other actions relating to issuance, revocation or denial of (EIA) licences or amount of money to be paid under the Act and imposition of restoration orders;
- To give direction to NEMA on any matter of complex nature referred to it by the Director General; and

If the proponent disagrees with NEMA decisions in exercising the above-mentioned functions, then they may lodge a case at the NET to seek to overturn the decision. Should this avenue not lead to a favourable ruling from the NET, an appeal may be lodged in the Environment and Land Court.

4.7.2.2 National Environmental Complaints Committee

The National Environmental Complaints Committee performs the following functions:

- Investigate any allegations or complaints against any person or against the authority in relation to the condition of the environment in Kenya and on its own motion, any suspected case of environmental degradation and to make a report of its findings together with its recommendations thereon to the Cabinet Secretary.
- Prepare and submit to the Cabinet Secretary periodic reports of its activities which shall form part of the annual report on the state of the environment under section 9 (3) and
- To undertake public interest litigation on behalf of the citizens in environmental matters.

This committee will act as a safeguard for members of the public who feel aggrieved by actions taken under the proposed project and can exercise their constitutional rights to launch a complaint should they have exhausted all other grievance redress mechanisms available to them.

4.7.2.3 National Environment Action Plan Committee

The Authority is responsible for the development of a 6-year National Environment Action plan and shall ensure that it has undertaken public participation before the adoption of the plan. The National Environment Action Plan shall:

- Contain analysis of the Natural Resources of Kenya with an indication as to any pattern of change in their distribution and quantity over time.
- Contain analytical profile of the various uses and value of the natural resources incorporating
- Considerations of intergenerational and intra-generational equity.

4.7.2.4 County Environment Committees

Governors shall by notice in the gazette constitute a County Environment Committee that shall be responsible for the proper management of the environment within the County for which it is appointed. They should also perform such additional functions as prescribed by the Act or as may, from time to time be assigned by the Governor by notice in the gazette. The decisions of these committees are legal and it is an offence not to implement them.

4.7.2.5 National Environment Restoration Fund

The objective of the Restoration Fund shall be to serve as supplementary insurance for the mitigation of environmental degradation where the perpetrator is not identifiable or where exceptional circumstances require the Authority to intervene towards the control or mitigation of environmental degradation. There is a draft EMC (deposit bonds) regulation 2014, but it is yet to be gazetted.

4.7.2.6 National Environment Trust Fund

The trust fund is vested in NEMA and subject to EMCA Cap 387. A board of five trustees appointed by the Cabinet Secretary administers it. These funds may be received from donations, endowments, grants and gifts from whatever source or sums of money or from monies designated by NEMA for this fund.

4.8 National and County Government Approvals and Permits

The implementation of Tatu City Extension (Mchana Estate) Master Plan require approvals, permits and licenses from relevant governing Authorities which has been analyzed in Table 4.1. Nonetheless Tatu City has been declared as a Special Economic Zone (Refer to section 4.5.24) with the Special Economic Zones (SEZ) Authority being responsible for designing, approving, establishing, developing, operating, promoting and regulating an SEZ.

Table 4-1 National and County Government Approvals and Permits

Approvals	Procedure for granting approval	Deliverables	Approving Authority	Duration for Approval
Environmental Impact Assessment (EIA)	<ul style="list-style-type: none"> Application to NEMA 	<ul style="list-style-type: none"> EIA License 	<ul style="list-style-type: none"> National Environment and Management Authority (NEMA) 	<ul style="list-style-type: none"> 1-3 Months
Approval by National Construction Authority	<ul style="list-style-type: none"> Application through prescribed form 	<ul style="list-style-type: none"> Approval in a prescribed form 	<ul style="list-style-type: none"> National Construction Authority (NCA) 	<ul style="list-style-type: none"> 1 Month
Obtain Occupation Certificate	<ul style="list-style-type: none"> Application through prescribed form 	<ul style="list-style-type: none"> Occupation certificate 	<ul style="list-style-type: none"> National Construction Authority (NCA) 	<ul style="list-style-type: none"> 1 Month
Obtain Certificate of Compliance	<ul style="list-style-type: none"> Application through prescribed form 	<ul style="list-style-type: none"> Form PPA5 	<ul style="list-style-type: none"> National Construction Authority (NCA) 	<ul style="list-style-type: none"> 1 Month

5 PUBLIC/STAKEHOLDER ENGAGEMENT

5.1 Introduction

This chapter describes the process of public consultation and participation that were followed to identify the key issues and impacts of the proposed Tatu City Extension (Mchana Estate) Master Plan Stakeholder Engagement and Public Participation process is an integral aspect of decision making in the SEA process for the purpose of achieving the fundamental principles of sustainable development. Public Participation and Consultation is a key policy requirement as stipulated in Article 10(2) and 69(d) of the Constitution of Kenya, 2010; Legal Notice 101 of the Environmental Management and Coordination Act (EMCA), 1999 (Cap 387); Section 3 of the EIA/EA regulations, 2003; Section 87 & 113 of the County Governments Act, 2012 and the National Guidelines for Strategic Environmental Assessment (SEA) 2012. It is an important process through which the affected parties and communities are given an opportunity to give their views on the proposed Master Plan before its implementation. The stakeholders environmental and social concerns will be integrated into the proposed Master Plan for purposes of ensuring its long-term sustainability. In addition, the process creates a sense of responsibility, commitment and local ownership for smooth implementation.

5.2 Objectives of the Consultation and Public Participation

The objective of the consultation and public participation is to:

- (i) Disseminate and inform the stakeholders about the development with special reference to its key components and location;
- (ii) Create awareness among the public on the need for the SEA study for the proposed Tatu City Extension (Mchana Estate) Master Plan;
- (iii) Collect stakeholders' views on the proposed plan including potential positive/negative impacts associated with the proposed plan and stakeholders' preferred development;
- (iv) Get local knowledge on any sensitive areas within the plan scope (physical/environmental, cultural or proposed facilities); and
- (v) Incorporate all the information collected in the screening, scoping and SEA study for decision making process.

In addition, the process will enable:

- (i) The establishment of a communication channel between the general public and the team of consultants, the proponent and the key government agencies; and
- (ii) The concerns of the stakeholders to be known to the concerned parties at an early (planning) stage of the Master Plan for decision-making purposes.

5.3 Stakeholder Identification and Mapping

Key stakeholders consulted during the SEA study were identified in accordance with the areas/sectors that are affected directly or indirectly by the proposed Master Plan. The criteria used to identify various stakeholders was based on the legal mandates of various institutions, assessment of the different interests of the stakeholders, stakeholder power rights and responsibilities and their role in the proposed Tatu City Extension Master Plan as outlined in the stakeholder engagement plan (Table 5:1).

Table 5-1: Stakeholder Engagement Plan

Stakeholder Category/ organization, group or individual	Potential role in the SEA activity	Engagement strategy	Follow-up strategy plans for feedback or continued involvement
<ul style="list-style-type: none"> ▪ Public Sector and Key Ministries/ Inter-ministerial Lead Agencies and Key Public Institutions 	<ul style="list-style-type: none"> ▪ Give their views on Tatu City ▪ Interlinkage of the Plan with other existing Plans ▪ Identify any improvement needed for the plan 	<ul style="list-style-type: none"> ▪ Invitation to public meetings ▪ Special consultations at the organizational levels ▪ Case studies to specific projects/ programs ▪ Review of any relevant existing documents 	<ul style="list-style-type: none"> ▪ Invitation to SEA validation meeting ▪ Implement the final recommendations ▪ Participate in Monitoring and Evaluation of the implementation of SEA recommendations
<ul style="list-style-type: none"> ▪ Private Sector Actors/ Investors and Associations 	<ul style="list-style-type: none"> ▪ Come up with ideas to improve the plan ▪ Give the challenges and the current trends most preferred by investors in such a city 	<ul style="list-style-type: none"> ▪ Invited to participate in consultation meetings ▪ Special consultations at the organisational levels 	<ul style="list-style-type: none"> ▪ Invitation to SEA validation meeting ▪ Implement the final recommendations ▪ Participate in Monitoring and evaluation of the implementation of SEA recommendations
<ul style="list-style-type: none"> ▪ Political Leadership 	<ul style="list-style-type: none"> ▪ Political leaders have a great influence on the various policies, plans and programs ▪ Play major role in creating awareness on the Master Plan ▪ Influence creation of more favourable policies, programs and plans to hasten economic growth in the country ▪ Help prevent negative perception of the Master Plan 	<ul style="list-style-type: none"> ▪ Invitation of some political leaders to participate in public consultation meetings 	<ul style="list-style-type: none"> ▪ Invitation to validation meeting
<ul style="list-style-type: none"> ▪ Civil Society Organisations (NGO's and CBOs) 	<ul style="list-style-type: none"> ▪ Help to ensure that gender and other vulnerable groups issues and concerns are incorporated in the entire SEA process. 	<ul style="list-style-type: none"> ▪ Invitation to participate in scoping meeting 	<ul style="list-style-type: none"> ▪ Invitation SEA validation meeting ▪ Implement the final recommendations especially on community-related issues

<i>Stakeholder Category/ organization, group or individual</i>	Potential role in the SEA activity	Engagement strategy	Follow-up strategy plans for feedback or continued involvement
	<ul style="list-style-type: none"> ▪ Enhance awareness of the Master Plan since they deal with people on the ground 		
<ul style="list-style-type: none"> ▪ <i>Professional Associations/ Experts/ Research and Academic Institutions</i> 	<ul style="list-style-type: none"> ▪ Lead in research and consultancy ▪ They are potential investors in the Tatu City 	<ul style="list-style-type: none"> ▪ Invitation to public meetings ▪ One on one consultation 	<ul style="list-style-type: none"> ▪ Invitation SEA validation meeting ▪ Participate in Monitoring and evaluation of the implementation of SEA recommendations

5.4 Stakeholder Analysis

Stakeholder analysis was done with a view to understand stakeholders mandate and interest in this Master Plan and for them to highlight their divergent views on anticipated impacts of the proposed Master Plan.

The National Environment Management Authority (NEMA) is mandated to supervise and coordinate over all matters relating to the environment. The Kiambu County NEMA office was consulted as it is the principal instrument of Government in the implementation of all Policies, Plans and Programmes relating to the environment in Kiambu County.

The development area and neighbouring land is vastly covered under coffee plantation, non-indigenous tree species, bamboo trees, and bush and grassland vegetation. It is worth noting that coffee is a major industrial (cash) crop grown in the County and therefore the Kenya Agricultural & Livestock Research Organization (KALRO) - Coffee Research Institute was consulted to provide insight on the coffee output and how it will affect agriculture considering it is the predominant economic activity in the proposed Tatu City Extension (Mchana Estate) area. The Ministry of Agriculture, Livestock and Fisheries and Kenya Forest Service (KFS) are key stakeholders that were consulted to shed light on the interrelation between the proposed development and Environment and natural resources in the Master Plan area.

The Ministry of Lands and Physical Planning is the regional center of power in the County on matters concerning developments such as the proposed Master Plan. The Physical Planning office was consulted about the zoning plans for Tatu City Mchana Estate and related matters to ensure the proposed Master Plan is compliant to the County's zoning plans. The Planning Minister provided information about the County's development plans and how these may affect or be affected by the proposed development.

Water Resources Authority (WRA)-Upper Athi Sub Region Kiambu County was consulted as the stakeholder dealing with effective regulation and management of water resources in the proposed development area including the issuing of permits for water abstraction. The proposed development will lead to increased demand on water resources during construction and operations phases for the housing and industrial developments, commercial centres, educational institutions, sports facilities, infrastructure and utilities developments and for recreation areas. Ruiru - Juja Water and Sewerage Company (RUJUWASCO) is mandated with the task of water service provision in Ruiru sub-County and is the water service provider for Tatu City. The company was thus consulted on matters of water supply and waste water management in the proposed development especially their ability in terms of capacity to handle water demand and supply.

In Tatu City Phase 1I, the existing regional road networks have a spatial and functional structure that impacts on the organization of land use activities. It will be served by two major roads, Ngenda Road (D399) and Ruiru – Githunguri Road (C65) which are currently under construction. These two roads will be the major arterial of the proposed development providing linkage to A2 (Thika Road) and C63 (Ruiru Kiambu Road). The next hierarchies of roads are the internal circulation networks, which will distribute goods and services, and people from the major arterials into the development. Kenya National Highways Authority (KeNHA), Kenya Urban Roads Authority (KURA) and Kenya Rural Roads Authority (KeRRA) are key stakeholders who were consulted on how they will manage, develop, rehabilitate and maintain the public roads as they are interlinked with the Master Plan area.

Kenya Power was consulted to provide baseline information and advice on matters of electrical transmission, and distribution to the proposed development as Tatu City Limited seeks to have a dedicated substation within the Master Plan area.

As per the Master plan zoning, 163.97 Hectares has been allocated for an industrial park that includes light and heavy industries. The Ministry of Industry, Trade and Cooperatives was consulted on the compatibility of the industrial park with other zones in the Master Plan. The establishment of the proposed Master Plan conforms to this provision by actualizing the development demands in addition to meeting the flagship project proposals of the Kenya Vision 2030 and the Big 4 agenda which entails enhancing the manufacturing sector.

The Ministry of Housing and Urban Development was consulted to shed light on the low, medium and residential housing in the Proposed Master Plan are in tandem with affordable housing being one of the Big Four Agendas of the National Government

The education institutions have been mapped for 15.24 Hectares in the proposed development. This includes pre-primary, primary and secondary schools, middle level college, research Centre and university and the existing public Ngewe Primary School which will be retained in its present location. The Ministry of Education was consulted on the educational facilities, their compatibility and how they integrate in achieving societal needs.

The neighbouring individuals and institutions are key stakeholders who were consulted with regard to mapping of potential project specific impacts and identification of mitigation measures for adverse impacts.

5.5 Methodology used for Public Participation and Consultation

Views and concerns from the local residents, local leaders, surrounding institutions and development partners in Tatu City Phase 1, who in one way or another would be affected or have interest in the proposed Tatu City Extension (Mchana Estate) Master Plan was sought through interviews, key stakeholder and public meetings as stipulated in the Environmental Management and Coordination Act, 1999 (Cap 387). During the consultation process, the stakeholders were taken through the Master Plan including their objectives and possible impacts associated with implementation activities. Stakeholders were then given time to ask relevant questions regarding the Proposed Master Plan to enable the consultants clarify on any issues that they may not have understood properly. Stakeholders were consulted during screening, scoping and SEA study.

In general, the following steps were followed in carrying out the public consultation process: -

- Identification and compiling a database of interested and affected individuals and institutions
- Interview schedules to different target groups and local community members in the Master Plan area.
- Technical Meetings with Key stakeholders

The public consultation and participation were conducted through;

- 1) Household socio-economic survey
- 2) Key stakeholder consultation and interviews
- 3) Key Stakeholder Consultative Meetings

The procedures used for each of the above are outlined below

5.5.1 Household Interviews and Survey

Household surveys were conducted within the entire neighborhood of the proposed development. Survey tools were prepared for effective and systematic interviews by the environmental and socio-economic consultants assisted by a team of technical field assistants from the area on the baseline survey. The tools included; structured and non-structured household interview schedules, key informant guidelines, mapping, sampling of the areas to be surveyed, field visits and observations, and triangulation of field data which focused specifically on the communities who stay within and around the area designated for Master Planning. Household interviews and site visits were conducted during the period of May to June 2018.

5.5.2 Key Stakeholders Consultation and Interviews

During the scoping exercise, thirty (30) key stakeholders from government ministries and lead agencies, Kiambu County Government officials, private investors, interested and affected individuals and institutions within and neighbouring the proposed Tatu City Extension (Mchana Estate) Master Plan were identified, consulted and interviewed during the period of May to June 2018 (Annex 1 - List of key stakeholders consulted).

The Strategic Environmental Assessment for public participation exercise was conducted by experienced experts via interviews and discussions under the guidance of interview schedules developed to capture the general and specific concerns, comments and issues comprehensively. The completion of such schedules

subsequently allowed for the synthesis and analysis of issues that arose which provided basis upon which the environmental, economic and social aspects of the SEA study was undertaken. The purpose for such interviews was to identify the positive and negative impacts that have been studied in detail (Chapter 6, 9 and 10) of this SEA report and subsequently promote proposals on the best practices to be adopted and mitigate the negative impacts respectively.

A standard public consultation and participation form was administered to the thirty (30) key stakeholders to obtain their views, comments and concerns and the filled-in survey questionnaires were attached to the scoping report submitted to NEMA on 18th July 2018 and approved on 19th October 2018.

5.5.3 Public Participation and Key Stakeholder Technical meeting

To ensure adequate public participation was undertaken, consultative invitation letters were sent to stakeholders including key national and County government ministries, government departments operating in Kiambu, local leaders, local authority amongst others who in one way or another are likely to interact with the proposed Master Plan development.

The key stakeholder technical meeting invitation letters (Annex 2a) and the programme (Annex 2b) were delivered to various stakeholders based on the stakeholder's engagement plan (Table 5.1). The technical meeting was held on Friday, 5th July 2019 at Tatu Primary School Playgrounds in Kiambu County. A comprehensive list of the 85 stakeholders who attended the key stakeholders meeting and the respective minutes are attached as annex 3a & 3b respectively in this report.



Plate 5-1 Kenya country head for Rendeavour giving his brief remarks on the Master Plan



Plate 5-2 SEA team leader making a presentation on the key findings on proposed Master Plan



Plate 5-3 Kiambu County Director of Environment giving remarks on the Master Plan



Plate 5-4 NEMA Officer making a presentation on the SEA process



Plate 5-5 Client representative responding to stakeholders on issues raised about the Master Plan



Plate 5-6 Views on the Master plan from a Kiambu County Official



Plate 5-7: Kenyatta University representative giving comments during meeting



Plate 5-8 A stakeholder giving recommendations about the Master plan

Key issues and concerns raised during the key stakeholders consultative meeting have been summarized in table 5:2 below

Table 5-2 Stakeholder comments and concerns

S/N	Key Issues Raised	Comments/ Issues/ Concern	Technical Team Response
1.	Water Conservation and waste water management	<ul style="list-style-type: none"> Mr. James Nyangweso (Water Resources Authority -Upper Athi Sub Region) proposed that Tatu City Limited should ensure dams, Rivers, wetlands, and Riverine forests are protected especially during construction and operation phases to capitalize on the environmental assets. Kiambu County Executive Committee Member -Water, Environment & Natural Resources Environment (Mr. David Kuria) further proposed that Tatu City should be connected to a water source in the Aberdares and a mechanism on water harvesting should be adopted. Kiambu County Executive Committee Member (CECM) for Roads, Transport & Public Works (Dr. Juliet Kimemia), suggested a water conservation system that harvests water, treats and recycles water should be adopted. Mr. Gitau (Kenya Power) suggested for a comprehensive water resource management plan with efficient storage facilities such dams that will enable sustainable water use during dry seasons. Red Land Roses Flower Farm representative (George Kimani) was concerned on that the proposed Master Plan will increase water demand which will have an impact on their water supply and most likely hamper the flower farm productivity. 	<ul style="list-style-type: none"> The Physical Planner stated the ecologically sensitive areas will be protected from encroachment as they are the nerves of the natural open space of the city. Tatu City Limited will ensure appropriate measures are in place to protect the riparian land within the Master Plan boundaries and acknowledge the three Rivers and its Riverine forest in phase 2 are the lifeline of the city. The developer's representative (Mr. Anthony Njoroge) informed the stakeholders that there is a water treatment and Storage plant in Tatu phase 1 with a storage capacity available is 5,000,000 litres. Plans are underway to construct and another plant of 10,000,000 litres. The SEA Consultant also highlighted that a comprehensive water management plan shall be designed to ensure sustainable use of water within the City. A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be also be implemented. Water abstraction for the development will be subject to availability assessments and the relevant laws;
2.	Effluent Discharge	<ul style="list-style-type: none"> KURA representative (Omondi Odero) wanted to know what measures will be put in place to ensure industrial effluent is treated before its channeled to water bodies. 	<ul style="list-style-type: none"> The SEA Consultant pointed out effluent discharge for the development will be handled as per the established regulations and conservation of riparian reserves and catchment areas within the development is key.

S/N	Key Issues Raised	Comments/ Issues/ Concern	Technical Team Response
			<ul style="list-style-type: none"> The Proponent was also advised to have a designated plant for treating Industrial effluent before release into the main effluent treatment system. The SEA consultant also recommended that developers within Tatu City Extension (Mchana Estate) will be required to undertake project-specific Environmental and Social Impact Assessments (ESIAs) with Environmental Management and Monitoring Plans (EMMP) developed for construction, operational and decommissioning phases with measures in place to ensure effluent discharge is treated up to the NEMA standards.
3.	Solid Waste Management	<ul style="list-style-type: none"> The stakeholders proposed the establishment of an integrated solid waste management system for Tatu City. Mr. Gitau (Kenya Power) also wanted to know how separation of waste from source would be implemented and whether the system would be a success. He suggested that waste produced should pass through transfer stations before taken to recycling sites. 	<ul style="list-style-type: none"> The SEA Consultant recommended Solid waste management for the development is critical and the proponent can consider designating an area in the Master Plan for a sanitary land fill. Working with the County government on this would give the best results. The SEA consultant further remarked that if separation of waste from source is introduced at the earlier stages of settlement, it would be easier to implement it than in the later stages. Effluent discharge and solid waste management should be efficiently handled to avoid pollution of water bodies.
4.	Graveyards/ Crematorium	<ul style="list-style-type: none"> Dr. Macharia (Kenyatta University) inquired if land has been allocated for the development of graveyard since death is inevitable. He also proposed the development of a crematorium 	<ul style="list-style-type: none"> The Physical Planner (Ms. Jane Manasseh) informed the stakeholders that Tatu City Limited will continue to modify and update the zoning and subdivision ordinances to promote a more thoughtful and holistic approach that is compatible with and compliments the character of its

S/N	Key Issues Raised	Comments/ Issues/ Concern	Technical Team Response
			<p>surroundings to ensure optimal land use of the proposed development.</p> <ul style="list-style-type: none"> The SEA Consultant also suggested, if Tatu considers the establishment graveyard in phase 2, they should design it in a more landscaped form as part of civic development of beliefs and institutions that sought to portray the city as civilized and harmonious. He gave an example of the Nairobi War Memorial cemetery which was articulately designed and serves as a picnic site and photographic site. Adherence to zoning plans for the area is critical and must be respected
5.	Green/ Renewable Energy	<ul style="list-style-type: none"> The stakeholders suggested the developer to invest in renewable/green energy by developing a power-park for solar energy harvesting. This will reduce reliability on the Hydro electrical power and enhance adoption of green energy technology. 	<ul style="list-style-type: none"> The developer's representative (Mr. Anthony Njoroge) informed stakeholders that a solar park will be constructed in Phase 2 to generate renewable energy for the city. He further explained the power produced from the solar panels will be distributed for use by homes and businesses thus residents will enjoy sustained power supply at very minimal costs. He also pointed out that this is in line with Tatu City's long-term commitment to environmental conservation through harnessing renewable energy sources.
6.	Power Way leaves	<ul style="list-style-type: none"> Mr Gitau (Kenya Power) requested the developer to provide sufficient space for power lines by clearing trees along where the cables will pass. He also proposed the location of high-rise buildings to be set effectively to deter interference with overhead lines. 	<ul style="list-style-type: none"> Tatu City informed they will observe power line way leaves requirements keenly and the existing power infrastructure within the site belongs to Kenya Power. Tatu City has also reserved land for construction of a substation

S/N	Key Issues Raised	Comments/ Issues/ Concern	Technical Team Response
7.	HIV/AIDS	<ul style="list-style-type: none"> • Mercy Njoki (KeNHA) proposed the incorporation of a HIV/AIDS mainstreaming strategy due to influx of construction workers and people likely to join the community. 	<ul style="list-style-type: none"> • The SEA Consultant assured the stakeholders that there would be a HIV/AIDS programme for Tatu City.
8.	Affordable Housing	<ul style="list-style-type: none"> • Michael Muturi (State Department of Housing) inquired if there was an inclusion of affordable housing in the Tatu City development plan. • Mr Makori (BTL) also wanted to know how the developer will integrate the local community who cannot afford the housing units. 	<ul style="list-style-type: none"> • The Physical Planner explained that the Master Plan has allocated 15,000 units for affordable housing.
9.	Integrity	<ul style="list-style-type: none"> • Kiambu County Executive Committee Member -Water, Environment & Natural Resources Environment (Mr. David Kuria) expressed concern that the County should be included in all planning, as they may give ideas that would lead to more effective development of the Tatu City. • Mercy (KENHA) also proposed the involvement of Kenya Forest Service (KFS) to enhance the welfare of water catchment areas. 	<ul style="list-style-type: none"> • The SEA Consultant informed stakeholders that anticipated loss of biological resources as a result of the development should be documented including any loss of endangered/threatened species. • Conservation of sensitive ecological areas such as pockets of marshy areas within the development to be carefully assessed.
10.	Human displacement	<ul style="list-style-type: none"> • Wilfred Koech (Kenya Power) requested to know whether a Resettlement Action Plan (RAP) will be carried out for the people living within the proposed during Master Plan that are likely to be displaced during implementation of the Master Plan • He further proposed that if a Resettlement Action Plan will be carried out, it is essential the physical and economic relocation of individuals, households and communities in the area should be approached as an opportunity for promoting sustainable development through improvements to the economic and social well-being of affected people. 	<ul style="list-style-type: none"> • The SEA Consultant responded that since the project affected persons (PAPs) during execution of the Master Plan are less than 200, Tatu City will undertake a comprehensive Livelihood Restoration Plan • The SEA consultant also assured the stakeholders that they will take into account the social systems (young and old) during implementation of the livelihood restoration plan • They will be no displacement of persons living in the staff houses within the proposed master plan area. • During implementation of the proposed Tatu City Extension (Mchana Estate) staff working in the

S/N	Key Issues Raised	Comments/ Issues/ Concern	Technical Team Response
		<ul style="list-style-type: none"> The stakeholders also suggested that the Resettlement Action Plan should consider the accommodation of older people, the social systems and cater for diverse aspects of health as a result of lifestyle, age and occupation. 	<p>coffee plantations will be given priority in the upcoming developments thus they will continue earning a living.</p>
11.	Security	<ul style="list-style-type: none"> The Kiambu Police commander expressed concern on security surveillance. He proposed security should be classified physically and technologically as cyber-crimes were likely to prevail due to the ultra-modern nature of the proposed development. He requested that CCTVs cameras be installed in all access points to monitor human traffic movement as some residents are likely to be civilian firearm holders Further, residents should be involved in doing a comprehensive examination on the safety of the Tatu City area and capacity building for the security officers required for such a city done. Tatu City Limited should have a biodata record resident that will be residing in phase 1 and 2. He also suggested the integration of security experts in the development plan 	<ul style="list-style-type: none"> The Physical Planner stated proper security measures will be put in place within the development and its environs and a police station is one of the community facilities included in the Master Plan. The proponent also stated that first class integrated safety and high tech security will be installed in the developmental zones and public facilities including community and welfare centres, leisure facilities, children care centres/crèche among others
12.	Industrial Pollution	<ul style="list-style-type: none"> The stakeholders wanted to have a clear criteria on the type of industries to be built within Tatu City due to their proximity with the residential. They also proposed for the level of pollution from the light industries to be set-up to be established 	<ul style="list-style-type: none"> The proponent responded by stating that Tatu City has its own policies and standards that each industry has to undergo before approval. Some of Industrial uses will include warehousing/depots, distribution centres and light manufacturing
13.	Youth Opportunities	<ul style="list-style-type: none"> Residents (youth) wanted to know if there would be sustainable of sports and educational facilities for their welfare. 	<ul style="list-style-type: none"> The developer's representative (Mr. Anthony Njoroge) informed that the training academy, school meals and more convenient facilities would still be made available for the youth.

S/N	Key Issues Raised	Comments/ Issues/ Concern	Technical Team Response
			<ul style="list-style-type: none"> Tatu City Limited will strive to continuously provide increased training opportunities for the increasing school leavers and other trainees to increase employability. The academy's vision is to provide skilled and globally competitive employable human resource through a dynamic curriculum responsive to the manpower needs of a dynamic economy; Impart marketable skills, technical know-how and attitudes that respond to contemporary labour market demands by the industry, informal sector and for self-employment.
14.	Environmental Awareness	<ul style="list-style-type: none"> Mr Isaac Kimotho (Kiambu Institute of Science and Technology) proposed that components encompassing environmental conservation information to be incorporated into various learning institutions and training sessions. 	
15.	Vegetation Cover	<ul style="list-style-type: none"> Wilfred Koech (Kenya Power) raised an issue regarding the rates of compensation for cut trees during the project construction phase Kiambu County Executive Committee Member - Environment expressed concern that current green cover is at 20% including water bodies while aspirations for the County would be 30%. 	<ul style="list-style-type: none"> The SEA consultant explained that water bodies and forest cover is planned to occupy 20-30% of the area.

5.5.4 Key stakeholders Validation meeting

Following the submission of the draft SEA report to NEMA on 20th September 2019; advertisements appeared in the Daily Nation of November 2019 and 29th October 2019 and the Kenya Gazette on 29th November 2019 which allowed for the public disclosure period (*Annexes 4 - Newspapers adverts*). In view of the expiry of the public disclosure period, Tatu City in coordination with NEMA organised for a validation workshop that was held on 30th January 2020.

The purpose of the meeting was to present and validate the draft Strategic Environmental Assessment (SEA) report for Tatu City Extension (Mchana Estate) Master Plan. The meeting also intended to receive oral or written comments from stakeholders to integrate environmental and social considerations into the final Strategic Environmental Assessment (SEA) report of the Master Plan for purposes of ensuring its long-term sustainability.

Invitation to the key stakeholder's workshop was guided by the stakeholder engagement plan (Table 5.1) with representation from various entities. A total of 65 participants attended the meeting. The minutes and list of participants are attached to this report (*Annex 5 a & b - List of attendants for the Validation meeting and Minutes of the validation meeting*).

Key issues and concerns raised during the key stakeholder's validation meeting have been summarized in table 5:3.



Plate 5-9 Tatu City Deputy Country manager making introductory remarks.



Plate 5-10 NEMA officer making his remarks during the SEA validation meeting



Plate 5-11 A representative of IPPM (The planners) giving a highlight of the Master Plan



Plate 5-12 The SEA team explaining the SEA process during the validation meeting



Plate 5-13 A local youth making remarks on the master plan

Table 5-3 Key issues, comments and concerns from the validation meeting

S/N	Key Issues Raised	Comments/ Issues/ Concern	Technical Team Response
1.	Care for Domesticated animals	<ul style="list-style-type: none"> Mr. Mwangi Kiai from the Ministry of Agriculture raised a health concern. He noted that there was no mention of a facility to cater for the health of domesticated animals and birds in the report. 	<ul style="list-style-type: none"> The SEA Consultant reported that there are two fully fledged animal hospitals within the vicinity with one located on Kiambu Road and another in Upper Kabete and are equipped with animal ambulances for emergency responses. These facilities will cater for the domesticated animals in need of medical attention. He stated that largely, there is minimal integration of livestock in urban areas to warrant a mitigation plan. Nevertheless, the report will capture likely impacts on livestock and possible displacement. Tatu City Deputy Country Director confirmed that the plan allocates up to 22% of land for urban agriculture within the city.
2.	Biodiversity conservation	<ul style="list-style-type: none"> The Ministry of Health representative (Mr. John Ndungu) raised concerns on the relocation plan of the hippos found within the proposed city and feared that their survival in new locations may not be guaranteed. A representative from the National Museums of Kenya (Mr. John Kipyegon) sought on the preservation plans and documentation of national heritage and biodiversity conservation especially for small animals and birds. He proposed the need to identify habitats that are likely to be affected by the proposed city development. 	<ul style="list-style-type: none"> Mr. Antony of Tatu City assured that the best conservation plans would be agreed between the developer and KWS on management of the hippos. Mr. Antony stated that no cultural heritage had been identified in Phase II. He echoed that only in Phase I where a Mugumo tree was identified and conserved as a Kikuyu cultural site. The SEA Consultant assured the stakeholders that there is no anticipated loss of endangered/ threatened species under IUCN within Tatu city.

S/N	Key Issues Raised	Comments/ Issues/ Concern	Technical Team Response
3.	Health facilities	<ul style="list-style-type: none"> The Ministry of Health representative (Mr. John Ngungu) inquired on the number and type of health facilities that are planned for in the proposed city. He also suggested that Tatu City needs to integrate its plans with the Kiambu County government to ensure complementarity and reduce duplication. 	<ul style="list-style-type: none"> Mr. Antony from Tatu City indicated that clinical facilities will be available within commercial sections of the city. Tatu City Ltd communicated that they were closely working with Kiambu County Government in its endeavors.
4.	Solid Waste Management	<ul style="list-style-type: none"> It was reported by the Ministry of Health representative (Mr. John Ndungu) that the landfill in Thika town lacks space to accommodate waste from the proposed Tatu city. He Proposed that the proposed city should manage waste within its boundaries to reduce pressure on the landfill and even prevent further traffic along the road to Thika. 	<ul style="list-style-type: none"> The SEA Consultant assured Mr. Ndungu that the SEA report has advocated for the city to implement an integrated solid waste management system where only 10% of the waste would have to be transported to designated landfills outside the city.
5.	Motor vehicle traffic	<ul style="list-style-type: none"> The stakeholder feared that the proposed city will cause an increase in motor traffic joining Thika highway which might cause congestion and delays. 	<ul style="list-style-type: none"> The stakeholders were reassured that the design of the city is anchored on existing public transport and road networks to allow efficient flow of traffic within and outside the city with minimal congestion through a Traffic Management Plan that has already been carried out.
6.	Vulnerable groups	<ul style="list-style-type: none"> The Chairman of Nyumba Kumi Initiative requested to know what plans are in place to cater for the education and health needs of young children whose parents currently work in Tatu city. 	<ul style="list-style-type: none"> Mr. Antony emphasized that there will be provision for schools and health facilities to cater for the needs of the community as the city plan is implemented.

S/N	Key Issues Raised	Comments/ Issues/ Concern	Technical Team Response
7.	Education	<ul style="list-style-type: none"> The Chairman of Nyumba Kumi Initiative expressed concern for lack of Early Childhood Development (ECD) centers for the worker's children as well as secondary schools in the planned city to be utilized by residents, workers and neighboring community Representative of the Principal Kiambu Institute of Technology (Mr. Isaac Ngaracha) noticed the lack of provision for space for establishment of higher education institutions. 	<ul style="list-style-type: none"> Tatu City explained that there has been adequate provision of land for expansion of local public schools such as Ngewa primary and Tatu primary It was noted that there would be an integration of educational development planning with surrounding learning institutions such as Kiambu Institute, Kenyatta University, University of Nairobi amongst others to train professionals and the youth on post-secondary education.
8.	Change of livelihoods for workers and creation of employment	<ul style="list-style-type: none"> A resident youth representative enquired about plans in place regarding the displacement of workers and the change in skill acquisition from farming. 	<ul style="list-style-type: none"> The youth were reassured that the minimum direct jobs available would be about 20,000 and preference would be given to community members residing in and around Tatu city. Also, there would be skills training for the workers so that they can have a smooth transition from agricultural skills to masonry, electrical, plumbing among others and fit within the new setting.
9.	Public spaces	<ul style="list-style-type: none"> Ruturu resident's representative proposed to have public spaces in the city, provision for police stations, educational and recreational facilities. Residents and the area Chief requested for clarity on the management plan over the public spaces and facilities provided for in the plan. 	<ul style="list-style-type: none"> The residents were assured that 12 acres of land has been set aside for educational facilities. Additional land has also been set aside for schools, community centres, police stations, fire station. Also, there are operational public schools in the city including Ngewa and Tatu City primary school. It was affirmed that park spaces have also been provided through the city. The local Chief (Mr. George Mwaura) suggested the need for planning and designating utilities and activities for the planned public spaces to prevent abuse, grabbing and conflict in the future.

S/N	Key Issues Raised	Comments/ Issues/ Concern	Technical Team Response
10.	Graveyards/ Crematorium	<ul style="list-style-type: none"> Dr. Juliana Mutua from the Ministry of Lands and Physical Planning inquired if land has been allocated for the development of a graveyard since death is inevitable. 	<ul style="list-style-type: none"> The developer's representative (Mr. Antony) informed members that Tatu has considered the establishment of a graveyard on 50 acres to be set aside in Phase III of Tatu City development. The SEA Consultant noted that Tatu City developers should design the graveyard to fit the modern kind; good landscape to demystify olden beliefs and portray the city as harmonious. He gave an example of the Nairobi War Memorial cemetery which was articulately designed and serves as a picnic area and photographic site.
11.	Industrial Pollution	<ul style="list-style-type: none"> The stakeholder expressed concern on the duration that the development would take, and the pollution levels expected, especially from industries that will be built in Tatu City, due to their proximity to residential areas. 	<ul style="list-style-type: none"> The proponent responded by stating that Tatu City has its own policies and standards that each industry must undergo before approval. Most of the establishments will be light Industries that will include warehouses/depots, distribution centres and light manufacturing industries that cause no pollution. Overall the city's development will be gradual and phased dependent on resources.
12.	Population expansion	<ul style="list-style-type: none"> A resident wanted to know what provisions had been made to meet needs of the expected population expansion. 	<ul style="list-style-type: none"> The Physical Planner assured the stakeholders that the model used to develop Tatu City is in such a way that it allows for expansion and even so, the city intends to be fully operational in about 100 years, which is a long time to exceed the expected capacity.
13.	Youth Opportunities	<ul style="list-style-type: none"> A resident of BTL (youth) wanted to know if there is provision for sports, recreation and educational facilities for the youth. He suggested that there is need for skills development to enable the local youth to tap into emerging job opportunities in the proposed city. 	<ul style="list-style-type: none"> The developer's representative (Mr. Antony) informed stakeholders that the training academy, school meals and more convenient facilities would still be made available to the local youth. They will strive to continuously provide increased training opportunities for the increasing school leavers and other trainees to increase employability.

S/N	Key Issues Raised	Comments/ Issues/ Concern	Technical Team Response
14.	Motorbike transport (bodaboda)	<ul style="list-style-type: none"> Residents sought to be told what requirements are needed for motorbike operators to start accessing the city to offer transport services. 	<ul style="list-style-type: none"> Tatu City Deputy Country Director indicated that the integration of motorbike operators into the city transport plans is very complex due to security issues. The area chief emphasized the need for motorbike riders to form associations or join existing associations to enable negotiation and management with Tatu city developers.
15.	Water Conservation and wastewater management	<ul style="list-style-type: none"> A BTL resident wondered what provisions the city has for water given that the local water supply company RUJUWASCO only supplies water to the area for 3 days or less in a week. 	<ul style="list-style-type: none"> Tatu City Deputy Country Director informed the stakeholders that there is a water treatment and Storage plant in Tatu phase 1 with a storage capacity of 5,000,000 litres, which is 25% of the required capacity. Plans are underway to construct another plant of 10,000,000 litres. The SEA Consultant also highlighted that a comprehensive water management plan shall be designed to ensure sustainable use of water within the City. A storm water management plan that minimizes impervious area infiltration by use of recharge areas and use of detention and/or retention with graduated outlet control structure will be also be implemented. The developers are also undertaking survey for wells and boreholes for development to increase water supply to the city Plans are also underway to collect water from Kamiti Stream whose intake is estimated to be 5000m³. Given that the city will take almost 10-30 years to fully develop, the demand for water will be gradually met by then.
16.	Loss of vegetation cover	<ul style="list-style-type: none"> Residents expressed concern over the anticipated loss of vegetation in the city. 	<ul style="list-style-type: none"> Tatu representative explained that the city is sponsoring a tree planting program every rainy season in all schools within and outside the proposed city to restore tree cover lost due to execution of the proposed Master Plan.

S/N	Key Issues Raised	Comments/ Issues/ Concern	Technical Team Response
17.	Public awareness	<ul style="list-style-type: none"> Residents wondered whether the community had been well mobilized and educated on the potential impacts of the city on their economy and environment as well as the mitigation measures that the developers will put in place. 	<ul style="list-style-type: none"> It was stressed that the ongoing consultations were a key tool in passing information regarding potential environmental impacts expected as well as the mitigation measures for those impacts.
18.	Corporate social responsibility	<ul style="list-style-type: none"> Residents requested for scholarships for the best students from the public schools within the city 	<ul style="list-style-type: none"> Tatu representative reinforced that the scholarship Programme is still on for outstanding students, who would be absorbed at Nova Pioneer schools.
19.	Land for Religious purposes	<ul style="list-style-type: none"> The Assistant chief for Gitothua sublocation, Mr. James Njuguna, requested for allocation of land for worship centers within the city e.g. churches. 	<ul style="list-style-type: none"> The Physical planner mentioned that this would be catered for in the final design of the Master Plan.

5.6 Positive comments made by the respondents

5.6.1 Employment Opportunities for the Locals

The respondents interviewed/consulted were optimistic that the proposed Master Plan development activities will create numerous employment opportunities for skilled, semi-skilled and unskilled labour during implementation of the master plan. Even though most of the development will need skilled labour force during operation, the participants expressed hope that they will be able to access employment once the development commences mostly as casual workers.

The respondents were also optimistic that they will be trained in advance by the proponent to take up jobs during construction and operational stages to ensure social investment to the community. Employment opportunities are of benefit both economically and socially. Generally, employment will lead to multidimensional development in the area and improve several people's living standards.

5.6.2 Poverty Alleviation

The respondents were positive that the proposed Master Plan development activities would improve the living standards for several individuals and households hence it is expected to alleviate poverty in Kiambu County and its environs, boost the country GDP and improve the living standards of Kenyans.

5.6.3 Increased Business Opportunities

The respondents were optimistic that business opportunities will arise during the specific project construction envisioned by the proposed Master Plan. Small scale businesspeople such as food vendors and kiosk owners will benefit greatly during construction of the specific projects proposed in the Master Plan. The locals noted that construction and operation stages due to the expected population increase.

5.6.4 Increase in Land Value

Land rent and standard of living of the populace will increase due to high demand for space for urban development thus increasing the value of land and property within and surrounding the Master Plan. This in turn will improve the standards of living of the locals.

5.6.5 Attraction of Investors

With the proposed Master Plan, investors will be attracted to invest their money in the proposed development through enterprises, business among others.

5.6.6 Development of Infrastructure and Social Amenities in Kiambu Area

Respondents were optimistic that the proposed Master Plan development activities would improve infrastructure in the area. Kiambu area will develop from a rural area to an urban area with improved transport and communication infrastructure, power distribution network, water and sewerage networks, education, health and recreational facilities among other social amenities.

5.6.7 Improved and Accessible Education

The respondents were optimistic that the proposed Master Plan development activities will improve the value of education and accessibility to research institutions. The responders noted development of both local and international education institutions would in the long-term impact on literacy levels, and improve knowledge and skills of the learners.

5.6.8 Better Healthcare

Respondents were positive that the Master Plan would ensure adequacy of healthcare facilities hence improved healthcare access for the region. Improved healthcare access will influence on the life expectancy leading to low mortality rates.

5.6.9 Improved Security

The respondents were optimistic that the proposed Master Plan development activities will lead to improved security situation in the neighbourhood due to the numbers that will reside in the areas and the possible synergistic effects that populated neighborhoods bring along with them.

5.6.10 Improved and Increased Housing in the Area

The development will attract better housing within Kiambu area since there would be high demand due to increased population. Better housing will be required in the proposed mixed-use development to cater for various classes of residents (high, medium and low).

5.6.11 Improve Networking and Culture Exchange

The development will attract various people from different counties and countries, and this will promote cultural integration of knowledge and exchange of a wide range of ideas.

5.6.12 Economic Growth / Increased revenue

The use of locally available materials and labour for the proposed Master Plan development activities will contribute towards growth of the local and national economies by contributing to the gross domestic product. The consumption of these materials like sand, cement, steel, building stones, timber, oil and others will attract taxes including VAT which will be payable to the government hence increasing government revenue while the cost of these raw materials will be payable directly to the producers.

5.6.13 Decongestion of Nairobi City

The proposed Master Plan will massively reduce congestion in central Nairobi and reverse traffic flows between the Centre and Kiambu County.

5.6.14 Promote Urbanization in Kiambu County

The proposed Master Plan will accelerate economic growth and serve as a catalyst for further urban development in Kiambu County and environs.

5.7 Negative impacts highlighted by the respondents

5.7.1 Habitat loss, alteration and fragmentation of Land

The respondents were concerned that the proposed Master Plan development activities will result in alteration and disruption to terrestrial habitats. Land use development activities may adversely affect wildlife habitats depending on the characteristics of existing vegetation, topographic features, and waterways. Habitat alteration may include fragmentation of forested habitat and other wildlife habitat through bush clearing, disruption of watercourses, establishment of non-native invasive plant species, creation of barriers to wildlife movement and visual and auditory disturbance due to the presence of machinery, construction workers, and associated equipment.

5.7.2 Environmental Degradation on change of land use

Respondents were concerned with the change of land use from agricultural land to a built environment. Conversion of land in the proposed Master Plan from coffee plantations to a mixed-use development will degrade the environment and alter the environmental conditions of Kiambu. The clearance coffee plantations, trees and vegetation cover for construction of the proposed development will have a negative impact to the environment through loss of biodiversity in the area.

5.7.3 Noise Pollution and Vibrations

The respondents expressed fear over high noise and vibrations levels produced by various developments suggested within the masterplan. Noise pollution and vibration was highlighted as an issue mainly during the specific project phases (construction and operation). Notably, noise generation was highlighted to be as a result of the machines in use e.g. excavation equipment, mixers and construction vehicles delivering materials to active construction sites. Various development such as industrial, commercial centre and transportation system was also echoed to be a major contributor to noise pollution and vibrations.

5.7.4 Air Pollution

The people expressed concern over possibility of generation of large amount of dust and fumes within the development and surrounding areas because of excavation works and transportation of construction materials and industries mainly during project specific activities. The proposed industrial park in the Master Plan was also highlighted as a possible key contributor to air pollution whose impacts would spread and affect the local region.

5.7.5 Water Pollution

The respondents expressed their fear that due to increased population in the City, River Mchana and Mukuyu would be polluted. Pollution was tied to all the major land use changes including wastewater from housing development, industrial effluents, educational institutions, and the commercial centres. Respondents expressed that poor management of the wastewater would contaminate the quality of water that is being utilized by the Kiambu County and its environs.

5.7.6 Increased pressure on infrastructure

The respondents noted that due to the magnitude of the developments envisioned in the proposed Master Plan, there is a potential of increasing pressure on existing infrastructure such as roads, water supply system, waste handling facilities, and electricity. Increased pressure would be as a result of population influx in the city and vehicle traffic along the City access / trunk roads.

5.7.7 Loss of Jobs

Clearance of the coffee plantations at Tatu City Extension (Mchana Estate) will impact negatively to the local communities who derive their livelihoods from these plantations. Coffee workers earning a livelihood from the coffee plantations will lose their jobs once the coffee plantation is cleared for development. This will have a localized impact on the neighbouring rural household economy.

5.7.8 Increased Insecurity

There were concerns that due to an influx of people in search of labour during the development of various land zones might result into insecurity within the region. This was pegged on the notion of labour influx from promising projects and employment opportunities within the proposed city.

5.7.9 High Cost of Living for the Locals

Respondents were worried that the development would significantly affect the local economy. They noted that value of property and land would escalate resulting into high cost of living. They feared that they may not be able to afford the cost of living.

5.7.10 Increased Spread of Communicable Diseases

The respondents expressed concern that there would be emergence of new diseases such as HIV/AIDS especially during development stages. There would also be a possibility of prostitution attributed to the labour influx both within the development area and the neighbouring towns.

5.7.11 Increased Social vices

Respondents interviewed expressed that the development envisioned in the master plan would in the long-term result in the emergence of social vices. Key social issues highlighted were drug abuse, immorality, teenage pregnancy and crime. This was linked to the possibility of labour influx and growth of unplanned towns surrounding the proposed Master Plan area.

5.7.12 Increased solid waste generation / Dumping of Solid Waste

The people expressed concern over possibility of generation of large volumes of waste by the various land use changes (industrial, residential, educational etc). In particular, the stakeholders were concerned that Kiambu County lacks adequate capacity / a dumpsite to manage solid waste within the County hence additional waste by the proposed city land use zones would create a crisis.

6 IMPACTS IDENTIFICATION AND ANALYSIS

6.1 Introduction

The environmental baseline information and the Master Plans land uses discussed earlier, formed the basis for impact identification and evaluation. Field surveys, key stakeholder consultation and public participation forums conducted on the proposed Tatu City Extension (Mchana Estate) Master Plan also identified both positive and negative environmental and social impacts. Additionally, literature review of published reports, scientific papers and other approved SEAs was conducted by the team of experts to provide a complete list of expected impacts. The impacts that are expected to arise from the Master Plan execution could either be termed as positive, negative, direct, indirect, short-term, long-term, temporary, and permanent depending on their area of cover and their stay in the environment.

This chapter gives a highlight of impacts analysis. Prediction and evaluation of impacts, including cumulative effects have been clearly documented including trade-offs. The positive and negative impacts likely to originate from the proposed Master Plan execution are described based on social and biophysical environment and the economic aspects.

6.2 Impacts analysis

The magnitude and the extent of the impacts was also quantified by this study. The magnitude of each impact is described in terms of being significant, minor or negligible, temporary or permanent, long-term or short-term, specific (localised) or widespread, reversible or irreversible. Generally, temporary impacts having no obvious long-term consequences are regarded as being minor. But those with long-term repercussions are classified as significant. Significant positive impacts are usually associated with improved access, which is the prime objective of the development.

The negative and positive impacts likely to originate from the development have been linked to the social and biophysical environment and the economic aspects on various land uses proposed by the Master Plan. Among the broad linkages discussed are as follows:

- i. Biophysical Environment:
 - Biodiversity: Flora and Fauna.
 - Water: hydrology of the area.
 - Land and Soil.
 - Climate and Weather
- ii. Social Environment:
 - Population characteristics.
 - Land use patterns.
 - Health and Safety.
- iii. Economic Issues:
 - Trade and industries.
 - Transportation and communication.
 - Income generation activities.

6.3 Quantification of the Magnitude of Impacts

The magnitude and significance of impacts was assessed based on the following factors:

- Location or extent: The area/volume covered
- Timing: Whether immediate or delayed
- Duration: Short term, long term, intermittent or continuous
- Reversibility or irreversibility
- Likelihood: Probability of the impact taking place
- Significance: Whether it is local, regional or global

In order to make the following observation, expert knowledge based on the magnitude of the predicted impacts was relied upon. The impacts are rated based on the applicable mitigation measures. The scale that

was applied in the analysis of impacts is shown in the table below and all the impacts discussed within this chapter have been quantified in line with this scale.

Table 6-1 Levels of Scale used in the Analysis of Impacts

Value (+ve)	Value (-ve)	Description	Scale Description
0	0	No impact	This means that to the best knowledge of the expert, the activity/action will not have any known impact on the environment. Such an impact will not in any way affect the normal functioning of either the human or the natural systems and does not therefore warrant any mitigation.
1	-1	Minimal impact	Such activities have minimum impacts on either natural or human environment or both. <i>If negative</i> , any activity with little impact on the environment calls for preventive measures, which are usually inexpensive and manageable.
2	-2	Moderate impact	A moderate impact will have localized effect on the environment. <i>If the effect is negative and cumulative</i> , action in form of mitigation measures needs to be put in place to ensure that it doesn't become permanent and /or irreversible.
3	-3	High impact	An impact is high if it affects a relatively high area (spatial), several biological resources (severity) and/or the effect is felt for a relatively long period (temporal) e.g. more than one year. <i>In case the effect is negative</i> , such an impact needs to be given timely consideration and proper mitigation measures put in place to prevent further direct, indirect or cumulative adverse effects.
4	-4	Very high impacts	Such an activity rates highly in all aspects used in the scale i.e., temporal, spatial and severity. <i>If negative</i> , it is expected to affect a huge population of plants and animals, biodiversity in general and a large area of the geophysical environment, usually having trans-boundary consequences. Urgent and specialized mitigation measures are needed. It is the experts' opinion that any project with very high negative impacts MUST be suspended until enough effective mitigation measures are put in place.

6.4 Impacts on the Physical Environment

6.4.1 Impact on Air Quality

Air pollution is the single biggest environmental health risk, which include black carbon, methane, ozone, and airborne particles produced by industrial operations and the burning of diesel, coal, kerosene or biomass (UNEP, 2018). These pollutants are also contributing to global warming, lowering labour productivity, and increasing food insecurity around the world.

The local ambient air quality will be impacted both during the execution and operation phases of the envisioned development by the proposed Master Plan. This will mostly be from dust emitted during excavation/earthworks and aggregate transportation to construction sites, and from construction vehicles

and machinery emitting oxides of carbon, nitrogen, and sulphur into the atmosphere during the construction phase.

Upon completion of the development, the most likely sources of air pollution include emissions from housing development, industrial, educational, sports facilities, commercial infrastructure, transportation, and agriculture (Table 6:2). Key pollution points would be standby generators, motor vehicles and kitchen fires. Other potential sources would be from incineration on site, and odours from sewer treatment plants/waste transfer sites.

Table 6-2 Sources of air pollution

Sector	Sources of air pollution
Agriculture and food	Land-based farming, food and agro-industry,
Energy	Combustion plants, fossil fuels, biomass, nuclear, domestic solid fuel heating
Industrial	Chemicals, mineral extractives, , cement
Manufacturing	Information technology, home electronics, construction and home-building products, batteries,
	textiles, apparel, footwear, and luxury goods, pharmaceuticals (for example antibiotics)
Services	Retail, hospitality and tourism, hospitals and health-care services
Transport	Automobiles, fuel use and supply, engine emissions, road (tyres, surface)
Waste	Improper management of municipal solid waste (which includes e-waste, plastics, food waste, organic waste and open burning), industrial waste (which includes e-waste, construction and demolition waste), hazardous waste (which includes e-waste), sewerage effluents, landfills (leachates)

Impact on ambient air quality was also echoed by various consulted stakeholders; however with adequate measures described in the environmental and social management plan chapter; this impact can be mitigated. The Master Plan should aim at ensuring maintenance and enhancement of green zones to sequester carbon from emissions. Further, Tatu can develop an air quality policy that binds developments such as industrial sector to pollution control and adherence to air quality regulations. It's worth noting that the Air Quality Regulations 2014 provides for the prevention, control and abatement of air pollution to ensure clean and healthy ambient air. Based on this, impact on ambient air quality was therefore found to be moderate and allocated value of -2.

6.4.2 Impact on Noise and Vibrations

Development works will most likely result in noise generation as a result of the machines in use e.g. excavation equipment, mixers and construction vehicles delivering materials to active construction sites. The noise is expected to last for the entire Master Plan execution period, respective developments operations and is likely to affect the neighbouring residents and institutions. Off-site noise will also be experienced near and along the access roads to the construction materials sources.

It is expected however that there will be a permanent increase in ambient noise levels with the completion and occupation of the developments. The ambient noise elevations will arise from the mundane activities in an urban developed area.

With proper planning of the various land uses to locate the noisier activities (such as industrial and commercial uses) near main roads or peripheral areas, and the residential / recreational / educational uses inwards in the more serene areas, noise impacts can be mitigated. Establishment of buffer zones between different land uses will attenuate noise, further reducing the potential impacts. Adherence to noise ordinances such as the Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009 and employment of noise attenuation mechanisms for point sources

will mitigate the impact. Based on this, impact on noise and vibrations was therefore found to be moderate and allocated value of -2.

6.4.3 Impact on Energy Resources

The proposed development will result in a higher demand on energy resources both during execution of the planned developments and operation phases. The forms of energy to be utilized include grid energy and fossil fuel.

Construction activities will mostly require fossil fuel in the running of construction vehicles, and generators. Some grid energy will also be required during construction but will be more so required for lighting and powering of machinery/equipment in residential, commercial and industrial establishments in the operation phase. It will be imperative to carry out energy audits for evaluation and improvement of energy consumption and saving practices adopted by all sectors involved.

It is however imperative to institute energy conservation measures in proposed developments while at the same time taking advantage of the renewable energy opportunities that the site and proposed developments provide. These include the harnessing of solar energy, and generation of energy from waste. Further, legal compliance on energy management will be critical for success in energy efficiency. Practical energy management and conservation options also require to be implemented as highlighted in the Energy ESMP. Impact on energy demand is expected to be moderate hence a rating of -2.

6.4.4 Impact on Soils and Geology

Development of the proposed Master Plan will affect the soil and geology of the land in ways such as depletion of the local soil resource from excavation and carting away of spoil material, and soil degradation from compaction and soil sealing leading to increased surface runoff and soil erosion. Soil compaction happens during construction or when remodelling of some type occurs near trees. Other causes of compaction are hardscape or landscape modifications such as driveways, sidewalks, or patios. Any time that equipment, vehicles, or people are driving or operating under trees, there will likely be soil compaction, leading to unhealthy and possibly dead trees.

Spillage of hazardous construction chemicals (such as oils, fuel, grease, paints, solvents, curing compounds, adhesives, acids, soil stabilizers and binders etc.) may also lead to soil contamination while importation of soil in landscaping and fill activities may lead to introduction of invasive species / noxious weeds and pathogens such as bacteria, fungi and nematodes.

Increased soil erosion and sedimentation is likely to be expected, usually an indirect impact of vegetation clearance. Removal of coffee bushes, indigenous and exotic tree species will leave bare land subject to soil erosion. Such bare land will be prone to wind and water erosion. Soil erosion is a serious problem both at its source and downstream of the area designed for Master Plan. Lost soil is deposited elsewhere, and the location of the deposition could alter downstream hydrology and increase flooding. It may also interfere with water quality directly through increasing turbidity levels in the dams, siltation and indirectly from contaminants carried with or attached to eroded soil particles.

It is considered that these impacts can be mitigated and should be adequately addressed in Environmental and social Management Plans (ESMPs) developed. Impact on soils and geology is expected to be moderate hence a rating of -2.

6.4.5 Impact on Water Resources

The development is likely to lead to increased demand on water resources both for all the land uses including, industrial, educational, sports facilities, commercial infrastructure, transportation, agriculture and recreation areas. This water will be sourced from RUJUWASCO flood water and rain water harvesting, and River abstraction.

Without conservative use of these water resources, there is likely to be adverse impacts such as depletion of groundwater resources from over-abstraction, and increased water scarcity in Ruiru and Kiambu area. Measures to ensure adequate water supplies for the envisioned development by the proposed Master Plan need to be established in the Master Planning. Further, water conservation measures will be instituted in

the construction and operation phase of environmental management plans for the various proposed projects / developments to ensure conservation of water resources.

Effluent from the proposed developments in the Tatu City Extension (Mchana Estate) has potential to cause ground/surface water pollution, and health hazards to human and aquatic life. Management of construction wastewater, spill control mechanisms, and treatment of effluent will be required to ensure protection of water resources. Public consultations revealed residents fear from upstream pollution by the proposed City through sewage effluent and water from industries. This will also affect the quality of water that is being utilized by the locals in Kiambu County and environs. In order to curb this sustainable water resource protection, and conservation options require to be instituted. Surface and ground water quality from periodic tests and analysis will need to be conducted for various land use zones. The developed ESMP require to be implemented for water use efficiency alongside implementation of water conservation and management policy. Due to the expected water uptake, impact on water resources is expected high allocated value of -3.

6.4.6 Waste Generation

All the proposed developments and land uses will generate a substantial amount of solid and liquid waste. During development phase spoil materials (soil, rocks, vegetation) packaging materials (e.g. paper, polythene, plastic and metallic packaging), reject materials (including damaged bricks, concrete and mortar, plastics), waste water, used oil among others will be generated. Adequate waste management measures are required since dumping/careless disposal both on-site and off-site will cause environmental pollution, interfere with aesthetics and lead to creation of breeding grounds for vermin. The households, commercial and industrial developments are also likely to generate significant amounts of effluent and organic/inorganic wastes. These wastes require proper handling and disposal to avoid environmental pollution.

Inadequate management of solid and sewerage waste from the developments will lead to pollution and creation of human health hazards endangering the residents and the public. Proper effluent management plans including treatment and discharge into the existing trunk sewer systems and recycling of waste water will be required to mitigate the potential adverse impacts of the generated effluent.

An integrated solid waste management strategy that includes reduction at source, reuse, recycling, incineration and disposal in designated landfill site(s) will also be required for management of solid waste from the developments. Opportunities for generation of energy from solid waste and/or effluent should be explored. It will be important for the development to pursue waste minimization at source principles e.g. zero generation, reduction, re-use and/or recycling. Separation of waste per respective zones domestic, commercial and industrial waste will be best suited to ensure effectiveness in waste management. Tatu Limited should also ensure mechanisms to segregate wastes at source to enable recycling. Pre - treatment of industrial effluent before discharge into sewers should be enforced as per regulations. Enactment of relevant laws such as Environmental Management and Coordination (Water Quality) Regulations, 2003 and Waste Management Regulations, 2006. Although echoed impacts can be mitigated, the expected solid and liquid waste generation is expected to be high hence allocated value of -3.

6.5 Impacts on the Biological Environment

6.5.1 Impact on Flora

An upsurge in catchment degradation within the Master Plan area through cutting down of trees and vegetation may lead to loss of economically significant flora and degradation of environmentally important areas. This may further interfere with ecosystem functions within the Master Plan area with attendant environmental consequences. Destruction of flora will be accelerated by the envisioned land use changes consisting of developments in housing, industrial, educational, sports facilities, commercial, infrastructure, transportation and agriculture. This will result into habitat loss, alteration and fragmentation of land. The proposed Master Plan development activities will also result in alteration and disruption to terrestrial habitats. Developments may adversely affect wildlife habitats depending on the characteristics of existing vegetation, topographic features, and waterways. habitat alteration may include fragmentation of forested habitat and other wildlife habitat through bush clearing, disruption of watercourses, establishment of non-

native invasive plant species, creation of barriers to wildlife movement and visual and auditory disturbance due to the presence of machinery, construction workers, associated equipment and development operations.

Most of the isolated forest plantations scattered amidst the coffee plantations will be cleared. Similarly, most of the isolated indigenous trees at the coffee plantations will be cleared to pave way for the proposed mixed development. Some sections of the natural forests are likely to be cleared. Cutting down/clearing of vegetation is known to have adverse effects on the environment such as reduction of biodiversity, reduction of aesthetic beauty, exposure of soil to surface run-off, reduction of shade and increment in dust pollution among others. Exposure of ground due to vegetation clearance will result to surface run-off. In absence of vegetation, dust pollution is expected to occur as well as sedimentation of the neighbourhood water bodies such as the Rivers and dams.

Environmental degradation on change of land use from agricultural land to a built environment was identified as a concern by the stakeholders. Conversion of land in the proposed Master Plan from coffee plantations to a mixed-use development will likely degrade the environment and alter the environmental conditions of the region. The clearance coffee plantations, trees and vegetation cover for the envisioned development will aptly have a negative impact to the environment through loss of biodiversity in the area. Destruction of wildlife habitat can result in the direct loss or displacement of species and the ability of the ecosystem to support other biological resources such as the plant communities upon which the wildlife rely on for survival.

The ESMP has identified key mitigation measures that can be employed to manage the impact associated with the destruction of fauna. Some of the key management strategies include should entail carrying out landscaping of different zones and maintaining the proposed green spaces as per the Master Plan. Nature trails and research sites should be enriched with native vegetation and where possible, avoidance of clearance of the existing indigenous vegetation should be done. The Master Plan should also ensure protection of the riparian environment and establishment of a riparian reserve management plan. Based on the precautionary measures to be put in place, this impact is expected to be moderate (value of -2).

6.5.2 Impact on Fauna

The natural forests house a number of small game / wildlife. Development of the land will cause disturbances to the wild game. There would be visual and auditory disturbance due to the presence of machinery, construction workers, and associated equipment. There is also the likely loss and fragmentation of wildlife habitats. Some of the natural forests which act as habitat for wildlife are likely to be cleared to pave way for the proposed development. This will result to habitat loss and fragmentation. Changes that may alter the existing natural conditions are known to impact negatively on wildlife. In many cases, wildlife is known to move out or die due to lack of food, shelter and mates when their habitats depart from natural conditions.

Disturbances to aquatic species and communities will be affected by the proposed land use developments. The Master Plan area is characterized by wetlands, Rivers and dams which house aquatic floral and faunal biodiversity. Development activities are expected to have negative impacts on the water bodies through catchment disturbances and siltation. Changes in surface hydrology and water quality can have adverse impacts on aquatic species such as fish, hippos, crocodiles, plants and microbes. Increased turbidity, temperature, velocity of flow, and pollutant loads can have direct impacts on the species and their habitat. A wildlife management plan can be developed in collaboration with the Kenya Wildlife Service (KWS) to determine the carrying capacity of the conservation area, translocations and/or introduction of any new wildlife species.

The destruction of natural habitats can also impacts on the local flora and fauna reducing biodiversity. This in turn affects the existing trophic levels (food chains and food webs). Such alterations may result to ecological imbalances to the detriment of all the biota inhabitation. The introduction of exotic species of plant or animal may oust indigenous species or introduce disease agents which may affect plants, animals and/or man. Further, opening up of vegetated areas may create gaps which are suitable entry point of invasive floral species. Many invasive species are known to be aggressive colonizers and tend to out-compete native species hence introducing ecological imbalance. Since the Master Plan of the proposed

development has set aside areas under water bodies to be maintained, this impact will be moderate (value of -2).

6.6 Impacts on the Socio- Economic Environment

Development of the various land uses will bring along major socio-economic impacts which are likely to be both negative and positive. Key positive impacts anticipated will include provision numerous employment opportunities for skilled, semi-skilled and unskilled labour. Even though most of the development will need skilled labour force during operation, the stakeholders expressed hope that they will be able to access employment once the development commences mostly as casual workers. Employment opportunities will in return benefit both economically and socially. Generally, employment will lead to multidimensional development in the area and improve several people's living standards hence enabling poverty alleviation for the locals and boost the country GDP overall improve the living standards of Kenyans.

Business opportunities are anticipated during the execution of different land uses. Opportunities will range from supply of raw materials to small scale business people such as food vendors and kiosk owners. It is also anticipated that the value of land will increase with urbanisation. Land rent and standard of living of the populace will increase due to high demand for space for urban development thus increasing the value of land and property within and surrounding the Master Plan area. Investors are likely to be attracted to invest their money in the proposed development through enterprises, business among others. The development of infrastructure and social amenities would improve Kiambu area. The County environs will develop from a rural area to an urban area with improved transport and communication infrastructure, power distribution network, water and sewerage networks, education, health and recreational facilities among other social amenities. Due to the anticipated educational institutions, the value of education and accessibility to research institutions will be made easy.

Better Healthcare is anticipated in the area due to development of health care facilities. This will reduce fatalities from curable diseases and increase life expectancy. Further, improved and increased housing development will attract various classes of residents (high, medium and low). The development will bring along networking and culture exchange as it attracts various people from different counties and countries resulting into cultural integration of knowledge and exchange of a wide range of ideas.

The envisioned development will enhance economic growth resulting to increased revenue. The use of locally available materials and labour for the proposed Master Plan development activities will contribute towards growth of the local and national economies by contributing to the gross domestic product. The consumption of these materials like sand, cement, steel, building stones, timber, oil and others will attract taxes including VAT which will be payable to the government hence increasing government revenue while the cost of these raw materials will be payable directly to the producers. Moreover, the proposed city is anticipated to massively reduce congestion in central Nairobi and reverse traffic flows between the Centre and Kiambu County. This will accelerate economic growth and serve as a catalyst for further urban development in Kiambu County and environs.

Nonetheless, envisioned development will result to negative pressures such as on infrastructure associated with magnitude of land use changes. There is a potential of increasing pressure on existing infrastructure such as roads, water supply system, waste handling facilities, electricity etc. This would be due to increased volumes on human and vehicle traffic along the access road. Further, there will be interference with already existing infrastructure such as the pipeline, water pipes, power lines, roads and thus causing inconveniences. Displacement of the local people mostly coffee settlers lead to loss of property in the area. Additionally, clearance of the coffee plantations at Tatu City Extension (Mchana Estate) will impact negatively to the local communities who derive their livelihoods from these plantations. Coffee workers working at the coffee plantations will lose their jobs once the coffee plantations are cleared and this will have a localized impact on rural household economy. Fears also emerged that locals may not be able to afford the cost of living brought about by accelerated urbanization. However, socio – economic impacts are expected to be mitigate and hence rated to be moderate (value of -2).

6.7 Impacts on the Health and Safety

The several developments and land use changes envisioned by the Master Plan will result to known workplace safety risks. Safety hazards are likely to increase resulting in a possible increase in accidents involving workers and/or the public. Development works will expose workers to occupational health and safety risks and injuries resulting from accidental falls or use of hand tools and construction equipment. Safety hazards are also posed to the public especially pedestrians and motorists passing near ongoing developments.

Upon development (or various phases/projects are complete) and in operation, potential health and safety hazards may arise in the event of a lack of adequate facilities, protection measures, worker protection measures, and general laxity in adherence to best practices and OSHA, 2007 regulations. Adequate health and safety plans will therefore require to be implemented to mitigate all foreseeable health and safety risks in the development.

Due to population influx, there is concern for increased spread of communicable diseases and emergence of new diseases such as HIV/AIDS with a possibility of prostitution. Such social vices including drug abuse, immorality, teenage pregnancy and crime could catalyse health and safety risks. However, health and safety impacts are expected to be mitigate and hence rated to be minimal (value of -1).

6.8 Cumulative Impacts

Cumulative impacts are impacts which result from the incremental impact of a proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. IFC defines cumulative as those impacts that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones. It is anticipated that cumulative impacts on resources such as water, and energy within Kiambu County region and environs might arise due to the needs for the simultaneous development of other interlinking plans. Based on this the SEA undertook a Cumulative Impacts Analysis (CIA) as described in succeeding sections.

6.8.1 Cumulative Impacts Analysis (CIA)

Cumulative Impact Analysis is a systematic procedure for identifying and evaluating the significance of effects from multiple activities. CIA was carried out during the Strategic Environmental Assessment as it considers a wider temporal and spatial scope at an early level of the planning process. With reference to development plans, cumulative impacts can occur from the combined impacts of policies and proposals on specific areas or sensitive receptors. The Tatu City Extension (Mchana Estate) Master Plan is anticipated to generate several cumulative impacts from the different operations zones considered in its development. During the CIA, the following elements that define the cause-effect relationship of the impacts according to Cooper (2004) were used;

- Identification of the impact sources i.e. multiple activities that could lead to potential impacts or environmental changes
- Consideration of the pathways of impacts between sources and receptors and the linkages between these impacts
- Analysis of the characteristics of these impacts i.e. whether they are additive, synergistic or antagonistic

The CIA process took place in several steps, some of which were done concurrently with the initial steps of the SEA process. The CIA for the proposed Master Plan was undertaken in the process summarized as follows:

- i) Scoping in consultation with the relevant key stakeholders and agencies
- ii) Establishing of the baseline characteristics of the proposed Master Plan
- iii) Assessing the impacts of the Master Plan
- iv) Proposing mitigation measures for the potential significant impacts
- v) Development of a monitoring plan – Chapter 9 of this SEA
- vi) Incorporating findings

6.8.2 Cumulative Positive Impacts

6.8.2.1 Improved road network

The developments taking place around the Tatu City will lead to the construction of more roads to link the various areas. This will improve the road network within Ruiru and Kiambu towns making the area more and easily accessible from different parts of the County.

6.8.2.2 Improved communication network coverage

The new industrial, residential and educational zones will increase the demand for better communication services, in terms of internet and normal cellular services. The major communication companies in Kenya will expand their coverage to the Ruiru and Kiambu towns region neighboring the development, leading to an overall better and efficient coverage and service provision.

6.8.2.3 Increased job opportunities in the area

The industrial, residential, educational and commercial zones will provide an opportunity for the local community and the rest of the neighbouring communities to get employment. The opportunities will also be available to people residing in Ruiru town, Kiambu town and its environs. Small-scale businesses and markets will also be established due to the demand by the foreseen increased population in the area, hence will lead to more job opportunities for the unemployed people.

6.8.2.4 Improved literacy level within the neighbouring community

New schools will also be constructed in the educational zones to cater for the foreseen growing population within and outside Tatu City, hence education services (primary, secondary and tertiary) will be easily accessible. This will increase the number of people who can read, write and engage in different professions within Ruiru and Kiambu towns.

6.8.2.5 Increase in property value

Once the Master Plan is executed, the land will appreciate hence leading to the overall increase in property value around Tatu City. The local community within Ruiru and Kiambu towns may benefit from selling the property at higher profit margins as compared to when there was no development.

6.8.3 Cumulative Negative impacts

6.8.3.1 Increased demand for housing / Population influx

The current Tatu City neighbourhood does not have a lot of housing facilities for low-middle class citizens. The population influx due to job opportunities will necessitate the need for the development of more residential zones around Tatu City, which may later lead to other negative environmental impacts such as loss of biodiversity due to clearing of vegetation.

6.8.3.2 Increased traffic

There will be increased traffic in the area due to the high number of people who will be accessing the Tatu City and the neighbouring foreseen residential zones around Tatu city. The improved road network will also create a new route for other motorists to use who may not be necessarily going to the new city leading to traffic snarl-up.

6.8.3.3 Increased demand for water use

There will be an increase in demand for water use by the Tatu City, neighbouring residential zones and the current demand within Ruiru and Kiambu towns in general. This will lead to increased pressure on water services provision to the already scarce resource in the area.

6.8.3.4 Increased demand for sewerage services

Ruiru and Kiambu towns do not have an efficient sewerage system and most of the neighbouring areas lacks sewer coverage. The new developments and anticipated new housing facilities will require more sewerage services which are not currently available.

6.8.3.5 Urbanization

The area where the Tatu city extension will be developed is mostly a rural area. The new road network, population influx and foreseen residential zones around Tatu city will lead to rapid urbanization of the area, leading to loss of the initial scenic beauty and aesthetic value.

6.8.3.6 Development of uncontrolled housing / Influx of new inhabitants

The increased demand for housing and urbanization of the area may lead to encroachments in some parts of the neighbouring land, hence leading to development of slum dwellings / uncontrolled housing for low income earners who may not afford the medium-high cost of rent in the residential zones.

The development of new industrial and residential zones will also lead to movement of people from the neighbouring estates and towns due to the new job opportunities within the area. This will eventually result in an increase in the population of the area around Tatu City.

6.8.3.7 Loss of biodiversity

The constant clearing of vegetation to create space for the developments will lead to loss of some of the indigenous species within the area resulting to loss of biodiversity.

6.8.3.8 Increased air pollution

The increased traffic within the Ruiru town, Kiambu town and around the Tatu city will lead to increased release of toxic gases and particulates from the vehicles, industrial zones and other activities within the neighbourhood.

6.8.3.9 Increased noise pollution

The industrial zones, residential, commercial zones, airstrip and increased traffic may lead to increased noise generation. The noise maybe of nuisance to the neighbouring community.

6.8.3.10 Increased solid waste generation

The industrial, commercial, educational and residential zones will lead to generation of more solid waste. The solid waste if not handled properly could lead to unpleasant smells and spread of diseases by some rodents.

6.8.3.11 Soil erosion and increased storm flow

The clearing of vegetation for the development of the various zones will expose the soil to erosion by wind or water during the rainy seasons. The industrial zones may contaminate the soil by spillage of hazardous substances or wastewater. The residential zones will generate high volumes of wastewater and if not properly disposed of may spill into soil hence contaminating it. Additionally, given the undulating terrain

in some parts of proposed land for Tatu City development, with the occurrence of increased impermeable surfaces in the form of tarmac, pathways, iron-sheet roofing and other surfaces, there is likelihood of increased surface run off hence, resulting into faster filling of the water dams , if rain prolongs, which may lead to flooding downstream.

6.8.3.12 Depletion of water resources

The industries and the residential areas will need a high and regular supply of water. The water will be abstracted from the Rivers and the existing boreholes. Continuous abstraction may lead to depletion of the River and groundwater resources. The fertilizers, pesticides and herbicides that will be used in the agricultural zones may leach into the surface water and groundwater resources hence contaminating them and rendering them useless for domestic use.

6.8.3.13 Eutrophication

The continuous leaching of nutrients from the agricultural zones may lead to their accumulation in the dams and the wetlands. This may result in algal blooms that will contaminate the water and kill the aquatic animals.

6.8.4 Mitigation measures for negative Cumulative Impacts

Mitigation of cumulative impacts is best approached through a multi-stakeholder’s approach. Some of the actions that may be needed to effectively manage cumulative impacts include the following:

- Project design changes to avoid cumulative impacts (location, timing, technology).
- Adaptive management approaches to project mitigation.
- Mitigation of project impacts by other projects (not under control of the proponent to further minimize impacts).
- Collaborative engagement in other regional cumulative impact management strategies.
- Participation in regional monitoring programs to assess the realized cumulative impacts and efficacy of management efforts.
- Effect monitoring needed to assess the realized cumulative impacts is clearly defined and implemented.
- Ensure multiparty regional mitigation and/or management (e.g., additional mitigation of other developments, offsets, management programs) that may be needed to effectively manage cumulative impacts is also identified
- Support from other stakeholders (County Governments, developers and communities) is sought to implement it.

Table 6-3 A highlight of key mitigation measures for described negative Cumulative Impacts

Impact	Mitigation
Increased demand for housing / Population influx	<ul style="list-style-type: none"> ▪ Increase accessibility of Tatu City by enhanced traffic for prompt transport. ▪ Develop well planned - low income residential zones
Increased traffic	<ul style="list-style-type: none"> ▪ Work with the relevant road authorities to develop efficient road designs ▪ Proper signage should also be incorporated to guide the road users with ease and the most efficient way.
Increased demand for water use	<ul style="list-style-type: none"> ▪ Come up with measures of optimizing the existing water resources such as rain harvesting and water recycling technologies ▪ Sensitizing the occupiers in all the zones on water conservation initiatives ▪ Perform scheduled maintenance on the water supply infrastructure to reduce any leakages

Impact	Mitigation
Increased demand for sewerage services	<ul style="list-style-type: none"> ▪ Develop an onsite wastewater treatment plant since Rujuwasco sewer coverage is low ▪ Lobby Kiambu County government to expand the current sewerage system and capacity improvement of the existing wastewater treatment plant to cater for the envisioned demand.
Urbanization	<ul style="list-style-type: none"> ▪ Implement a controlled development strategy around the Tatu city to prevent an uncontrolled urbanization
Development of uncontrolled settlements / Influx of new inhabitants	<ul style="list-style-type: none"> ▪ Work closely with the Kiambu County Physical planner to control and prevent any persons from settling in unauthorized areas ▪ Sensitize local community into community policing to prevent illegal settlements ▪ Work closely with some private investors to develop well planned - low income residential zones to cater for the low-income earners and low middle class
Loss of biodiversity	<ul style="list-style-type: none"> ▪ Avoid clearing indigenous vegetation ▪ Ensure replacement of any cleared vegetation is done after development
Increased air pollution	<ul style="list-style-type: none"> ▪ Instigate measures of air pollution control before releasing any harmful substances into the air ▪ Sensitize on the use of non-sulphur fuels for different purposes in all the zones. ▪ Sensitize neighbouring community against open burning of waste
Increased noise pollution	<ul style="list-style-type: none"> ▪ The industrial and commercial zones to schedule most of the operations during the day ▪ Only operations that meet the required permissible noise levels should be allowed to operate at night ▪ Install 'no hooting' signs in zones where noise will be of most nuisance like the education and residential zones. ▪ Sensitization of motorists within these zones against unnecessary noise making ▪ Airstrip to be developed away from the residential and educational zones to minimize the effect of the noise
Increased solid waste generation	<ul style="list-style-type: none"> ▪ Develop a waste management plan for the city which will guide the occupiers of the different zones in managing their waste ▪ Sensitize the occupiers and visitors on the recommended ways of waste disposal
Impacts on soil	<ul style="list-style-type: none"> ▪ Put measures in place to control the spillage of hazardous substances and wastewater into the soil. ▪ Ensure that the wastewater system in all the zones is adequate and made from good quality materials to prevent spillage into the soil.
Flooding	<ul style="list-style-type: none"> ▪ Planting of grass, trees, water reeds in flood areas ▪ Develop spill ways for the min-check dams in Tatu City Phase 1,2 ▪ Develop plans to harvest roof catchment waters for inhouse use and washing ▪ Ensure Cabbro pavements are done as opposed to tarmac slabs
Impacts on water resources	<ul style="list-style-type: none"> ▪ In collaboration with the Kiambu County government, implement water resource conservation measures such as water storage in dams and rainwater harvesting ▪ Lobby County government to implement laws to prohibit illegal abstraction of surface and ground water ▪ Encourage organic farming to reduce the leaching of the chemicals from the agricultural zone

Impact	Mitigation
Eutrophication	<ul style="list-style-type: none"><li>▪ Encourage the use of organic farm inputs to reduce the usage of chemical fertilizers.<li>▪ Wetland plants that have the capability of utilizing the excess nutrients should be introduced to aid in water biological water purification.

7 ALTERNATIVE OPTIONS OF THE MASTER PLAN

7.1 Introduction

This chapter addresses the alternative options of the Master Plan compared against key environmental indicators. It bases this on various options including the employing alternatives to achieve the same plan, use of alternative approaches, and the no intervention and discussing the implication of key Master Plans to the proposed Tatu City Extension (Mchana Estate) Master Plan. The chapter begins by identification of alternatives which include the no intervention option (carbon sink), farmland/agriculture, wildlife conservancy and proposed city use. Justification of the preferred alternative is given in succeeding section with the linkages with ongoing projects and developments forming the last subsection in the chapter.

7.1 Alternative Policy, Options and Strategies

The land use zoning for the proposed Tatu City Extension (Mchana Estate) Master Plan was done after considering several suitability factors to meet the social, economic, environmental, cultural and even political aspirations of the respective planning jurisdictions. As a result, different land uses were opted for ranging from, among others, residential, commercial, industrial, open spaces, transportation public amenities and infrastructure in a balanced manner that promotes sustainable development. The establishment of the proposed Master Plan conforms to this provision by actualizing the development demands in addition to meeting the flagship project proposals of the Kenya Vision 2030.

Much as this development conforms to the zoning provisions of the land, there was need to widen the scope of potential alternative developments which may suffice needs other than the designated use. The SEA team identified four possible alternatives/ options to which the land could be used. They include: Option 1-No Intervention Option (Carbon sink), Option 2-Farmland/Agriculture Use, Option 3-Wildlife Conservancy and Option 4-The Proposed City Use. The likely environmental and socio-economic impacts of each option were assessed.

7.1.1 Option 1 - No Intervention Option (Carbon sink/ sequestration Option),

The development area proposed for Tatu City Extension (Mchana Estate) Master Plan is characterized by a diversity of forests and vegetation types. Forest plantations occur in isolated patches amidst the predominant coffee plantations and the natural forests/vegetation types characterize the riparian zones of the key Rivers, streams and earth dams within the proposed development. On the 885.22 ha (2,186 acres) of land proposed for Tatu City Extension (Mchana Estate), 235 acres is under forests and bushlands.

Carbon sequestration in the agriculture sector refers to the capacity of agriculture lands and forests to remove carbon dioxide from the atmosphere. Trees are natural sequesters of carbon and depending on their characteristics and local circumstances, forests can play different roles in the carbon cycle, from net emitters to net sinks of carbon. Forests sequester carbon by capturing carbon dioxide from the atmosphere and transforming it into biomass through photosynthesis. Sequestered carbon is then accumulated in the form of biomass, deadwood, litter and in forest soils. Release of carbon from forest ecosystems results from natural processes (respiration and oxidation) as well as deliberate or unintended results of human activities (i.e. harvesting, fires, deforestation). For this process of carbon sequestration to succeed it is essential that carbon must not return to the atmosphere from burning.

Forests and stable grasslands are referred to as carbon sinks because they can store large amounts of carbon in their vegetation and root systems for long periods of time. Soils are the largest terrestrial sink for carbon on the planet. The ability of agriculture lands to store or sequester carbon depends on several factors, including climate, soil type, type of crop or vegetation cover and management practices.

The contribution of forests to carbon cycles has to be evaluated taking also into account the use of harvested wood, such as wood products storing carbon for a certain period of time, or energy generation releasing carbon in the atmosphere. In cases where the net balance of carbon emissions by forests is negative, i.e. carbon sequestration prevails, forests contribute to mitigating carbon emissions by acting as both a carbon

reservoir and a tool to sequester additional carbon. In cases when the net balance of carbon emissions is positive, forests contribute to enhancing greenhouse effect and climate change.

Forests and their role in the carbon cycle are affected by changing climatic conditions. Evolutions in rainfall and temperature can have either damaging or beneficial impacts on forest health and productivity, which are very complex to predict. Depending on circumstances, climate change will either reduce or increase carbon sequestration into forests, which causes uncertainty about the extent to which the forest will be able to contribute to climate change mitigation in the long term. Forest management activities have the potential to influence carbon sequestration by stimulating certain processes and mitigating impacts of negative factors.

Carbon sequestration is not separable from other environmental effects of a given land-use practice and the storage of carbon in agricultural soils is likely to come with a number of co-benefits including wildlife habitat, water quality, and landscape aesthetics. Carbon Sequestration can assist significantly in maintaining the natural carbon cycle. However, to implement this practice properly there is a need to go for natural sequestration thus conservation of existing forests and more and more reforestation is required. Only then we will be able to reduce carbon emission and corresponding harmful impacts.

Land is one of the finite natural resource on earth. Its optimal utilization is therefore one key factor to consider. This option has the highest and most appealing environmentally and ecologically rewarding outputs. Nature shall thrive, both flora and fauna. Eventually, the land can end up creating a micro-climate in the urban set up, a peaceful park for the locals and promote carbon sequestration. However, if the value of the land is compared to the no use option, this shall amount to massive wastage of valuable land, owing to the fact that's its located a few kilometers from Nairobi City Centre.

7.1.2 Option 2 - Farm land / Agricultural Use Option

Agriculture is the predominant economic activity in the proposed Tatu City Extension (Mchana Estate). The development area and neighboring land is vastly under coffee plantation, non-indigenous tree species, bamboo trees, bush and grassland vegetation as shown in Plates 7:1, 7:2 and 7:3 below. On the 885.22 hectares of land proposed for Tatu City Extension, land cover under coffee plantations is estimated to be 1,090 acres. However, also notable are sparsely populated natural/indigenous tree species. Food crops such as bananas, maize and beans can be spotted grown relatively in small scale.



Plate 7-1 Coffee plantation within the Master Plan area.



Plate 7-2 Tree Cover opposite Ngewe Primary School within the Master Plan area



Plate 7-3 Bamboo trees near Comte Dam.

According to the Master Plan, Tatu City Extension (Mchana Estate) has two dams. To the South, Comte Dam built in 1984 (Plate 7:4.) which separates the proposed Tatu City Extension (Mchana Estate) from Tatu City Phase 1. The other dam is Kofinaf Dam.



Plate 7-4 Comte Dam

Historically, coffee has been an important commodity in Kenya because of its contribution to foreign exchange earnings, farm incomes and employment opportunities. Apart from the direct impact on livelihoods of farming families, coffee cultivation offers several other advantages. Coffee growing helps reduce soil erosion, is a useful carbon sink (especially with plantations grown under shade trees), aids good watershed management, helps to maintain a degree of biodiversity, particularly in systems with mixed cropping on small family farms, and can provide a good habitat for many migrant birds and other animals. However, if this land use option is compared to other land use development options identified above, it will be noted that this is not the most optimal way to use the land. This land is in a prime high land value area for the mixed use and mixed income satellite city of Nairobi.

7.1.3 Option 3 - Wildlife Conservancy

Wildlife conservation is the practice of protecting wild species and their habitats in order to prevent species from going extinct. Wildlife plays an important role in balancing the environment and provides stability to different natural processes of nature and maintenance of essential ecological processes and life-support. Major threats to wildlife include habitat destruction/degradation/fragmentation, overexploitation, hunting, pollution and climate change.

Wildlife conservation has social, environmental and economic benefits: Social in the sense that, apart from being a carbon sink by absorbing toxic gases in the environment, wildlife provides sites for natural beauty, hiking, controlled hunting, canoeing and wildlife photographing. On the environment perspective, wildlife plays an essential role in the ecological and biological processes that are yet again significant to life. The normal functioning of the biosphere depends on endless interactions amongst animals, plants and microorganisms. This in turn maintains and enhances human life further. To add on these, ecological processes are vital for agriculture, forestry, fisheries and other endeavors that support human life. Besides, there are several biological processes wherein wildlife plays a key role such as pollination, germination, seed dispersal, soil generation, nutrient cycling, predation, habitat maintenance, waste, breakdown among other benefits. Wildlife conservation is also linked to the acceleration of ecotourism on a national level which is a very influential stimulus for the Kenyan economy. Eco-tourism and wildlife conservation are complementary or overlapping sectors of the economy. Income generated from ecotourism can be used to fund both wildlife conservation and socio-economic development to benefits of the local communities.

Several pockets of wildlife habitats exist within the proposed Master Plan area. Depending on type of habitat, different wild game exists. At the proposed Master Plan area, three types of wildlife habitats exist. Water bodies such as Mukuyu and Mchana Rivers, Comte and Mchana Earth dams form a key wildlife habitat mostly for aquatic animals. Secondly, the riparian corridors of the water bodies mainly composed of natural forests/vegetation forms another key wildlife habitat at the proposed Master Plan area. Thirdly, the many pockets of grasslands/marshy lands scattered in the proposed area forms another habitat for wildlife. The proposed development area comprises several hippopotami, which occupy the perennial rivers and earth dams which run along the northern and southern boundaries of the area and make use of the seasonally moist grasslands and riparian areas (including wetlands) for foraging purposes and as ecological corridors for movement. During the SEA study, no amphibian species were identified. However, the amphibians can be spotted during the wet season. Many bird species exist in the study area including secretary bird, crowned cranes, pelicans, marabou storks, and eagles.

Wildlife species need four essential elements to survive: food, water, shelter, and space. Shelter must be adequate to protect the wildlife from predators and the environment. Space must be adequate for the wildlife to successfully rear their young. In addition to these four requirements, the spatial arrangement of these necessities must be in proper order. That is to say, the sources must be within a certain distance of each other so that the animal can access each safely on a daily basis. To control urban wildlife populations, one must manipulate one of the four habitat factors as wildlife cannot survive unless their habitat needs are met. If one of these habitat requirements is absent, wildlife will either migrate to another area capable of providing their needs or die. For long-term wildlife management, this can be challenging leading to possible human- wildlife conflicts.

As a result of ongoing developmental activities in Tatu City phase 1 and agricultural activities currently at Tatu City Extension (Mchana Estate), most of the wildlife habitats are small and isolated. Ecologically, only small game can survive in such small habitats since the available resources for feeding, sheltering and reproduction are limited. This implies that the existing wildlife habitat will be decimated further to the detriment of the wildlife in habitation. Wild game is known to prefer natural ecosystems and any disruption that may result to departure from the natural state such as habitat fragmentation, loss of nesting sites and other wildlife habitat through bush clearing, disruption of watercourses, establishment of non-native invasive plant species, creation of barriers to wildlife movement and visual and auditory disturbance forces wild game to move out of their habitat, die of heat stroke or die due to lack of their most preferred diet.

The proposed Master Plan mixed-use land uses are expected to subject the existing wildlife habitats to further disturbances/modifications. Incidences of habitat pollution, especially the water bodies and marshy lands, are likely to occur thus altering the existing natural conditions. Surface run-off from the proposed Master Plan development will be used to recharge the earth dams. Surface run-off from urban environs is usually contaminated and this may compromise the quality of water to the detriment of aquatic life in habitation.

Tatu City in coordination with relevant agencies such as the Kenya Wildlife Service are in the process of relocating the animals since the existing wildlife habitats are small and previously disturbed by habitat fragmentation. This will also ensure the safety of the people living within the proposed development as well as the survival of the animals.

Wildlife Conservancy option is also not compatible to Tatu City's immediate surroundings of mixed land use developments and as much as this land use option is important, the economic gain is low as compared to the current option of utilizing it as mixed-use city development.

7.1.4 Option 4 - Proposed City Development

This option will focus on developing the whole 2000 acres of land for mixed use development, including housing, commerce, manufacturing industry, education, agriculture and livestock, recreation, public purpose and natural green open spaces with riparian reserve, water bodies and wetlands. All the proposed development will be served with a comprehensive transportation network and telecommunication

facilities.

Recently, the Kenyan government, under its Economic Transformation Agenda, identified four key priority sectors for the development of the country and realization of Vision 2030. Popularly known as the Big Four, the transformation focuses on increasing capacity in affordable housing, manufacturing sector, universal healthcare and food security. With housing provision for over 150,000 residents planned on completion, alongside tens of thousands of jobs in construction, manufacturing and ancillary services, Tatu City (Mchana Estate) will contribute significantly toward Kenya's Big Four objectives.

Housing has always been a basic human need. Developing countries, Kenya included, have encountered the perennial challenge of housing shortage, more so for the low and middle-income population. The housing shortage can be attributed to the high urban population influx and growth rate. Nairobi, as the -country capital city, has heavy shortage of the middle-low income housing.

The mixed-use development option will optimize economic benefits in its entire decision making. Commercial development shall promote the economic development by providing more space for doing business. One key factor to consider is the socio-economic impact of this option to both the locals and investors.

Industrial development on the other hand has a higher potential of impacting on the value chain aspects of development. For instance, whereas the option will promote the various professional, business and service provision elements of development, industrial development shall promote the entire range from agro-production, agroforestry, transport, manufacturing, logistics, professionals, research and development. This shall also promote production for export. This will earn foreign exchange in the short, medium and long term. The housing development alone cannot achieve this.

Industrialization has been one of the major economic Rivers since the industrial revolution era. As a result, less industrialized countries in the third world countries, Kenya included, have struggled to thrive economically and competitively in the global trade. It is on this backdrop that Kenya established several industrial development flagship projects under the Kenya Vision 2030. Industrial development is an approach to revitalizing the industrial sector that has been dwindling over time. In addition, industries focus on the public value rather than individual value.

7.2 Justification for the Preferred Alternative - Proposed Tatu City Extension Development

The process of identifying the best Master Plan alternative required a thorough analysis using a multi-criteria approach. The enormity of impacts was weighted and measured across the four considered options: Option 1-No Intervention Option (Carbon sink), Option 2-Farmland/Agriculture Use, Option 3-Wildlife Conservancy and Option 4-The Proposed City Use. This was achieved by pre-determining the impacts based on international guidelines and expert opinion. Each impact was then categorised as per the three dimensions of sustainable development: environmental, social and economic. The impacts were scored as per the levels of scale used in Table 6-1.

The results (table 7-1) demonstrated that the most preferred alternative is the proposed Tatu City development, since it recorded the highest score interms of economic impacts and highest total score when compared between the three paradigm shift of sustainable development. Much as the Tatu City alternative is expected to produce some negative environmental effects, the mitigations that have been proposed in the SEA will be adequate to reduce on impacts.

Table 7-1 Multi-criteria analysis approach for the preferred alternative

Key Impacts	Option 1-No Intervention Option (Carbon sink),	Option 2-Farmland/ Agriculture Use	Option 3-Wildlife Conservancy	Option 4-The Proposed Tatu City Development
Environmental Impacts(+ve)				
Increase in use of Renewable energy (such as Solar)	0	0	0	4
Technologies in water harvesting	0	0	0	4
Environmental Impacts				
Air Pollution	0	-2	-1	-2
Increased Noise and vibrations	0	-2	-1	-2
Increased use of energy resources	0	-2	0	-2
Soil degradation	0	-2	-1	-2
Increased water use	0	-4	-1	-2
Water Pollution	0	-3	-1	-2
Negative impact on Flora	0	-2	0	-2
Negative Impact on Fauna	0	-2	0	-2
Social Impacts (+ve Impacts)				
Employment	1	2	2	4
Improved living standards	0	1	1	4
Poverty alleviation	0	1	1	2
Business opportunities	0	1	1	4
Increasement in land Value	0	1	1	4
Improved standard of living	0	1	1	2
Increased property values	0	0	1	4
Urbanization	0	0	0	4
Improved transport	0	0	0	3
Improved Communication	0	0	0	4
Increased power distribution network	0	0	0	4
Increased Education amenities	0	0	0	3
Value of education and accessibility to research institutions will be made easy	0	0	0	3
Improved healthcare Access	0	0	0	2
Improved recreational facilities	0	0	0	2
Better social Facilities	0	0	1	2
Social Impacts (-ve Impacts)				
Land use changes	0	-3	-1	-3
Increased pressure on existing infrastructure such as roads, water supply system, waste handling facilities, electricity.	0	-1	0	-2
Increased volumes on human and vehicle traffic along the access road	0	-1	0	-2
Interference with already existing infrastructure such as the pipeline, water pipes, power lines, roads and thus causing inconveniences.	0	-1	0	-2

Key Impacts	Option 1-No Intervention Option (Carbon sink),	Option 2-Farmland/ Agriculture Use	Option 3-Wildlife Conservancy	Option 4-The Proposed Tatu City Development
Displacement of the local people mostly coffee settlers	0	-2	0	-2
Loss of existing property	0	-2	-2	-2
Reduced livelihoods from coffee plantation	0	0	-4	-2
Increased spread of communicable diseases	0	-1	0	-2
Emergence of new diseases such as HIV/AIDS with a possibility of prostitution.	0	0	0	-2
Social vices including drug abuse, immorality, teenage pregnancy and crime	0	0	0	-3
Population influx	0	0	0	-3
Increased cost of living	0	0	0	-2
Economic impacts (+ve Impacts)				
Increased life expectancy	0	0	0	3
Increased housing development	0	0	0	2
Networking and culture exchange	0	0	0	3
Growth of the local and national economies	0	1	1	4
Contributing to the gross domestic product	0	1	1	4
Attracting taxes including VAT	0	1	1	4
Catalyst for further urban development in Kiambu	0	0	1	4
Economic impacts (-ve Impacts)				
Income disparity	-4	-2	-2	-1
Unemployment	-4	-2	-2	-1
Increased taxes	-4	-2	-2	-1
Lack of Revenue	-4	-2	-2	-1
Health and Safety Impacts				
Workplace safety risks	0	-1	-1	-4
Increased accidents involving workers and/or the public	0	-1	-1	-4
Exposure of workers to occupational health and safety risks and injuries	0	-1	-1	-4
Increased spread of communicable diseases	0	-2	-2	-4
Emergence of new diseases such as HIV/AIDS with a possibility of prostitution.	0	-2	-2	-4
Social vices including drug abuse, immorality, teenage pregnancy and crime	0	-2	-2	-4
Total	-15	-37	-16	4

The development further conforms to the zoning provisions of the land since incompatible land uses such as residential and industrial have been clearly separated. Land uses have been provided in an integrative manner ranging from among others, residential, commercial, industrial, open spaces, transportation public amenities in order to promote sustainable development as envisioned by the Kenya Vision 2030. Preferred land uses in the Master Plan have also been designated to be correlation with the adopted streets and highways provided this very crucial in enhancing connectivity, effective traffic flow and convenience.

Tatu City Extension (Mchana Estate) development was further based on the assessment of the compatibility of Tatu City Extension (Mchana Estate) to immediate surrounding land uses. Since the proposed development is also surrounded by other similar proposed land uses such as Northlands City Development, Kenyatta University Development, The Two Rivers Development and Gulmarg- Sasini development, it was found to be compatible with the land use since their cumulative implementation will lead to further development of not only the area but the entire Kiambu County and Nairobi Metropolitan Region. This will help in achieving the development goals stated in the Kiambu County Integrated Development Plan as well as the Nairobi Metro Plan and the NIUPLAN. Increased urbanization of the area will lead to increased job opportunities, availability of housing and increased revenue by both the County and National Government.

It is noted that implementation of the Master Plan will lead to further loss of agricultural land since majority of the existing land is under agricultural use. This loss of fertile agricultural land means a decline in the national food basket. Moreover, the development of the city will also lead to future threats on existing neighbouring agricultural land uses due to urban sprawl hence the need of coming up with proper zoning guidelines to curb these negative effects. However changing use from agricultural to residential and commercial use has often proved to be more economically viable as development comes with positive effects such as employment and business opportunities leading to improved economy. This further leads to increased urban land uses as well as population creating further opportunities into the rural areas.

7.3 Linkages with ongoing Projects and developments

Linkages with ongoing projects, plans and programmes and how they fit in the Proposed Tatu City Extension (Mchana Estate) Master Plan was based on two key analysis. These included assessing the implication of the key linkage Master Plans to proposed Tatu City Extension (Mchana Estate) and the vice versa.

7.3.1 The Nairobi Integrated Urban Development Master Plan (NIUPLAN)

NIUPLAN provides for creation of satellite Towns to decongest the City by creating a Nairobi Metropolitan Region (NMR). Ruiru Town is identified as one of the satellite towns. Ruiru has the potential to become an alternative or secondary Centre of the NMR and may even become the “Future Centre of the Metropolis” as envisaged in Nairobi Metropolitan Services Improvement Programme (NaMSIP). Tatu City which is located within Ruiru Municipality will provide an excellent solution to this due to its strategic location coupled with the proposed transport developments in the NIUPLAN.

Proximity to Nairobi therefore gives Tatu a wide range of benefits from which it can capitalize from. To make Tatu City a smart and futuristic development that covers for all the needs for its residents, the city needs to come up with strategies of managing anticipated population from Nairobi and its environment that encompasses both the poor and the rich in the society. The NIUPLAN also gives Tatu City a framework of how to manage anticipated urban area challenges as Nairobi acts as a real case study.

Tatu City will offer facilities that as expected to attract populations from Nairobi for mutual benefit between the two cities. The city will offer alternative opportunities those offered in Nairobi attracting people to hence acting as a satellite city thus helping in decongesting Nairobi. NIUPLAN provides for creation of satellite Towns to decongest the City by creating a Nairobi Metropolitan Region (NMR). Ruiru Town is identified as one of the satellite towns.

7.3.2 Tatu City Phase 1

The Success of the Tatu City Phase 1 development gave to rise of the proposed Tatu City Extension (Mchana Estate) with the newly proposed project standing to benefit from the structures and strategies already established by the Phase 1 project. A Completed Phase 1 project will act as a direct marketing strategy to investors who will be willing to directly invest in the proposed Tatu City extension (Phase 1) since it mirrors the values and objectives towards sustainable urbanization and development.

The proposed Tatu City will lead to further development and expansion of the Tatu City as one Unit with ability to offer first class infrastructure and services to not only its residents but also visitors. The proposed extension will lead to increased population in the city raising its status and also increasing its facility and service base.

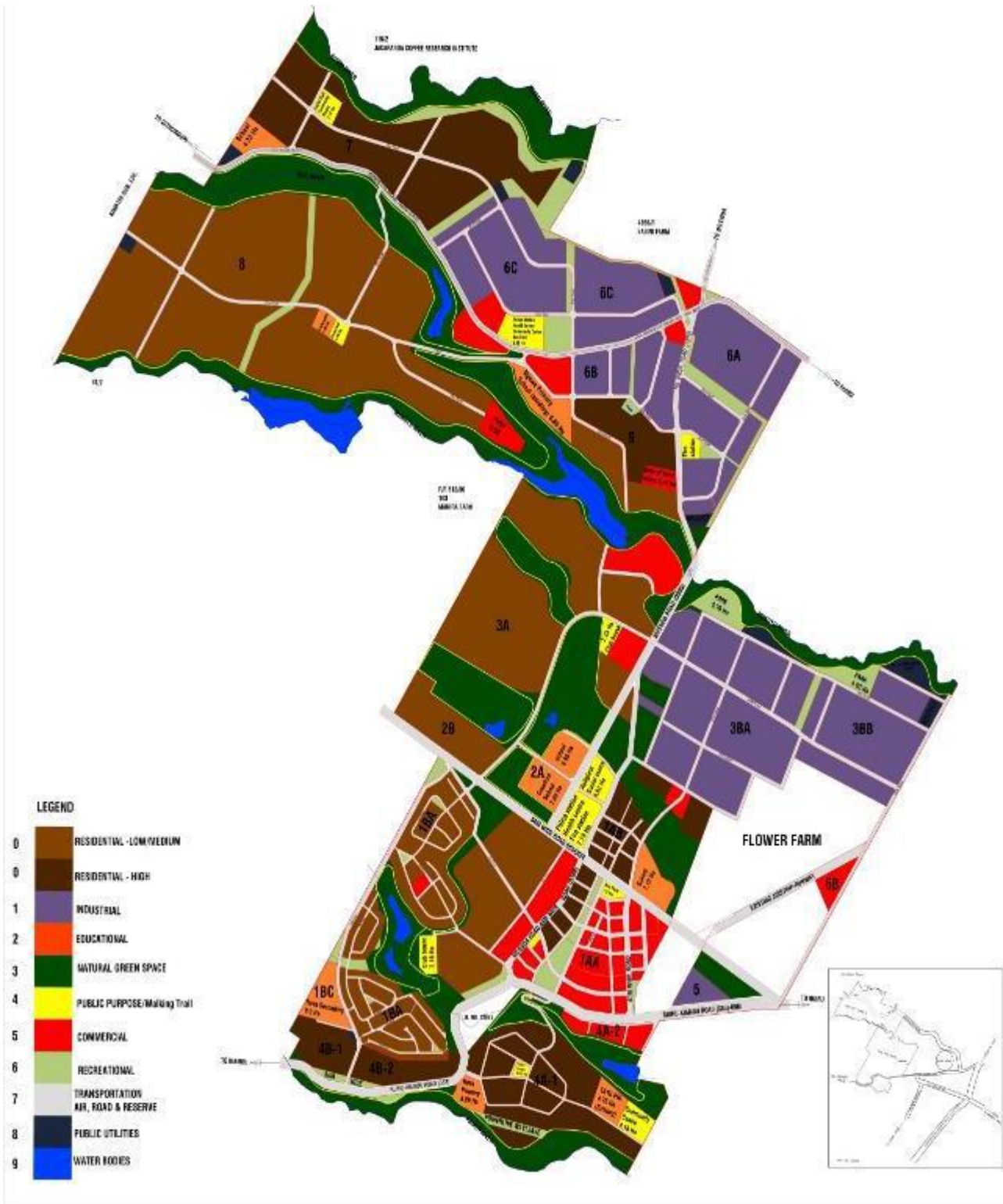


Figure 7.1 Tatu City Local Physical Development Plan

7.3.3 The Kenyatta University Master Plan

Proximity to the University means that Tatu City will gain immensely as the expected increase in population of both students and staff will offer opportunities in terms of needs for accommodation and shopping which can be offered by the proposed Tatu City. Moreover, the university will offer tertiary education to Tatu City residents at a stone throw comfort.

Further development and expansion of Kenyatta University means an increase in the numbers of students who will in turn lead to increased demand for accommodation for both students and staff. Tatu city due to its proximity to the University will therefore benefit from this increased demand as it will be able to offer accommodation for both the students and staff.

7.3.4 The Two Rivers Development Master plan

The Two Rivers will offer Tatu City Residents access to its high-quality retail, residential, office, leisure and hospitality components. Residents will be able to visit the Two Rivers Mall for their shopping needs and also for leisure. Moreover, the development offers opportunities for employment and business for the residents to explore.

However, this development is also aimed at providing similar facilities and services such as homes, schools, offices, a shopping district, medical clinics, nature areas and sport & entertainment complex. This means Tatu City will have to compete with Two Rivers. Therefore, Tatu city will be forced to ensure that these services and facilities are provided in a unique and effective manner in order to suit different tastes and preferences for both its residents and visitors. This will enable the city to compete favourably with the Two Rivers Development.

Tatu City residents will be a ready market for the variety of commercial, lifestyle and recreational activities offered at the Two Rivers Development. The proposed Tatu City extension development will offer highly competitive facilities and services which are also offered by The Two Rivers development including residential, commercial and leisure.

7.3.5 The Northlands Master Plan and the Gulmarg- Sasini Master Plan

The Master plans aim at offering almost similar features as the proposed Tatu City such as Residential Housing Units, Retail, Hospitality and Office Developments, Educational Facilities, Industrial uses and Recreation areas. This means that they provide direct competition to Tatu City in terms of attraction to interested investors. This means that in order to compete with these new developments, Tatu City will have to offer not only unique services but also advertise its services and facilities to potential clients, investors and visitors to ensure success.

The proximity of Tatu City to these proposed new development means that urban developments will be concentrated on one large area creating a continuous urban space. The area will have increased populations (both rural-urban migration and urban –urban migration) due to increased urbanization. This will come with challenges such as pressure on existing facilities and resources, solid and liquid waste management, unemployment, natural resource management among other urban issues. Tatu City will need to come up with effective strategies on how to counter these anticipated future urban challenges.

Tatu City provides competition to The Northlands and The Gulmarg- Sasini developments in terms of attraction to available investors. Tatu City will lead to further urbanization of the area after implementation of all the Master Plans hence leading to organized development in the region.

8 CLIMATE CHANGE VULNERABILITY ASSESSMENT, ADAPTATION AND MITIGATION ACTIONS

8.1 Introduction

Cities are major contributors to climate change: although they cover less than two per cent (2%) of the earth's surface, cities consume 78% of the world's energy and produce more than 60% of all carbon dioxide and significant amounts of other greenhouse gas emissions, mainly through energy generation, vehicles, industry, and biomass use (UN habitat). At the same time, cities and towns are heavily vulnerable to climate change. Despite these risks, many cities have not yet addressed climate change. The reasons include a lack of relevant city policies and action plans; existence of regulations on urban planning and environment which have not been adjusted to manage climate change; slow response to climate disasters due to lack of capacity and resources; and lack of public awareness on climate variability and climate change-induced hazard mitigation. However, when properly planned, capacitated, and managed through the appropriate governance structures, cities can be places of innovation and efficiency. Together with their local authorities, they have the potential to diminish the causes of climate change (mitigation) and effectively protect themselves from its impacts (adaptation).

This chapter begins with a highlight of causes of climate change and later discusses the climate change vulnerability of proposed Tatu City Extension (Mchana Estate). It also assesses the likely impacts from the envisioned development by Tatu City Master Plan which will contribute to climate change. Further it analyses the key adaptation and mitigation actions that need to be employed during the Master Plan execution.

8.2 The causes of climate change

The main sources of GHGs contributing to global warming include but not limited to increase in energy use, land-use changes and emissions from industrial activities. Urban households may also consume fuels more directly, in heaters and cookers, or indirectly in air conditioning or electric heating further impacting on climate change. Land-use changes induced by urban growth may lead to deforestation and reductions in the uptake of CO₂ by vegetation. Landfill sites taking up urban wastes also generate methane. Cement, as a construction material of primary importance to the development of urban infrastructure, as well as of commercial and residential buildings, also has a large carbon footprint due to an energy-intensive manufacturing process and high energy cost for transporting this dense material. Lastly, activities such as agriculture, livestock production, mining, and timber production, increase GHG emissions as direct emitters or reduce the uptake of these gases by vegetation.

Reducing the contribution of cities to climate change, or mitigation, requires an adequate understanding of the Rivers of urban GHG emissions, while effective adaptation must be based on a good understanding of what makes cities and their constituent socio-economic groups either vulnerable or resilient to climate change impacts. The exploration of how cities contribute to climate change requires an understanding of how transportation, heating and cooling systems, industries and other urban activities and infrastructures act both as emitters and direct causes of climate change. They create two main categories of impacts on the carbon cycle and the climate system:

- a) **Changes related to the emission of aerosols, GHGs and solid wastes** - GHGs are the main source of changes in the climate system. Not only do they change the dynamics of the carbon cycle, but together with aerosols they also generate changes in the Earth's radiation that induce climate change. Wastes affect the growth, function and health of vegetation and of ecosystems in general.
- b) **Land-use related changes** - Urbanization is a process that changes the use of land and by creating impervious surfaces, filling wetlands and fragmentation of ecosystems has disproportional impacts upon the carbon cycle. The built environment of urban areas is also a forcing function on the weather-climate system of urban centres because it is a source of heat and a poor water storage system.

8.3 Vulnerability of Proposed Master Plan to Climate Change

With increasing urbanization, understanding the vulnerability of the envisioned development by proposed Master Plan to climate change is important. This has been addressed by assessing the likely impacts of climate change to proposed Master Plan land uses. The impacts have been described below.

8.3.1 Heavy precipitation events

Heavy precipitation events are defined as the percentage of days with precipitation that exceeds some fixed or regional threshold compared to an average reference period of precipitation. Severe decreases in both precipitation intensity and volume have been documented in the recent past.

8.3.2 Extreme heat events

Heat waves are typically defined as extended periods of hotter than average temperatures, although the precise timing and temperature differential varies regionally. As a result of climate change, extreme heat events are predicted to become more frequent, intense and longer lasting over most land areas.

8.3.3 Drought

Drought can be defined as a phenomenon in which precipitation is significantly below normal levels, which leads to hydrological imbalances that negatively affect land resources and production systems. Drought affects urban areas in numerous ways. It can compromise water quality and increase the operating costs of water systems while reducing their reliability.

8.4 Proposed Master Plan Sectors likely to be potential sources of GHGs

There are several reasons for the importance of considering the contribution of urban areas to climate change. First, there are a range of activities associated with cities and their functioning that contribute to GHG emissions. Transportation, energy generation and industrial production within the territorial boundaries of towns and cities generate GHG emissions directly. Urban centers rely on inward flows of food, water and consumer goods that may result in GHG emissions from areas outside the city during their transportation.

Second, climate-friendly developments have the potential to attract external investment, and the growing importance of international urban network provides spaces for learning and knowledge transfer. The measuring of emissions level has recently been inserted into global policy debates. For example, the United Nations Environment Programme (UNEP), the United Nations Human Settlements Programme (UN-Habitat) and the World Bank launched an International Standard for Determining Greenhouse Gas Emissions for Cities. This standard provides a common method for cities to calculate the amount of GHG emissions produced within their boundaries.

Third, an assessment of the contribution of cities to climate change is a vital first step in identifying potential solutions. The large and growing proportion of the Earth's population living in towns and cities, and the concentration of economic and industrial activities in these areas, means that they need to be at the forefront of mitigation. The establishment of emission baselines is necessary if effective mitigation benefits are to be identified and applied.

Critical sectors identified to have the potential of contributing to the GHGs have been briefly described below.

8.4.1 Transport

Globally, transportation is responsible for about 23% of total energy-related GHG emissions and 13% of global GHG emissions. Urban areas rely heavily on transportation networks of various kinds for both internal and external movements of goods and people. The road transport is the largest contributor to GHGs emission. The implementation of the proposed Master Plan will see increase in the number of vehicles on the roads. This as a result will have a negative impact on the environment as it will increase consumption of petroleum products while releasing CO₂ and N₂O to the atmosphere.

8.4.2 Commercial and residential buildings

GHG emissions from commercial and residential buildings are closely associated with emissions from electricity use, space heating and cooling. Commercial and residential buildings are responsible for direct emissions (onsite combustion of fuels), indirect emissions (from public electricity use for street lighting and other activities, and district heat consumption), and emissions associated with embodied energy (e.g. in the materials used for their construction). Emissions are affected by the need for heating and cooling, and by the behaviour of building occupants.

8.4.3 Industries

Many industrial activities are energy intensive in their operation. These include the manufacturing industries, chemicals and fertilizer industries, cement, and pulp and paper. Tatu city is envisaged to establish an industrial park that includes light and heavy industries. The light industries involve light processing of goods such as detergents, toiletries; plastics and pharmaceuticals while heavy industries involve large and heavy equipment or complex, numerous processes. Some of the industries can generate nitrous oxide, carbon dioxide and fluorinated gases which form the principle GHGs.

8.4.4 Waste

Despite being only a small contributor to global emissions, rates of waste generation have been increasing during recent years, particularly in developing countries that have been experiencing increasing affluence. Poor management of waste in landfills and dumpsites contributes to production of methane gas which is one of the major GHGs.

8.4.5 Agriculture, land-use change and forestry

Urban areas have a potential to shape emissions from agriculture, land-use change and forestry in two major ways. First, the process of urbanization can involve direct changes in land use, as formerly agricultural land becomes incorporated within built-up areas. Agriculture is one of the leading sectors in the removal of GHGs from the atmosphere. Second, the forested areas can be cleared to pave way for the development hence leading to a reduction in the forest cover. This can reduce the capacity of the forests and vegetation to carry out carbon dioxide sequestration.

8.4.6 Energy supply for electricity generation

Energy is perhaps the broadest possible category for assessing GHG emissions. The combustion of fossil fuels is the major source amongst them, and is used throughout the world for electricity generation, heating, cooling, cooking, transportation and industrial production. Energy is obtained from fossil fuels, biomass, nuclear power, hydroelectric generation and other renewable sources. Urban areas rely heavily on energy systems, the energy structure (types of energy forms used) and the quality of the energy (its energetic and environmental characteristics). This section will thus focus on the use of energy for electricity generation in urban areas, the different sources of energy and the implications for GHG emissions. Hydroelectricity is the main form of electricity in the region, and its powered by diesel generators. The generation of electricity from diesel generators contributes the highest to GHG emissions.

8.5 Adaptation and Mitigation actions for the Master Plan

The climate change adaptation actions are those that help in reducing the vulnerability of a development plan to the effects of climate change, while the mitigation actions are those that should be undertaken to avoid the increase of a pollutant emission. The following adaptation and mitigation measures should be considered during the execution of the Tatu City (Mchana Estate) Master Plan.

Table 8-1 Adaptation and mitigation measures for the proposed Master Plan

Sector	Adaptation Actions	Mitigation Actions
Transportation	-Revision of the road construction designs and materials to incorporate those that are climate change proof	-Develop strategies to enable efficient means of transport that have a low GHG foot print
Commercial centers	-Revision of the existing building codes and standards to incorporate the use of climate change proof designs and materials - Develop strategies for preventive and precautionary actions e.g. evacuation plans	-Put in place measures to enhance energy conservation, efficiency and use of renewable energy -Put in place measures to ensure implementation of the revised building codes and standards
Industries	-Develop a policy to guide the design and operations of the industries	-Put in place measures to control and reduce GHG emissions by the industries such as carbon taxing
Agriculture development, and green spaces	- Develop policies to incorporate landscape restorations and reforestation in all development plans - Develop strategies for flexible agriculture to prepare for natural catastrophes	-Develop strategies to enhance the agricultural and forestry zones which aid in carbon dioxide sequestration
Housing development / educational institutions	- Develop an integrated, improved early warning and response systems for climate change risks such as flooding - Development and implementation of educational and public awareness programmes on climate change and its effects -Ensuring that all new development are climate-proof over their lifespan -Develop strategies to optimize the use of renewable and sustainable energy sources	- Mainstreaming of climate change into development planning and management for sustainability -Put in place measures to enhance conservation of energy
Infrastructure and utilities	-Ensuring that all new infrastructure is climate-proof over its lifespan Revise the designs for the waste management systems such as landfills to those that can adapt to the effects of climate change	- Improving local water recycling facilities -Develop strategies for waste reduction at source - Develop strategies to enhance the waste treatment methods

Sector	Adaptation Actions	Mitigation Actions
	<ul style="list-style-type: none"> - Put in place emergency measures to deal with waste management during catastrophes 	
<p>Natural Green Open Space , wetlands and water bodies</p>	<ul style="list-style-type: none"> - Discourage environmentally destructive land uses and improper non-green infrastructure whose impacts could eventually amplify the effects of climate change -Sustainable riparian zone management for Rivers in the Master Plan zone such as Mukuyu, Mchana, Comte etc. -Establishment of rain water harvesting reservoirs 	<ul style="list-style-type: none"> -Increasing tree cover in the green and open spaces of the Master plan to greater carbon sequestration, both in the soil and the biomass, -Promoting and institutionalizing payment for ecosystem services schemes to support watershed protection initiatives in the uplands zones

9 ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)

9.1 Introduction

An Environmental and Social Management and Monitoring Plan (ESMMP) is prepared to show how site-specific concerns and mitigation measures will be addressed through planning/design, construction and operation phases of the proposed Tatu City Extension (Mchana Estate) Master Plan. It provides a link between the impacts of project activities during the Master Plan implementation and the mitigation measures which should be put in place to minimize the negative impacts and enhance the positive impacts.

In this SEA report, most of the proposed plan interventions are at a broader level and are only envisaged to provide strategic guidelines for the subsequent project specific ESMMP based on detailed component designs, construction and operation plans. These will be formulated from project and site specific Environmental and Social Impact Assessments (ESIA) which will be undertaken before commencing implementation of the various specific projects.

This ESMMP prescribes and directs the management of all environmental aspects associated with and arising from planning, construction, and operation of the components of the proposed Tatu City Extension (Mchana Estate) Master Plan and shall be expanded and may be modified where there is need to customize to specific project/development conditions.

9.2 Scope and Objectives of the Environmental and Social Management and Monitoring Plan (ESMMP)

This ESMMP is an instrument that will allow Tatu City Limited, private developers, regulatory agencies and key stakeholders to integrate Environmental and Social components during implementation and execution of the various components of the proposed Tatu City Extension (Mchana Estate) Master Plan under study. Its aim is to detail the actions required to effectively implement the mitigation measures and alternative options for environmental and social obligation and enhance the positive impacts as recommended in SEA. These actions are necessary in order to minimize the negative impacts which might originate from implementation of the Master Plan and support the long-term management and monitoring of the environmental and social issues during plan implementation.

Specific objectives of this Environmental and Social Management and Monitoring Plan (ESMMP) are to:

- a) Provide the National Environment Management Authority (NEMA) with a tool to make ease the evaluation of the objectives of the different phases of the proposed Master Plan taking into account Kenyan environmental legislation;
- b) Provide guidelines for appropriate management and protection measures of environmental and social issues and concerns resulting from all activities associated with implementation of all phases of the Tatu City Extension (Mchana Estate) Master Plan components;
- c) Provide Tatu City Limited, private developers, regulatory agencies and other key stakeholders their environmental and social responsibilities in implementation of all phases of the proposed Master Plan;
- d) Assure the regulators, interested and affected parties the satisfaction of their demands in relation to environmental and social performance;
- e) Provide detailed standards and specifications for the management and mitigation of activities that have the potential to impact negatively on the physical and social environment; and
- f) Provide guidelines to project implementers regarding procedures for protecting the environment and minimizing negative environmental effects, thereby supporting the Master Plan's goal of promoting sustainable development.

Tatu City Limited, private developers, all investors and stakeholders within the proposed Master plan should comply with various conditions of implementing the Environmental and Social Management and Monitoring Plan (ESMMP) which include:

- a) Ensure continuous compliance of the ESMMP and adhere to the recommendations thereof;

- b) Ensure sound environmental management by minimizing negative environmental impacts in all the activities they undertake and instead enhance on the positive impacts; and
- c) Comply with all Kenyan legislation and policies regarding the environment and implement them accordingly

9.3 Environmental Management Plan (EMP)

Environmental Management is an essential component of the SEA Process. The SEA has recommended simple, straight-forward and tangible management actions which are specific to each of the mitigation measures and alternative options. These can be considered as the direct environmental management prescriptions which will deal with the environmental challenges identified in the proposed Tatu City Extension (Mchana Estate) Master Plan.

The various actions should be implemented to ensure that the environmental weaknesses are addressed for the good of the locality. The Environmental Management Plan (EMP) has been outlined in tables for each management action including:

- Biodiversity and nature conservation;
- Solid and effluent waste;
- Water resources;
- Energy resources;
- Environmental and landscape changes;
- Traffic and transport;
- Greenhouse gases emissions;
- Occupational health and safety; and
- Socio - economic concerns

9.3.1 Biodiversity and Nature Conservation

Table 9-1 Environmental Management Plan (EMP) for Biodiversity and Nature Conservation

Potential Adverse Impact	<ul style="list-style-type: none"> ▪ Ecological imbalance due to destruction of natural habitats for the local flora and fauna reducing biodiversity in the area ▪ Loss of agricultural land under coffee plantation, forests and bushlands ▪ Disturbance/ Loss of habitats for monkeys, rabbits, dikdik, snakes, bees residing in the natural forests and along the riparian corridors ▪ Loss of habitats for number of aquatic wildlife including several bird species such as the secretary bird, crowned cranes, pelicans, marabou storks, and eagles ▪ Loss and fragmentation of wildlife habitats especially for the crocodiles and hippopotamus residing in the riparian zones of streams, Rivers and earth dams. ▪ Possible modification of River channels ▪ Modification of Riverine vegetation ▪ Clearance of the riparian vegetation leading to pollution of the streams and Rivers within the project area ▪ Wildlife habitat deterioration due to low carrying capacity 		
Objective	<ul style="list-style-type: none"> ▪ Conservation of wildlife and biodiversity on site ▪ Conservation of biological diversity and the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources 		
Management strategy	<ul style="list-style-type: none"> ▪ Protection of endangered/threatened/vulnerable species and habitats and enhancement of biodiversity on site 		
Recommended Mitigation Measures	Responsible Party	Time Frame	Cost
<ul style="list-style-type: none"> ▪ EIAs to be undertaken for all development activities ▪ Carry out landscaping of different zones ▪ Maintain the proposed green spaces as per the Master Plan ▪ The nature trails and research sites as per the Master Plan to be enriched with native vegetation ▪ Unless it is mandatory, avoid clearance of the existing indigenous tree species ▪ Where clearance of native vegetation is inevitable, consider introducing such natives in landscaped and other green spaces to compensate for the loss ▪ Consider leaving isolated patches of indigenous vegetation to act as refuge to small wild game during implementation of the Master Plan ▪ Liase with KWS on the migration of wild game within the Master Plan ▪ Consider putting up a small orphanage/park ▪ Invest some of the land in other agricultural investments 	<ul style="list-style-type: none"> ▪ Tatu City Limited ▪ Developer / Contractors ▪ KWS 	<p style="text-align: center;">During Plan Implementation</p>	<ul style="list-style-type: none"> ▪ Cost of EIAs and preparation of management plans to be determined at prevailing rates during plan implementation

<ul style="list-style-type: none"> ▪ Protection of the riparian environment and establishment of a riparian reserve management plan ▪ Establish a tree planting program within the community such as schools within and outside the proposed city to restore tree cover lost. ▪ Establishment of a wildlife management plan in collaboration with KWS 			
Performance Indicators	<ul style="list-style-type: none"> ▪ Number of crocodiles and hippopotamus ▪ Numbers of bee hives , monkeys, rabbits, dikdiks ▪ Relocation of mammals to the Undeveloped & Agriculture Zone through the use of a wildlife management plan ▪ Size of riparian zone ▪ Size of land under natural forest, coffee plantations, bushlands and indigenous vegetation cleared for development 		
Monitoring Requirements	<ul style="list-style-type: none"> ▪ Periodical ecological surveys and mammal counts ▪ Wildlife Inventory 		
Reporting	<ul style="list-style-type: none"> ▪ Ecological Survey Report 		
Legal Obligation	<ul style="list-style-type: none"> ▪ Riparian Reserve Management Plan, Wildlife Management Plan ▪ Wildlife Management and Conservation Act 2013 ▪ Water Act, 2016 ▪ The Environmental Management and Co-ordination (Wetlands, River Banks, Lake Shores and Sea Shore Management) Regulations, 2009, Conservation and Management of Wetlands Amendment Regulations, 2017 		

9.3.2 Waste Management

Table 9-2 Environmental Management Plan (EMP) for solid and effluent waste

Potential Adverse Impact	<ul style="list-style-type: none"> High generation of solid and effluent waste from residential, commercial and industrial areas. 		
Objective	<ul style="list-style-type: none"> Eliminate impact on public health due to the poor waste management on location. 		
Management strategy	<ul style="list-style-type: none"> Removal of agents of environmental pollution and proper disposal of wastes. 		
Recommended Mitigation Measures	Responsible Party	Time Frame	Cost
<ul style="list-style-type: none"> Adoption of an integrated solid waste management plan through a hierarchy of options that includes reduction at source, reuse, recycling, incineration, composting and land filling Pursue waste minimization at source principles e.g. zero generation, reduction, re-use and/or recycling Domestic, commercial and industrial waste to be done and managed separately Provide mechanisms to segregate wastes at source to enable recycling Provision of transfer stations from where waste will be disposed in designated areas Ensure all wastes are stored temporarily at the designated transfer stations, and that they are regularly carried away for disposal in designated areas Connection to existing trunk sewers in Tatu City Pre-treatment of industrial effluent before discharge into sewers Undertake EIA for all development activities 	<ul style="list-style-type: none"> Tatu City Limited Developer / Contractors 	Throughout plan Implementation	<ul style="list-style-type: none"> Cost of waste collection and disposal systems to be determined in the detailed planning for each phase of the development
Performance Indicators	<ul style="list-style-type: none"> Housekeeping, littering, status of solid waste management Functional waste management facilities Re-use and recycling plants 		
Monitoring Requirements	<ul style="list-style-type: none"> Periodical inspection of waste management operations 		
Reporting	<ul style="list-style-type: none"> Environmental Audits and other statutory and non-statutory reports 		
Legal Obligation	<ul style="list-style-type: none"> Environmental Management and Co-ordination (Waste Management) Regulations 2006 Environmental Management and Co-ordination (Water Quality) Regulations 2006 		

9.3.3 Water Resources

Table 9-3 Environmental Management Plan (EMP) for Water Resources

Potential Adverse Impact	<ul style="list-style-type: none"> High water demand in residential, commercial and industrial areas and for recreational areas during development and operational stages High water abstraction from Mukuyu, Mchana, Galana/Ruiru Rivers, Comte Earth Dam and Mchana Earth Dam Pollution of Mukuyu River, Mchana River Comte Earth Dam and Mchana Earth Dam Decline in groundwater levels 		
Objective	<ul style="list-style-type: none"> Minimize impact on available water resources and ensure their conservation 		
Management strategy	<ul style="list-style-type: none"> Conservation of water resources through sustainable utilization 		
Recommended Mitigation Measures	Responsible Party	Time Frame	Cost
<ul style="list-style-type: none"> Promote rain water harvesting Promote recycling and reuse of water as much as possible Conservative water use in low volume fixtures in buildings Use of recycled and harvested storm water in cleaning and Landscaping Incorporate water accounting systems and metering for all areas Limited abstraction of River water and instead use of alternative sources of water such as roof catchment rain water harvesting and harvesting of flood waters Pre-treatment of all effluent before discharge into Rivers Undertake a hydrogeological study in collaboration with WRA to determine the sustainable ground water abstraction levels Continually seek new avenues for water conservation as international best practices evolve Undertake EIA for all development activities 	<ul style="list-style-type: none"> Tatu City Limited Developer / Contractors 	During Plan Implementation	<ul style="list-style-type: none"> Cost of water efficient fixtures and appliances will be part of project costs Cost of water monitoring including viable conservation measures to be determined and procured at prevailing rates during operations
Performance Indicators	<ul style="list-style-type: none"> Water use levels Borehole yields 		
Monitoring Requirements	<ul style="list-style-type: none"> A water use monitoring and evaluation schedule 		
Reporting	<ul style="list-style-type: none"> Logs of inspections 		
Legal Obligation	<ul style="list-style-type: none"> The Water Act 2016, Water Resource Management Rules 2007 and Water (Resources Management) Amendment Regulations 2010 Environmental Management and Co-ordination (Water Quality) Regulations 2006 		

9.3.4 Energy Resources

Table 9-4 Environmental Management Plan (EMP) for Energy Resources

Potential Adverse Impact	<ul style="list-style-type: none"> Increased energy consumption / High energy demand in residential, commercial and industrial areas 		
Objective	<ul style="list-style-type: none"> Minimize impact on available energy resources and ensure their conservation 		
Management strategy	<ul style="list-style-type: none"> Conservation of energy resources through lowering of consumption levels 		
Recommended Mitigation Measures	Responsible Party	Time Frame	Cost
<ul style="list-style-type: none"> Institution awareness programmes to conserve energy Energy conservation through installation/use of energy efficient appliances / fittings Adoption of green energy sources e.g. solar energy, waste to energy projects Use of green building designs that allow for passive heating and cooling, and maximum utilization of natural light in buildings Continually seek avenues for energy conservation as international best practices evolve 	<ul style="list-style-type: none"> Tatu City Limited Developer / Contractors 	During Plan Implementation	<ul style="list-style-type: none"> Cost of energy efficient fixtures and appliances will be part of project costs Cost of energy monitoring including viable conservation measures to be determined and procured at prevailing rates during operations
Performance Indicators	<ul style="list-style-type: none"> Energy use levels against benchmarks 		
Monitoring Requirements	<ul style="list-style-type: none"> Metering Energy use monitoring and evaluation schedule 		
Reporting	<ul style="list-style-type: none"> Energy Audit reports 		
Legal Obligations	<ul style="list-style-type: none"> The Energy Act 2006 Subsidiary legislation under the Energy Act International Best Practices 		

9.3.5 Environmental and Landscape Changes

Table 9-5 Environmental Management Plan (EMP) for Environmental and Landscape Changes

Potential Adverse Impact	<ul style="list-style-type: none"> ▪ Increased risk of flooding due to increase in storm water generated on site ▪ Poor ambient air quality and increase in background noise level ▪ Negative visual impact due to loss of visual amenity from dense urban structures ▪ Long term evolution of urban heat islands ▪ Risk of urban heat island effects ▪ Noise Pollution and Excessive Vibrations 			
Objective	<ul style="list-style-type: none"> ▪ Ensuring positive landscape changes and enhancement of environmental quality 			
Management strategy	<ul style="list-style-type: none"> ▪ Protection of endangered/threatened/vulnerable species and habitats , enhancement of biodiversity on site 			
Recommended Mitigation Measures	Responsible Party	Time Frame	Cost	
<ul style="list-style-type: none"> ▪ Undertake EIA for all development activities ▪ Ensure adequate tree cover and gardens within developed areas to provide shade and cooling effect ▪ Ensure adequate drainage of the site through drainage works ▪ Plenty of gardens and green areas within developed areas will enable percolation of rainfall and reduce runoff ▪ Ensure plenty of vegetation cover (trees and shrubs) as buffers between land-uses to reduce noise effects ▪ Enforcement of pollution control measures for air pollution sources ▪ Tarmacking all major roads to enhance movement in all-weather and to avoid dust generation 	<ul style="list-style-type: none"> ▪ Tatu City Limited ▪ Developer / Contractors 	During Plan Implementation	<ul style="list-style-type: none"> ▪ Cost of landscaping to be determined at prevailing rates during plan implementation ▪ Cost of EIAs and preparation of management plans to be determined at prevailing rates during plan implementation 	
Performance Indicators	<ul style="list-style-type: none"> ▪ Percentage green spaces vis a vis developed spaces ▪ Size of buffer zones ▪ Background noise and ambient air quality 			
Monitoring Requirements	<ul style="list-style-type: none"> ▪ Periodical surveys and measurements 			
Reporting	<ul style="list-style-type: none"> ▪ Air Quality tests ▪ Noise survey ▪ Audit Report 			
Legal Obligation	<ul style="list-style-type: none"> ▪ Environmental Management and Co-ordination (Air Quality) Regulations 2009 ▪ Environmental Management and Co-ordination (Noise & Excessive Vibration Pollution) (Control) Regulations, 2009 ▪ The Factories & Other Places of Work (Noise Prevention and Control) Rules 2005 			

9.3.6 Traffic and Transport

Table 9-6 Environmental Management Plan (EMP) for Traffic and Transport

Potential Adverse Impact	<ul style="list-style-type: none"> Increased human and vehicular traffic/ Risk of traffic congestion within Tatu City Increased traffic activity and traffic interruptions along the Thika Super Highway, Northern and Eastern bypasses Increased vehicular traffic may lead to higher air and noise emissions adversely affecting the local air quality and ambient noise levels. 		
Objective	<ul style="list-style-type: none"> Ensure the smooth flow of pedestrian and vehicular traffic and minimize risks of accidents 		
Management strategy	<ul style="list-style-type: none"> Provision of adequate facilities and infrastructure Separation of pedestrian and vehicular traffic Continually monitoring traffic incidences, establish their root cause and provide solutions 		
Recommended Mitigation Measures	Responsible Party	Time Frame	Cost
<ul style="list-style-type: none"> Ensure a good connection between spine roads and the Thika Super Highway, Northern and Eastern bypasses Provision of adequate vehicular circulation space and parking areas Provision of pedestrian walkways along all roads within the development Paving all pedestrian walk ways with robust, durable, and non-slippery materials Provision of all necessary street furniture along all roads within the development to accommodate users (including the disabled, elderly, and children) and to enhance security. Provision of bollards in appropriate areas to prevent vehicles from encroaching into the pedestrian domains. Provision of street lights to provide sufficient light for both pedestrian areas and carriage ways. Provision of trees along pedestrian walkways for shading and that require minimum maintenance; preferably indigenous for ecological and cultural advantages. Ensure Installation and maintenance of all construction signs, signals, markings, and other devices used to regulate traffic, including posted speed limits, warnings of sharp turns, or other special road conditions 	<ul style="list-style-type: none"> Tatu City Limited Developer / Contractors Implementing agencies like KeNHA, KURA, 	During Plan Implementation	<ul style="list-style-type: none"> Cost of signage and warnings in hazard prone areas and other infrastructure shall be included in the project costs during construction Additional safety measures / features to be procured at prevailing rates during operations
Performance Indicators	<ul style="list-style-type: none"> Traffic status Ease of access and circulation 		
Monitoring Requirements	<ul style="list-style-type: none"> Regular monitoring of traffic flow 		
Reporting	<ul style="list-style-type: none"> Incidence logging 		

Legal Obligation	<ul style="list-style-type: none"> ▪ Traffic Management Plan ▪ Physical Planning handbook ▪ Traffic design and management guidelines
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9.3.7 Greenhouse Gases Emissions

Table 9-7 Environmental Management Plan (EMP) for Greenhouse Gases Emissions

Potential Adverse Impact	<ul style="list-style-type: none"> ▪ Emission of greenhouse gases 		
Objective	<ul style="list-style-type: none"> ▪ Minimize emission of greenhouse gases in the atmosphere 		
Management strategy	<ul style="list-style-type: none"> ▪ Removal of agents of environmental pollution 		
Recommended Mitigation Measures	Responsible Party	Time Frame	Cost
<ul style="list-style-type: none"> ▪ Use of renewable sources of energy such as wind and solar energy ▪ Retention of green spaces/landscaped spaces as carbon sinks ▪ Recycling of solid/liquid wastes ▪ Adoption of clean production mechanism ▪ Adoption of green buildings technology ▪ Adoption of efficient transport system ▪ Continually seek avenues for energy conservation as international best practices evolve ▪ Annual air quality monitoring 	<ul style="list-style-type: none"> ▪ Tatu City Limited ▪ Developer / Contractors 	Throughout plan Implementation	<ul style="list-style-type: none"> ▪ Cost of EIAs and preparation of management plans to be determined at prevailing rates during plan implementation
Performance Indicators	<ul style="list-style-type: none"> ▪ Reduced atmospheric greenhouse gas concentration ▪ Reduced climate change related illnesses ▪ Sustainable energy consumption- increased use of renewable energy sources ▪ Increased tree cover and green areas ▪ Increased use of low carbo technologies 		
Monitoring Requirements	<ul style="list-style-type: none"> ▪ Annual air quality monitoring 		
Reporting	<ul style="list-style-type: none"> ▪ Environmental Audits and other statutory and non-statutory reports 		
Legal Obligation	<ul style="list-style-type: none"> ▪ Climate Change Act, 2016 ▪ International best practice 		

9.3.8 Occupational Health and Safety

Table 9-8 Management Plan for Occupational Health and Safety

Potential Adverse Impact	<ul style="list-style-type: none"> High number of incidents, accidents, dangerous occurrences, fatalities / deaths reported during construction, operational and decommissioning phases of specific project implementation 		
Objective	<ul style="list-style-type: none"> To provide for the safety, health and welfare of workers and all persons at workplaces 		
Management strategy	<ul style="list-style-type: none"> Ensure project specific sites are registered with DOSHS as work places 		
Recommended Mitigation Measures	Responsible Party	Time Frame	Cost
<ul style="list-style-type: none"> All places intended to be used as a work place must be registered by DOSH before they are occupied. Ensure that all building plans are approved by the Local Authority and the County Occupational Health and Safety Office All workplaces must have written procedures for hazard identification and risk assessments and Safe Work Method Statements (SWMS) for all activities intended to be done at site. EIAs to be undertaken for all development activities 	<ul style="list-style-type: none"> Tatu City Limited Developer/ Contractors DOSHS 	During Plan Implementation	<ul style="list-style-type: none"> Cost of EIAs and preparation of management plans to be determined at prevailing rates during plan implementation
Performance Indicators	<ul style="list-style-type: none"> Number of incidents, accidents and dangerous occurrences reported Fatalities / Deaths reported during development, operationalization phases Number of fire service stations within the area Number Police Stations and Disaster Operations Centre 		
Monitoring Requirements	<ul style="list-style-type: none"> Number of workplaces registered by DOSHS within Tatu City Extension Master Plan Premises insured as per statutory requirements (third party and workman's compensation) Emergency preparedness and evacuation procedures Compensation Claims related to work injuries 		
Reporting	<ul style="list-style-type: none"> Health and Safety Audits and other statutory and non-statutory reports Health and Safety Management Plan Emergency Response Plan 		
Legal Obligation	<ul style="list-style-type: none"> Occupational Health And Safety Act (OSHA), 2007 Subsidiary Legislations under OSHA 2007 Public Health Act 		

9.3.9 Socio-Economic Concerns

Table 9-9 Management Plan for Socio-Economic concerns

Potential Adverse Impact	<ul style="list-style-type: none"> Disruption and change of local livelihoods
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	<ul style="list-style-type: none"> ▪ Unemployment -Loss of employment opportunities for people working in the coffee plantations ▪ Increased crime rates ▪ Urban poverty ▪ Rapid urbanization ▪ Informal settlements ▪ Housing scarcity ▪ Income disparity between the city and local communities 		
Objective	<ul style="list-style-type: none"> ▪ Improve livelihoods of people within and around the Master Plan 		
Management strategy	<ul style="list-style-type: none"> ▪ Sustain and accelerate economic growth of Kiambu County and serve as a catalyst for further urban development. 		
Recommended Mitigation Measures	Responsible Party	Time Frame	Cost
<ul style="list-style-type: none"> ▪ Maximize the recruitment of locals where possible ▪ Develop community awareness programmes to enhance cohesion between project employees and the local community. ▪ Consult with the public and the locals during implementation of proposed developments ▪ Sensitize the Kofinaf coffee workers about the proposed mixed use development and allow for smooth transition ▪ Undertake a livelihood restoration plan in order to compensate the affected appropriately ▪ Undertake EIA for all development activities 	<ul style="list-style-type: none"> ▪ Tatu City Limited ▪ Developer / Contractors 	Throughout plan Implementation	<ul style="list-style-type: none"> ▪ Cost of EIAs and preparation of management plans to be determined at prevailing rates during plan implementation
Performance Indicators	<ul style="list-style-type: none"> ▪ Gauge impact of Master Plan implementation on livelihoods ▪ Land value trends ▪ Development of market centres 		
Monitoring Requirements	<ul style="list-style-type: none"> ▪ Records of hired manpower and remuneration 		
Reporting	<ul style="list-style-type: none"> ▪ Statutory and non-statutory reports 		

9.4 Environmental Monitoring Plan

An Environmental Monitoring Plan (EMP) is vital for any Strategic Environmental Assessment Plan as it helps in assessing the effectiveness of proposed mitigation measures, in assessing changes in environmental conditions and to provide warning of significant deterioration in environmental quality for further preventive action.

Specific attention has been made to ensure that the monitoring plan conforms to the following criteria, it is auditable in that it:

- Identifies sampling sites and variables to be measured
- Associates mitigation and monitoring tasks to specific impacts.
- Proposes frequency and timing of sampling sites
- Identifies specific quantifiable monitoring regimes
- Where practically possible identifies key indicator, which can be utilized for environmental performance monitoring
- Conforms to all best practice principles by acknowledging the existence of both long term and immediate impacts and the resulting mitigation measures necessary to deal with such
- Delineates key lines of accountability and responsible parties to implement the monitoring plan
- Ensures flexibility to enable incorporation of additional monitoring and mitigation techniques as deemed necessary throughout the life of the development
- Identifies key corporate commitments made by the proponent, with regard to its environmental performance.

9.5 Monitoring Requirements

To ensure that the Strategic Environmental Assessment (SEA) is effective, environmental monitoring is mandatory. Because of the complexity of cumulative effects problems at a strategic level, there will be uncertainty about impact predictions. Monitoring is therefore important in order to assess the accuracy of the predictions and to monitor the effectiveness of mitigation measures.

The monitoring frequency and indicators have been recommended for each management action. Regular monitoring using the recommended indicators will indicate the level of progress with regard to ensuring environmental sustainability in the proposed Master Plan.

The parameters of the proposed Tatu City Extension (Mchana Estate) Master Plan that were identified for monitoring include: water quality, air quality, biodiversity loss, Landscape changes, solid and liquid waste generation, occupational health and safety risks and socio- economic concerns. This is represented in the table below.

Table 9-10 Environmental Monitoring Plan for Tatu City Extension (Mchana Estate) Master Plan

Environmental Aspects & socioeconomic component	Points / sources to be monitored	Parameters	Key Issues	Frequency of monitoring	Responsibility
Water Quality and Quantity	<ul style="list-style-type: none"> ▪ Mukuyu River ▪ Mchana River ▪ Galana/Ruiru River ▪ Comte Earth Dam ▪ Mchana Earth Dam ▪ Surrounding streams ▪ Ground water resources Borehole ▪ County Council supply ▪ Runoff from buildings ▪ Water treatment plant 	<ul style="list-style-type: none"> ▪ pH, Total Suspended Solids (TSS) and Total Dissolved Solids(TDS), heavy metals, oils and grease ▪ Abstraction rates and drawdown for boreholes 	<ul style="list-style-type: none"> ▪ Water quality and quantity as a public health concern. ▪ Residential, commercial and industrial water standards ▪ Aquatic life ecosystem support. ▪ Waterborne diseases prevalence 	<ul style="list-style-type: none"> ▪ Quarterly or at least two times a year to cover seasonal variations 	<ul style="list-style-type: none"> ▪ Tatu City Limited ▪ WRA ▪ RUJUWASCO
Solid and Liquid Waste Generation	<ul style="list-style-type: none"> ▪ Residential, commercial and industrial zones ▪ Rivers, streams and earth dams within and around the proposed area ▪ Water treatment plant ▪ Runoff from buildings 	<ul style="list-style-type: none"> ▪ Amounts produced ▪ Nature or type of waste ▪ Storage means ▪ Transportation ▪ Treatment methods ▪ Waste composition such as slag, domestic refuse, metallic scraps, sludge ▪ Waste reduction and recovery at source ▪ pH, Total Suspended Solids (TSS) and Total Dissolved Solids(TDS), heavy metals, oils and grease 	<ul style="list-style-type: none"> ▪ Water quality and quantity as a public health concern. ▪ Aquatic life ecosystem support. ▪ Waterborne diseases prevalence 	<ul style="list-style-type: none"> ▪ Continuous 	<ul style="list-style-type: none"> ▪ Tatu City Limited ▪ NEMA ▪ Government lead Agencies
Biodiversity Loss	<ul style="list-style-type: none"> ▪ Land area under coffee plantation, forests and 	<ul style="list-style-type: none"> ▪ Ecological surveys and mammal counts ▪ Wildlife inventory 	<ul style="list-style-type: none"> ▪ Ecological imbalance due to destruction of natural habitats for the local flora and fauna 	<ul style="list-style-type: none"> ▪ Continuous 	<ul style="list-style-type: none"> ▪ Tatu City Limited

Environmental Aspects & socioeconomic component	Points / sources to be monitored	Parameters	Key Issues	Frequency of monitoring	Responsibility
	<ul style="list-style-type: none"> bushlands cleared for development ▪ Rivers, streams and earth dams around the site ▪ Wildlife habitats in proposed development 	<ul style="list-style-type: none"> ▪ Individual species count (capture recapture) ▪ Biomass Index 	<ul style="list-style-type: none"> reducing biodiversity in the area ▪ Loss of agricultural land ▪ Loss and fragmentation of endangered flora & fauna and bird species 		<ul style="list-style-type: none"> ▪ Developers /Contractor
Environmental and Landscape Changes	<ul style="list-style-type: none"> ▪ Project specific areas ▪ Excavated areas, sloppy areas along the road ▪ Water sources 	<ul style="list-style-type: none"> ▪ Topography ▪ Soil salinity and humus content ▪ Turbidity in storm water and other water sources ▪ Rainfall volume ▪ Temperature levels 	<ul style="list-style-type: none"> ▪ Slope stability ▪ Soil erosion rates, ▪ Water, sediments load, 	Annually	<ul style="list-style-type: none"> ▪ Tatu City Limited
Air Quality and Noise	<ul style="list-style-type: none"> ▪ Commercial and industrial zones ▪ Water treatment plant ▪ Construction sites Quarrying and Earth Borrowing sites, campsites 	<ul style="list-style-type: none"> ▪ Air particulate matter ▪ TSP, NO_x, SO₂, CO, Dust particles, particulate matter ▪ Noise levels, 	<ul style="list-style-type: none"> ▪ Air pollution and excessive Noise and Vibrations 	<ul style="list-style-type: none"> ▪ Continuous ▪ Throughout Construction and operational Phases 	<ul style="list-style-type: none"> ▪ Tatu City Limited ▪ Developers /Contractor ▪ NEMA ▪ DOSHS
Occupational Health and Safety risks	<ul style="list-style-type: none"> ▪ Industrial, residential and commercial zones ▪ Construction of support trunk utilities for Tatu city such as air and road infrastructure, power distribution network, water and 	<ul style="list-style-type: none"> ▪ Health and Safety audit reports ▪ Number and types of accident and incident reports and records, ▪ Accident locations ▪ Field inspections and information from lead agencies 	<ul style="list-style-type: none"> ▪ Compliance to Occupational Safety and Health Act 2007 	Annually	<ul style="list-style-type: none"> ▪ Tatu City Limited ▪ Developers /Contractor ▪ DOSHS

Environmental Aspects & socioeconomic component	Points / sources to be monitored	Parameters	Key Issues	Frequency of monitoring	Responsibility
	sewerage networks waste water collection, treatments and recycling facilities, telecommunication facilities, firefighting facilities				
Socio-Economic	<ul style="list-style-type: none"> ▪ New tenants ▪ Neighbouring communities 	<ul style="list-style-type: none"> ▪ General population information, ▪ Demographic characteristics ▪ Economic activities ▪ Housing characteristics ▪ Land tenure and ownership regimes, ▪ Energy source 	<ul style="list-style-type: none"> ▪ Impact of the development on the immediate and neighboring community 	<ul style="list-style-type: none"> ▪ Annually 	<ul style="list-style-type: none"> ▪ Tatu City Limited ▪ Kiambu County Government ▪ Project committees

9.6 Construction Environmental Management and Monitoring Plans (CEMMP)

Implementation of specific projects within Tatu City Extension (Mchana Estate) Master Plan will be preceded by project-specific Environmental and Social Impact Assessments (ESIAs). Environmental Management and Monitoring Plans (EMMP) developed in these EIAs shall be in line with the Strategic Environment Assessment EMMP developed for the proposed Master Plan.

The contractors who shall be appointed for construction of the various developments shall develop their own EMMPs to ensure actions and mitigation necessary to protect the environment are incorporated into all site procedures. At a minimum, the Construction Environmental Management and Monitoring Plans must address the following issues identified as key in Tatu City Extension Master Plan:

- Physical setting, flora and fauna;
- Solid and Liquid waste management;
- Storm-water, runoff and soil erosion;
- Air quality (Dust and Exhaust emissions);
- Water resources ;
- Energy resources;
- Noise and vibrations;
- Traffic Management; and
- Occupational Health and Safety;

The contractors who shall be appointed for construction of the various developments shall develop their own Environmental Management and Monitoring Plans (EMMPs) to ensure actions and mitigation necessary to protect the environment are incorporated into all site procedures. At a minimum, a contractor's EMP must address the following:

- Policy
- Planning
- Implementation and Operation

9.6.1 Policy

The contractor will develop an environmental policy that includes, as a minimum, the following: A commitment to comply with applicable regulations and other requirements that the company subscribes to;

- A commitment to provide a safe work environment;
- A commitment to provide the training and equipment necessary for employees to conduct their work safely;
- A commitment to continuously improve performance and to pollution prevention;
- A commitment to communicate the policy to all persons working for and on behalf of the company;

9.6.2 Implementation and Operation

Roles, responsibilities and authorities should be defined, documented and communicated to ensure effective environmental and social management. A specific management representative should be assigned that is responsible for ensuring that the EMP is established, implemented and maintained and is responsible for reporting performance, reviewing the Plan and making recommendations for improvement.

9.7 Institutional Arrangements

For effective implementation of the EMMP, it is a necessary to identify the relevant institutions, agencies, authorities or persons and their respective roles in the SEA process. Thus, the following identified entities ought to be involved in the implementation of the EMMP throughout the project cycle or as deemed fit.

For environmental sustainability of the Tatu City Extension (Mchana Estate) Master Plan there is need for close and committed monitoring of all the activities. The study therefore proposes that

Tatu City Limited establishes an Environmental Management Unit (EMU) to take responsibility of overseeing the implementation activities. The unit officers main responsibilities will be to understand the environmental requirements of the Master Plan, ensure full implementation and maintenance of the recommended actions, reviewing the Plan and make recommendations for improvement where need be, monitor environmental parameters using the appropriate indicators , reporting performance and ensure compliance by all agencies. The whole of these responsibilities may also be contracted externally to a NEMA registered firm of experts.

The unit representative will be expected to understand all the environmental, health and safety laws and by-laws relevant to implementation of the EMMP and all the equipment required to monitor environmental parameters.

Secondly, the unit will be expected to liaise with the departments responsible for environmental matters at the Kiambu County Office, National Government Agencies and the implementing agencies to ensure effective implementation of the EMMP. Key implementing agencies include County Government (s), local Water and Sewerage Company, Kenya Power, Kenya National Highways Authority (KeNHA), Ministry of Lands and physical planning, local Non-Governmental Organizations (NGOs), all government parastatals among others.

The National Environment Management Authority (NEMA) is the key institution of the government overseeing implementation of environmental policy and laws in Kenya. The authority will take responsibility for general supervision and coordination of all environmental matters. In addition to reviewing environmental reports on the progress of proposed Master Plan, the authority's inspectors may visit any of the projects, during implementation and suggest improvements to ensure compliance to the recommended quality standards.

The institutional arrangement for implementing the proposed Tatu City Extension (Mchana Estate) Master Plan is summarized in Table 10.11 below:

Table 9-11 Institutional Arrangements of Implementing Environmental Components of the Master Plan

S/No	Institutions	Key Responsibilities
1.	Tatu City Limited	<ul style="list-style-type: none"> Tatu City Limited to participate in the entire ESSMP process as the developer and oversee implementation of the proposed Master Plan as conducted by contractors/investors during construction and operation phases of specific project activities and reviewing and verifying the implementation of the ESSMP of Tatu City Extension (Mchana Estate)
2.	National Environment Management Authority (NEMA)	<ul style="list-style-type: none"> Review the draft SEA report and approve of the Final SEA Review Environmental Impact Assessment (EIA) and Environmental Audit (EA) reports for the different investors/projects Approve EIA and EA reports. Deal with cases of non-compliance
3.	Kiambu County Government (All relevant departments and ministries)	<ul style="list-style-type: none"> Provide oversight and advisory services during the Plan implementation
4.	National Government Ministries	<ul style="list-style-type: none"> Policy direction on implementation of the Master Plan Approval of Master Plan activities Training and mobilizing - Facilitate capacity building of young entrepreneurs. Facilitating technology development and transfer.
5.	Governmental Parastatals / Implementing Agencies	<ul style="list-style-type: none"> Provision of infrastructure utilities and services like road networks, Electricity power supply Monitoring and Evaluation - quality control and product standards
6.	Water Resources Management Authority (WRMA)	<ul style="list-style-type: none"> Monitoring of water abstraction rates. Monitoring of water quality - pollution of water sources –Rivers and boreholes.
7.	Ruiru- Juja Water and Sewerage Company (RUJWASCO)	<ul style="list-style-type: none"> Efficient and sustainable water supply management Supply of clean water to Tatu City Extension Providing sewer services Regular monitoring of sewer quality before draining into the public sewer.

S/No	Institutions	Key Responsibilities
8.	Tatu City Limited, Private developers and Investors	<ul style="list-style-type: none"> ▪ Construct and invest according to the laid down development and environmental guidelines and regulations ▪ Comply with County, national and international quality standards
9.	Special Economic Zones Authority	<ul style="list-style-type: none"> ▪ Liaise with Tatu City to establish and operationalize a 'one-stop' shop within the city to facilitate processing and issuance of development construction permits and certificates of occupancy as envisaged under the provisions of section 11 of the Special Economic Zones Act, No. 16 of 2015. ▪ Provide a framework for the physical development and management of the area and guide the development control processes within Tatu City.

9.8 Institutional Strengthening/ Capacity Building

Tatu City will require an effective Environmental Management Unit (EMU) to ensure implementation of the Environmental Management and Monitoring Plan (EMMP). The institution will require strengthening and capacity building. This should incorporate key aspects as follows:

- Equipment requirements – an indication of type of equipment and number of units needed
- Training/study tours - Information regarding type of training, number to be trained, duration of the training, organization providing the training and cost.

Table 9-12 Equipment requirements

Type of Equipment	Requirements	Units	Purpose
Duly Equipped water testing laboratory <ul style="list-style-type: none"> ▪ <i>electronic meters will test water pH, turbidity and electrical conductivity,</i> ▪ <i>Microbiological testing,</i> ▪ <i>Heavy metals</i> ▪ <i>Carbon Dioxide Analyzer (CO2 Gas Analyzer)</i> ▪ <i>Dust Monitor</i> ▪ <i>Soil Testing Kit (tests for: pH, nitrogen, phosphorus and potassium)</i> ▪ <i>Noise meters</i> 	Registration and approval by Water Resources Authority NEMA accreditation /approval KEBs Accreditation	1	<ul style="list-style-type: none"> ▪ Monitoring of water abstraction rates. ▪ Monitoring of water quality ▪ Monitoring pollution of water sources –Rivers and boreholes ▪ Water & effluent analysis ▪ Carbon dioxide analyzers will be uses for monitoring purposes and control of CO2. ▪ Monitor the concentration of particles and fine particles such as dust, smoke, pollen, and other aerosols that are in the air. ▪ To monitor soil acidity or alkalinity. ▪ To monitor noise and vibrations
Incinerator <ul style="list-style-type: none"> ▪ <i>Biomedical incinerator</i> 	NEMA approval KEBs Accreditation	1	<ul style="list-style-type: none"> ▪ Combustion of biomedical waste.
Fully equipped Waste Management Department / Sustainable solid waste management facility / centre <ul style="list-style-type: none"> ▪ <i>Equipped Waste Recycling / collection station</i> ▪ <i>Waste collection bins</i> ▪ <i>Street litre bins/</i> 	NEMA approval	1	<ul style="list-style-type: none"> ▪ Waste sorting for recycling purposes ▪ Waste segregation <ul style="list-style-type: none"> ▪ will be set up which will be responsible for ▪ collection and disposal of solid waste. Tatu City will encourage best/sustainable management practices such as the 3Rs to ensure that the waste that ends

<ul style="list-style-type: none"> ▪ Skips / ▪ Waste / transportation vehicles 			up in dumping site is minimal.
	NEMA approval for Waste transportation County Government of Kiambu	No. of vehicles dependent on waste production	<ul style="list-style-type: none"> ▪ Waste Collection ▪ Waste transportation

Table 9-13 highlights some of the key trainings, professional courses / requirements, and studies needed for effective capacity development on implementation of the SEA.

Table 9-13 Training, Research and Studies

Training / Professionals Courses Required	Duration of the training	Scope / purpose / Skills required	Organizations / Institutions providing the training and cost.
Environmental Planning and Management /	Degree Bachelor's 4 Years	Integration of holistic planning and Management of land development with consideration of natural environment, social, political, economic and governance with goal to sustainable development	<ul style="list-style-type: none"> ▪ Kenyatta University ▪ University of Nairobi ▪ Jomo Kenyatta University ▪ Dedan Kimathi University ▪ Pwani University ▪ Egerton University ▪ Moi University ▪ Other approved Universities and intuitions of higher learning ▪ Vocational Technical Colleges (Amboseli Institute Thika, Nairobi Institute of Business studies)
Environmental studies (community Development)	Master's 2 years		
Energy auditor	PhD. 4 Years	To preserve energy and reduce energy usage by inspecting buildings to find and fix leaks to help people use fewer resources.	
Environmental engineers		To use the principles of engineering, soil science, biology, and chemistry and create solutions to environmental problems—like improvements to recycling, waste disposal, public health, and water and air pollution control.	
Hydrologist		Expertise of water quality and availability, To collect samples, or reading monitoring equipment, and analyze data and model their findings.	
Environment protection technician / auditors		To police for the environment, these technicians monitor the environment and investigate sources of pollution and	

		contamination, and work to prevent violations.	<ul style="list-style-type: none"> ▪ Technical institution (Kiambu Institute of Science and Technologies; Technical University of Kenya etc). ▪ Tatu Vocational Training Centre <p><i>Costs are dependent on the respective program rates by learning institutions</i></p>
Wildlife biologist		To study animals and their behaviour to see how they interact with their natural habitats.	
Earth Sciences		Encompasses <ul style="list-style-type: none"> • Geology. • Meteorology and Climatology. 	
Conservation scientist and forester		Manage the overall land quality of forests, parks, riparian zones and other natural resources. Their duties include protecting and enhancing habitats for animals, facilitating public recreation.	
Environmental Health and safety Specialists		conducting environmental health investigations or inspections. Enduring occupational health and safety during project construction, operations and decommissioning.	
Solar photovoltaic installers	2-3 years Diploma/ Higher Diplomas from Technical Institutions	Often called PV installers, these workers will assemble, install and/or maintain solar panel systems, which are great sources of renewable energy.	
Plumbers		To deal with plumbing issues (repairs and maintenance) and fixing leaks Utilities record keeping	
Electricians		To deal with electrical wiring (repairs and maintenance) etc Utilities record keeping	
Vocational training	<ul style="list-style-type: none"> ▪ On job trainings 	Other services including: <ul style="list-style-type: none"> • Refuse management • Tree management • Cleaning 	

10 SUMMARY OF THE POTENTIAL SIGNIFICANT IMPACTS OF THE PROPOSED MASTER PLAN

10.1 Introduction

This chapter gives a highlight of key potential and significant impacts of the proposed Master Plan. The impacts have been analysed based on the SEA study including stakeholders' consultations. It is therefore imperative for Tatu City Limited to ensure the highlighted impacts and key concerns are prioritized.

10.2 Rise to Grievances

In regard to the development scale, and displacement of people, rise to grievances among the affected population over varying issues ranging from rates of compensation and eligibility criteria to the location of resettlement sites and the quality of services at those sites to unknown fears will inevitably lead to grievances. Timely redress of such grievances is vital to the satisfactory implementation of resettlement and to completion of the development. Tatu Limited should develop and ensure that procedures are in place to allow affected people to lodge a complaint or a claim (including claims that derive from customary law and usage) without cost and with the assurance of a timely and satisfactory resolution of that complaint or claim. In addition, the development should make special accommodations for women and members of vulnerable groups to ensure that they have equal access to grievance redress procedures. Such accommodation may include employment of women or members of vulnerable groups to facilitate the grievance redress process or to ensure those groups representing the interests of women and other vulnerable groups take part in the process. Grievances are best redressed through project management, local civil administration, or other channels of mediation acceptable to all parties. Such channels of mediation may involve customary and traditional institutions of dispute resolution. Tatu Limited management should make every effort to resolve grievances at the community level. Recourse to the legal system should be avoided except as a last resort. Key measures for grievances redress from affected people or organizations/ institutions should include;

- Institutional arrangements for grievance redress;
- The procedures for recording and processing grievances;
- The mechanisms for adjudicating grievances and appealing judgments; and
- A schedule with deadlines for all steps in the grievance redresses process.

10.3 Socio- Economic issues / Concerns

Taking into cognizant of the proposed Master Plan and scale of the development upon execution, it will impact negatively to the local communities who derive their livelihoods from the coffee plantations. The coffee workers earning a livelihood will lose their jobs once the coffee plantation is cleared for development. This will have a localized impact on the neighbouring rural household economy. Further, the workers. The SEA study also established approximately 40 houses with staff who reside within Mchana Estate. It will be important to ensure the staff are compensated for a smooth relocation. In brief the following mitigation measures are recommend;

- Maximize the recruitment of locals where possible
- Develop community awareness programmes to enhance cohesion between project employees and the local community
- Consult with the public and the locals during implementation of proposed developments
- Sensitize coffee workers about the proposed mixed-use development and allow for smooth transition

- Develop and implement a Livelihood Restoration Plan (LRP) for the coffee workers whose career will be affected during implementation of the proposed Tatu City Extension (Mchana Estate) master plan.

10.4 Degradation of aquatic ecosystems

The storm water from Tatu City Extension (Mchana estate) will be directed to the existing dams. Typically, storm water/surface run-off from urban environments is known to be of low quality due to high level of sediment loads and pollutants. Entry of such waters into water bodies is likely to degrade the quality of aquatic ecosystems. It is highly likely that the streams, rivers, wetlands and dams in the proposed Master Plan area will be the recipient of surface run-off from the proposed development. Creation of buffer zones and protection of the riparian zone around such catchment areas will go a long way in cushioning the areas from spill-over effects of the proposed mixed use development.

10.5 Traffic Impact

The envisioned development by the proposed Master Plan is likely to result into an increase on current levels of human and vehicular traffic. This will be exacerbated by the ongoing linkage developments such as Northland City, K.U, Ruiru and Juja Towns. It is therefore important to ensure a traffic impact analysis is conducted based on KeNHA and KURA plans. Key insights should be on how traffic in the Master Plan area will be managed including design standards for connections to the existing national roads. Further, capacity of existing traffic and transport infrastructure to support the traffic is required. Clear improvement/modifications need to be recommended including the type and capacity of the access junction to be established, the peak hourly traffic volume along the existing roads as well as from the development needs to be established. Further trip distribution and route assignment of the development traffic needs to be established. The data requires to be forecasted into the future planning horizon of each land use area / phase to establish the future capacity of the roads.

Traffic Impact Analysis (TIA) will help to determine the possible effects of the development on the transportation and traffic system. TIA should be used as one of the vital parts of several kinds of information's to judge the suitability of development from a transportation standpoint. Traffic congestion results in several problems, including economic cost due to delayed travel times, stop and go situation of traffic at both link and nodes in any traffic network and its concomitant air pollution and of course road accidents. As one roadway becomes congested, drivers may use others not necessarily intended for through traffic. Often TIA it is applied only to the direct impact area and countermeasures for potential negative impacts are specific for the development. TIA will help to assess the adequacy of the existing or future transportation infrastructure to accommodate additional trips generated by a proposed development and land use rezoning.

10.6 Water Demand

The proposed Tatu City Extension (Mchana Estate) Master Plan has earmarked mega developments such as industrial zones, recreation areas, residential, commercial and agricultural zones all of which are water demanding. It is anticipated that there will be high water abstraction from Mukuyu, Mchana, Galana/Ruiru Rivers, Comte Earth Dam and Mchana Earth Dam. Pollution of the aforementioned water resources is also not guaranteed. This therefore necessitates the need to conduct hydrological studies and account for the actual water demand for the city relative to proposed land uses. Further the studies will help to establish the potential of ground water resources in Tatu City and amounts of storm water that can be harvested for utilization. The supply potential of Nairobi Water and Sewerage Company (NWSC), Ruiru-Juja Water and Sewerage Company (RUJWASCO) and others need to be examined in respect to other upcoming development such as Gulmarg - Sasini, KU Unicity and Northlands City.

10.7 Waste Impacts

The proposed Master Plan will result to developments known to generate high amounts of solid and effluent waste. This will mainly be output from residential, commercial and industrial areas. It is therefore important to ensure the impact associated with waste are critically analysed. These should entail an assessment of the existing and planned management infrastructure on site, Ruiru Sub-County and Kiambu County at large. Scenarios should look into waste generated by the interlinking Master Plans and the capacity to manage waste from Tatu City. The potential of alternative waste management technologies such as on-site treatment for energy production, recycling or disposal require to be studied.

10.8 Habitat Alteration / Loss of agricultural land

The SEA study notes that the execution of the proposed Master Plan will lead to habitat alteration and eventual loss of agricultural land. Although the alternative of analysis clearly showed that development of a city will have higher benefits, its ideal that the Master Plan ensure reduced catchment disturbances. The vegetation cover along the rivers play critical environmental and ecological roles as such maximum caution during planning to avoid land use changes that might result into disturbances to the natural forest/vegetation. Some of the key mitigation measures are as follows:

- Maintain the proposed green spaces as per the Master Plan
- Where clearance of natural vegetation is inevitable; ensure replacement with indigenous species / tree planting program in landscaped sections and other green spaces
- Formulation and implementation of a wildlife management plan in collaboration with KWS
- Ensure protection of the riparian environment and establishment of a riparian reserve management plan
- Formulation and implementation of a Biodiversity Management Plan
- Undertake ecological assessment including site specific invertebrate assessment during EIAs
- Ensure all projects comply with the Environmental Management and Co-ordination (Conservation of Biological Diversity and Resources, and Access to Genetic Resources and Benefits Sharing) Regulations, 2006.

11 CONCLUSIONS AND RECOMMENDATIONS

From the foregoing, the proposed Tatu City Extension (Mchana Master Plan) by Tatu City Limited is a worthy investment by the proponent and will contribute significantly to the improvement of living standards among the investors and by extension spur economic development to the population within Kiambu County and Kenya at large.

The developments envisioned by the proposed Master Plan anchored on specific principles of a mixed-use and vibrant urban environment, which embodies the notion of live, work, and play; public transport and pedestrian friendliness; flexibility and accommodation of a variety of lifestyles; spatial integration with the Tatu City Phase 1, immediate urban context and greater Nairobi as a whole; and maximizing self-sufficiency will bring along numerous positive impacts ranging from creation of employment, supply of the much-needed office, retail/commercial/industrial and residential spaces, decongesting the nearby towns and cities, optimized land use among other benefits, all aimed at attaining the vision 2030. The proposed Master Plan helps in realization of the two pillars of Vision 2030 by contributing in the economic and social pillars. Further, the Master Plans align well with the Big Four Agenda on enhancing manufacturing sector, providing affordable housing and providing universal health coverage. In summary, all the projects contained in the Tatu City Extension (Mchana Estate) Master Plan contributes greatly towards achievement of the government's Big Four Agenda.

The Kiambu CIDP's objective of creating and transforming systems, structures and institutions within the County is based on five key pillars of security, employment, education, health and urban planning echoes well with the proposed Tatu City Extension Master Plan specifically growth of industries and trade; and other sectors of the economy such as housing, education, agriculture, hospitality, natural resources conservation amongst others. It is our recommendation that NEMA approves this SEA report to allow for the execution of the Master Plan and realization of envisioned developments.

11.1 Recommendations

This sub-section gives a detailed description of recommended Master Plan changes. Further it has elaborated on the recommended mitigation measures for the Master Plans based on analysed impacts. The sub-section echoes various projects and developments that must undergo an EIA with an aim at developing systems that shall be environmentally friendly, economically viable, socially acceptable and sustainable for the developments. Towards the end, the sub-section has identified key tasks that should serve as the minimum components for subsequent EIAs.

11.1.1 Recommended Master Plan Changes

Tatu city Limited will continue to modify and update the zoning and subdivision ordinances to promote a more thoughtful and holistic approach that is compatible with and compliments the character of its surroundings to ensure optimal land use of the proposed development. A well-defined mandatory design review process shall be established to ensure the zoning designs are appropriate and consistent with the long-term objectives of the Land-Use Plan.

All preferred land uses deemed necessary to accommodate present and future needs of the city for a sustained long-term growth will be adopted to maintain a favourable land use map that incorporates all areas within the boundaries of the city. Ample areas will be identified and designated within the land use map to cover for the missing gaps identified such as cemeteries / crematoriums and dumpsites in order to satisfy anticipated demands for a wide-range of residential development

For the proposed development to achieve its intended strategic objectives and be compatible with sustainable environmental planning and management, the following recommendations should be incorporated in the design.

11.1.1.1 Establishment of a Cemetery/crematorium

The Master Plan has not provided for a cemetery/crematorium for its population since death is inevitable. There needs for a facility to provide for safe and organized disposal of dead bodies. The Kiambu County Integrated Development Plan accommodates for provision of these facilities in order to promote general public health and sanitation. In these regards, it is critical for Tatu City Limited to provide adequate land for cemetery purposes. If unviable for phase 2 - Mchana Estate Master Plan, the consideration should be prioritised in phase 3 of the earmarked Tatu City extension.

11.1.1.2 Designation of a Solid waste management facility

The master Plan has not provided for a dumpsite for solid waste disposal. The Kiambu County Integrated Development Plan identifies poor urban area solid waste management as a problem in the County and proposes the acquisition of suitable land for dumpsites. A sustainable solid waste management facility / centre therefore is crucial to enhance hygiene of the city. It is therefore recommended that a suitable site be identified for waste management which should be anchored on an integrated solid waste management system for the city.

11.1.1.3 Wastewater Treatment facility

Tatu City Limited has estimated that 12,474 cubic metres of waste water will be generated daily by the low, medium and high residential developments, industrial, commercial, educational and recreational developments, public utilities, tourism and social facilities with the industrial zone producing the highest volume of waste water (2,040 M³/Day). Tatu City Limited should consider adopting an Industrial Ecology Approach for the Industrial Park. Industrial Ecology is a paradigm based on the idea of making industrial systems to emulate a more efficient and sustainable natural systems to reduce the industrial systems' environmental impacts. One of its key components is to change from linear (open) processes to cyclical (closed) processes, so that the waste from one industry is used as an input for another, in an effort to mirror an ecosystem. Land should therefore be allocated for Wastewater Treatment facility with emphasis on an industrial waste treatment plant from the industrial park. Every industry should have its own treatment plant for effluent waste before being discharged into the main sewer line or to the industrial waste treatment facility.

11.1.1.4 Location of Industrial uses away from residential uses

Both light and heavy industrial forms are classified as undesirable neighbours of residential land uses, especially low-density residential developments. Following the anticipated negative impacts from some of the components of the Master Plan (more especially heavy industries/commercial areas), there is need to consider the proximity distances and establish a control system so as not to negatively affect the residential areas; hence it will be prudent for the proponent to ensure the minimum distances are observed.

11.1.1.5 Establishment of storm water treatment / filtration systems

Tatu City should develop a local storm water management plan that includes design strategies to protect sensitive open space areas, minimizing site disturbances, and using the land's natural treatment functions. An option of providing a space for storm water ponds can also be incorporated in an effort to recharge underground water.

11.1.2 Recommended Mitigation Measures

The Master Plan is intended to provide the direction for development within the proposed Tatu City Extension (Mchana Estate). It must balance the capacity for supporting new development within the

ability and desire of the City to best manage growth. In order to be effective as a decision-making tool for design, construction and management, it should also serve as the foundation for the zoning ordinance text and map. Generally, this foundation is to link the density or intensity of development within the plan with the appropriate use and parcel requirements within the ordinance.

11.1.2.1 Protection of riparian land / zones / wetlands

For the preservation, protection and management of riparian areas which are endowed with a number of natural resources that need to be protected through a better and effective system of management, Tatu City Limited should ensure no development activity is undertaken within the full width of a River or stream to a minimum of six (6) metres and a maximum of 30 metres on either sides based on the highest recorded flow levels. This is according to Environmental Management and Coordination (Water Quality Regulations), 2006, Part II section 6 (b) and (c) that provides regulations on protection of Lakes, Rivers, Streams, Springs, Wells and other water sources.

The constitution of Kenya (GOK, 2010) Chapter 5 - Land and Environment - in article 62 1 (l) states that public land is 'all land between the high and low water marks' which translates to all riparian zones being public land and therefore Tatu Limited should therefore ensure no development activities encroach on riparian zones.

Other key legislations on riparian land protection include; Water Resources Management Rules, 2007, Agricultural Act (Cap318), Forest Conservation and Management Act, 2016, the Land Act 2012, the Water Act, 2016 and the Wildlife (Conservation and Management) Act 2013.

Conservation and protection of wetland resources should form part of the Master Plan activities. Wetlands within the Master Plan area should be mapped and protected in order to reap ecological and other benefits associated with these areas. Local communities should be actively involved in the development activities and be made part of the decision-making process on matters linked to the Master Plan. Catchment destruction should be controlled, and the areas conserved by involving local stakeholders in environmental conservation process.

11.1.2.2 Protection of upstream River basins

The evolution and growth of cities and towns are primarily dependent on three important factors- Its geographic location, physical environment and its socio-economic environment. The presence of water in various forms in its natural setting plays an important role in enhancing the quality of physical environment and the socio-economic environment. Tatu City is endowed with water bodies whose sources are from the highland areas located outside Master Plan boundaries.

The implementation of the various components of the Master Plan will be a catalyst for growth and development within the neighbourhood, thus rapid urbanization and unplanned growth is expected on upstream River basins leading to deterioration of the upstream water bodies which flow into Tatu City. This results in land transformation which in turn affects the water bodies either by pollution, disappearance or making it completely useless. This will be increased water demand within the mushroomed developments, obstruction and diversion of water channel and pollution of the water bodies is inevitable as they become dumping sites for untreated domestic sewage and solid waste thus compromising the quality of water in the Rivers.

It is therefore prudent for Tatu city to work in collaborative partnership with the department of Water, Environment, Energy & Natural Resources of Kiambu County and raise environmental awareness on the preservation, conservation and rejuvenation of water bodies as major factors that contribute to the sustainable development of Kiambu County. Through public participation programmes, communities should be enlightened on water pollution abatement since water bodies improve the social and recreational value thus increasing the liveability of the residents and land value many folds. It should also be noted that the presence of water bodies gives added social,

psychological and environmental value as it enhances the aesthetic quality and place quality, thereby contributing to the image of the city or town.

The proposed Tatu City extension will promote a pattern of zoning and development along the river reserves in a manner that is sensitive to and compatible with the natural habitat and character of this area. The City development will also encourage recreational development and commercial opportunities in areas adjacent to the rivers including provisions of facilities for walking, hiking, cycling, fishing, picnicking, wildlife and natural habitat observation, as well as a variety of active recreational facilities where appropriate.

11.1.2.3 Habitat and Wildlife management

The Tatu City Management in consultation with KWS should prepare an Integrated Wildlife Management Plan (WMP) and provide an inventory of the wildlife species within the Master Plan for adequate management of the species. Where feasible the plan should allow migration of the small wild game to neighbourhood undisturbed sites during implementation of the Master Plan. Alternatively, Tatu City Limited may consider putting up a small orphanage/park and introduce native wild game.

11.1.2.4 Leverage for controlled urban planning on the Master Plan boundary

Effective planning regulations and enforcement will help Tatu City deal with the growth of informal settlements and provide a map for how the city will grow and develop, while promoting economic growth. Tatu city Limited should work in collaborative partnerships with the planning department of Kiambu County in supporting the developments compatibility with the neighbourhood scale and character. Low-density residential subdivisions and development shall be discouraged from developing immediately adjacent to arterial roadways which are anticipated for long-range widening and improvements, unless appropriate transitional zoning or buffering is provided.

11.1.2.5 Harnessing power from renewable energy sources to supplement supply from the National Grid

The design of sustainable cities plays a natural catalytic role for change and improvement of the environment quality. Sustainable development strategies and methodological principles of sustainable architecture in particular, serve as a basis to define a set of core principles of establishing architectural solutions of energy-efficient buildings such as urban, architectural and planning, design concepts as well as the principles of the use of renewable energy. The proposed development will result in a higher demand on energy resources both during construction and operation phases of the development. Tatu City should encourage developers within the Master Plan to explore options for establishing sustainable energy systems by reducing energy consumption, particularly in the buildings. Solar energy can be harnessed by incorporating solar infrastructure within the roofs of all residential buildings.

11.1.2.6 Incorporating Green Building Techniques in construction of individual projects

Green building (also known as green construction or sustainable building) refers to both a structure and the application of processes that are environmentally responsible and resource-efficient throughout a building's life-cycle: from planning to design, construction, operation, maintenance, renovation, and demolition. This requires close cooperation of the contractor, the architects, the engineers, and the client at all project stages. The Green Building practice expands and complements the classical building design concerns of economy, utility, durability, and comfort at the same time rendering the building more efficient in utilization of renewable resources thereby reducing pollution. There is need for Tatu City Management to consider incorporating the green building techniques in the individual projects during project design, construction and operation phases.

11.1.3 Need for Subsequent ESIA's

This SEA is for the proposed Tatu City Extension (Mchana Estate) Master Plan; the developments and projects envisioned by the Master Plan will require to undergo individual integrated environmental and social impact assessment as per EMCA (Cap 387), and Environmental Impact Assessment (Assessment and Auditing) Regulations of the year 2003. The second schedule of EMCA (Cap 387), provides details on projects that require Environmental Impact Assessment study be undertaken to provide baseline information upon which subsequent environmental audits shall be based. The Environmental Impact Assessment (Assessment and Auditing) Regulations of the year 2003, which is given under legal notice no. 101 stipulate the ways in which environment impact assessment and audits should be conducted.

11.1.3.1 Projects to undergo Environmental Impact Assessment

The second schedule of EMCA Cap 387 has categorised respective projects to undergo Environmental Impact Assessment according to risks. These include;

- (i) Low risk projects
- (ii) Medium risk projects
- (iii) High risk projects

All low risk and medium risk projects are required to undergo Environmental Impact Assessment whereas high risk projects require submission of environmental impact assessment study reports under section 58(2) of the Act. For all Low Risk and Medium Risk Projects, NEMA needs a summary ESIA project report of the likely environmental effect of the project. If the impacts are minimal, the report shall be approved within 5 days or recommended for a comprehensive project report if the impacts are significant.

High Risk Projects shall require development of detailed Terms of Reference for comprehensive/ full study. As per the 2nd schedule of EMCA (Cap 387) high risk projects in general include; an activity out of character with its surrounding; and any structure of a scale not in keeping with its surrounding. Further, as anticipated in the proposed Master Plan, major changes in land use; urban development including designation of new townships; transportation and related infrastructure projects including all new major roads such airports and airfields; must undergo an environmental impact assessment study.

The proponent for all respective developments and projects which fall under the Second Schedule of EMCA Cap 387, as anticipated in the execution of Tatu City Extension Master Plan will require to consult NEMA licenced environmental consultants/firms to ensure an EIA is undertaken for licensing purposes before works commence.

11.1.3.2 Key components for the EIAs

The respective EIAs will mainly aim at developing systems that shall be environmentally friendly, economically viable, socially acceptable and sustainable for the developments. To achieve these components, the EIAs will be undertaken as per legal notice no. 101. The following tasks should serve the minimum components for subsequent EIAs:

Task 1: ESIA Screening and Scoping

To undertake a consultative ESIA screening and scoping through desktop studies, literature review, development and administration of checklists, identification and preliminary consultations with key stakeholders, reconnaissance trip to the project area and identification of key issues. The key issues that will emerge during the screening stage will be included in the EIA Report and TORs that will be

developed for approval by NEMA. The TORs for NEMA approval as required by EMCA Cap 387 will outline the main outputs of this task that will be carried out in the first week of the EIA study. It will give provision for scoping the key issues identified and to be addressed in the report.

Task 2: Description of the Proposed Project

The Consultant will provide a good description of the relevant components of the project based on the existing baseline surveys and existing maps (at appropriate scale) where necessary and including the following information: location; general layout of activities/ components, approaches, operations, required off-site investments; and life span. The final project objectives should be outlined. This information will be collected from existing project documents and interviews of the project proponents/ developers.

Task 3: Description of the Environment/ Baseline Surveys

The Consultant will assemble, evaluate and present baseline data on the relevant environmental characteristics of the study area. This task refers to all baseline surveys outlined below:

- The climate, habitat and vegetation, ecological assessment including site specific invertebrate assessment, soils, geology, demographic and settlement characteristics; the physical environment; historical archeological monuments and cultural heritage etc.
- The socio-economic profile of the area in terms of existing population trends, road and communication networks, key economic activities, etc.

This data will be generated using the methodology described above and field surveys using questionnaires. Secondary data sources like government institutions will be a supplement for this component.

Task 4: Analysis of the Legislative and Regulatory Considerations

Describe the pertinent international, regional and national (NEMA) regulations and standards governing environmental quality, health and safety, protection of sensitive areas, protection of endangered species, sitting, land use control, etc., at international, national, regional and local levels. This will set the environmental legal and institutional framework for future by the management of the proposed project. The focus will be on EMCA CAP 387, Water Act 2016, Public Health Act, Occupational Safety and Health Act 2007, Vision 2030, County laws, and International Multilateral Environmental Agreements etc.

Task 5: Determination of the Potential Impacts of the Proposed Project

The consultant will analyze and distinguish between significant positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts. Impacts which are unavoidable or irreversible will be identified. Wherever possible, description of impacts quantitatively, in terms of environmental costs and benefits will be undertaken and assign economic values when and where feasible. The extent and quality of available data will be characterized, explaining significant information deficiencies and any uncertainties associated with predictions of impact. When describing the impacts, the consultant will indicate those that are irreversible or unavoidable and which can be mitigated. The consultant will also identify the types of special studies likely to be needed for this project in future.

Task 6: Analysis of the Alternatives to the Proposed Project

The consultant will describe alternatives that will be examined during developing the proposed project and identify other alternatives which would achieve the same objectives. The concept of alternatives will extend to sitting, design, technology selection, implementation and phasing, and operating and maintenance procedures. Comparison of alternatives in terms of potential

environmental impacts; capital and operating costs; suitability under local conditions; and instructional, training, and monitoring requirements will be done. To the extent possible, the costs and benefits of each alternative will be quantified incorporating the estimated costs of any associated mitigating measures. The consultant will include the alternative of not implementing the project, in order to demonstrate the environmental conditions without it.

Task 7: Development of Environmental and Social Management Plan to Mitigate Negative Impacts

The consultant will recommend feasible and cost-effective measures to prevent or reduce significant negative impacts to acceptable levels. The impact and costs of those measures and of the institutional and training requirements to implement them will be estimated using current and project market prices of materials and services. Compensation to the affected parties (if any) for impacts which cannot be mitigated will be considered where need arises. A comprehensive environmental and social management plan including proposed work programs, budget estimates, schedules, staffing and training requirements, and other necessary support services to implement the mitigating measure will be prepared.

Task 8: Development of Environmental Monitoring Plan

The consultant will prepare a detailed plan to monitor the implementation of mitigating measures and the impacts of the project during the whole cycle. Key parameters to be monitored and procedures will be identified clearly. An estimate of capital of operating costs and a description of other inputs (such as training and instructional strengthening) needed to carry out the monitoring will be included in the plan.

Task 9: Public Consultations and Inter-Agency Coordination

The consultant will assist in coordinating the environmental assessment with other government agencies, in obtaining the views of local people/ businesses, affected groups, and in keeping records of meetings and other activities, communications, and comments and their dispositions. Such activities will include: focus group meetings, environmental briefings for project staff and interagency committees, support to environmental advisory panels and public forums as need will arise.

Task 10: ESIA Project Report Compilation

This will be a continuous exercise throughout the process until final submission. The environmental assessment report will be concise and limited to significant environmental issues. The main text will focus on findings, conclusions and recommended actions, supported by summaries of the data collected and citations for any references used in interpreting those data. Detailed or un-interpreted data will not be appropriate in the main text and will be presented in a separate volume. The final Environmental and Social Impact Assessment Report will be outlined as below.

- i. Cover Page
- ii. Declaration by NEMA ESIA Lead experts and the proponent
- iii. Executive Summary
- iv. Policy, Legal and Administrative Framework
- v. Description of the Proposed Project
- vi. Description of the Environment/ Baseline Survey
- vii. Public Consultation and Participation
- viii. Significant Environmental Impacts
- ix. Analysis of Alternatives
- x. Environmental Mitigation Management Plan
- xi. Environmental Monitoring Plan

- xii. List of References
- xiii. Appendices

Care should be taken to describe the Environmental and Social Impact Assessment process as clearly as possible. However, should any additional information become available or additional information be required, the process should be adapted accordingly. An Integrated Environmental Assessment approach is recommended to all future project-specific ESIA's. The ESIA shall include: Environmental Impact Assessment, Archeological Assessment, Social impact assessment, Health Impact Assessment, Cumulative Impact Assessment, Visual Impact Assessment and Cultural Impact Assessment.

11.2 Recommended Way Forward

We recommend for approval of this Final SEA Report due to the huge socio-economic benefits that will emerge from its implementation subject to implementation of the recommendations herein and those that the Authority may recommend to the proponent.

LIST OF REFERENCES

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APPENDICES

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